PROCEEDINGS

Edited by Prof.Dr. Hüseyin Gökçekuş

VOLUME 5

International Conference on
Environment: Survival and Sustainability

19-24 February 2007 Nicosia-Turkish Republic of Northern Cyprus
Organized by **NEAR EAST UNIVERSITY**

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PREFACE

Creating a sustainable and a healthy environment is one of the most important global issues facing mankind today. Therefore, serious consideration should be given to environmental problems and concerted efforts should be made worldwide in order to respond and prevent present and future environmental risks and challenges.

The International Conference on Environment: Survival and Sustainability (ESS 2007) organized by the Near East University between the dates 19 and 24 February 2007 was held in Lefkosa, Turkish Republic of Northern Cyprus. The main objective of this multidisciplinary conference was to gather scientists from all over the world to discuss the overall issue of the environment, to find out sustainable solutions for environmental problems and to identify areas for future collaboration in this matter. The conference brought together 2,052 participants from 108 different countries. During the conference a total of 1,463 papers were presented under 21 different subtopics, representing various scientific disciplines. The topics included environmental law and ethics, environmental knowledge, technology and information systems, media, environmental awareness, education and lifelong learning, the use of literature for environmental awareness and the effects of the green factor in politics and in international relations.

The Scientific Committee of International Conference ESS2007 evaluated all of the 1,463 papers and selected among them 610 papers to be included in The Proceedings of Environment: Survival and Sustainability. The readers will notice the wide range of topics represented by the papers included in the Conference Proceedings.

It is hoped that this book will serve to contribute to increase in awareness towards various environmental issues as well as drawing more attention to the urgency of international cooperation and collaboration in pursuing sustainable environmental management.

Prof. Dr. Hüseyin Gökçekuş
President of the Conference and the Organizing Committee
Vice Rector of the Near East University
Lefkoşa-TRNC
18 February 2009

ACKNOWLEDGMENTS

The Organizing Committee of the ESS2007 Conference would like to extend its sincere appreciation to Dr. Suat Günsel, the Founding Rector of the Near East University, to Prof. Dr. Ekmeleddin İhsanoğlu, General Secretary of the Organization of Islamic Conference and to Prof. Dr. Walter W. Kofler, President of ICSD/IAS for their significant support and encouragement in the conference.

Appreciation is also extended to the chairpersons, the keynote speakers and the presenters of papers in the conference.

We are deeply grateful for the members of the editorial board who have carefully read and recommended the papers for publishing.

We also wish to express our gratitude to numerous individuals for their valuable contribution to the editing process.

Prof. Dr. Hüseyin Gökçekuş
President of the Conference and the Organizing Committee
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Message from the Honorary President of the Conference

The interaction between humans and their environment has entered a critical stage as the delicate balance between them has become more fragile making it difficult for the nature in many areas to renew itself. All this poses a variety of serious challenges for us all. The main challenge before us is no less than redefining our entire relationship with our environment. At this critical juncture, I feel excited and take pride in once again hosting such a distinguished group of scientists, researchers, journalists, and students from all over the world at our university addressing such a critical global concern. I look forward to welcoming you all in Turkish Republic of Northern Cyprus.

Yours truly,
Dr. Suat İ. Günsel
Founding Rector of the Near East University

Message from President of the Conference

It gives me the utmost pleasure in welcoming you all to the International Conference " Environment: Survival and Sustainability" here at the Near East University in Turkish Republic of Northern Cyprus to be held at 19-24 February 2007.

The conference aimed at bringing together more than 2,000 scholars and researchers from over 90 countries around the world to discuss environmental issues from a variety of perspectives; underline the importance of the need for urgency in taking steps by the international organizations, states, local authorities and non-governmental organizations to move to a sustainable environment/development model; and thereby makes its contribution to worldwide debate effort on strengthening the bridge between theory and practice in meeting environmental threats/challenges.

Since our last international conference on environment, "Environmental Problems of the Mediterranean Regions", worldwide environmental disasters as well as local ones have multiplied and environmental degradation and pollution has continued. While major strides have been made in the world in analyzing, understanding and informing the public about the environmental challenges we are facing, we still have a long way to go. Our way of life is still far from a sustainable model and our environment continues to degrade and deteriorate due to human activities. The consequences can be seen in worldwide environmental disasters as well as locally in our daily lives.

This is going to be our third international conference on Environment organized by our young university since it was established in 1988.

Yours sincerely,
Prof. Dr. Hüseyin Gökçekuş
Vice Rector of the Near East University

OPENING SPEECHES

Prof. Dr. Ümit HASSAN
Rector of Near East University, TRNC

His Excellency, the Prime Minister of the Turkish Republic of Northern Cyprus,

His Excellency Secretary General Organization of the Islamic Conference,

Distinguished guests, colleagues, ladies and gentlemen,

On behalf of the Founding Rector and the Near East University, I take this opportunity to wish you all a warm welcome for a fruitful conference. It is a great pleasure for me to be a participant at this international conference.

The International Conference on Environment, Survival and Sustainability is a new and most important sequel to a chain of international conferences organized by the Near East University. I trust the conference will provide participants with an opportunity to discuss, to show and to express the related problems and share their experiences. I believe that we will have a most beneficial scientific medium taking the battles into consideration between theoretical analysis and experimental observations and studies.

It is evident that this balance of methods and techniques will have to create a high level of scientific contribution. In other words, the conference will strengthen the bridge between theory and practice in meeting environmental threats, and emphasize the urgent need for coordination and integration among all bodies towards a more sustainable environment. I would like to take this opportunity to proudly emphasize and announce the accomplishments of the Near East University in fulfilling the requirements in founding the School of Medicine as a subsequent step following the School of Pharmacology and the School of Dentistry which will start to function properly in this coming academic year. Within this context, I would like to inform you that the technological means and the academic staff needed by such schools are at the highest level at the Near East University. Our conception of the Technopark being different from the practices of other universities is solely aimed at using our efforts and resources in developing the necessary infrastructure for establishing a Medical School which will be in the service of the island. From a social-psychological perspective, I believe this will enhance the perception of people regarding the dimensions on the management of health issues of the islanders, and for us this would be a moral boost. Considering the significant intellectual and moral capacity of the participants, I simply think that we all want to declare that each and every soul on this planet has the right for survival and to be included amongst the fittest.

Thank you, thank you all.

Prof. Dr. Hüseyin GÖKÇEKUŞ
President of the Conference & Organizing Committee
Vice Rector of Near East University

Your Excellency, President of the Turkish Republic of Northern Cyprus,
Your Excellencies, Distinguished Scientists and Participants,
Ladies and Gentlemen, Members of the World Press

On behalf of the NEU, I would like to welcome you all to the "Environment: Survival and Sustainability" Conference organized by Near East University in LEFKOŞA.

Today, it has been understood that environmental problems with their cumulative characteristics are closely interrelated with many economic, social, cultural, political and administrative parameters, which are naturally interrelated with academic insight.

Near East University was established in 1988 and has since then grown to become one of the fastest developing universities in the region setting itself the strategic goal of joining the "top 500 universities in the world."

Near East University is a member of the European University Association, the International Association of Universities and the Federation of the Universities of the Islamic World.
The University has over 3,000 staff, of which 900 are academic personnel. 17,000 students from 44 different countries are attending 12 faculties and 50 departments at the university. There are 14 dormitories with a capacity of 4,000; and several new dormitories are under construction. Nearly 50% of the students receive scholarships. This figure includes full scholarships, partial support given to students who are in need of financial help, and to those students with sportive accomplishments.

The University has to date organized 12 international conferences and congresses and many local and regional conferences, seminars and panel discussions on a variety of subjects.

The Near East University is honored to host this world conference which has surpassed in scope and content the conferences it has organized before.

Around 2,000 participants from more than 100 countries in the world are present here to discuss environmental issues from a variety of perspectives.

Turning back to the cumulative characteristic of the environmental problems, it is clear that ecological deterioration is the most important problem resulting from regional conflicts, demographic outburst, consumption of natural resources, starvation, degradation of the environment, dwindling fresh water supplies, natural mega-disasters like typhoons, earthquakes, and landslides. Hunger and malnutrition are a direct result of a lack of access to/or exclusion from productive resources, such as land, the forests, the seas, water and technology. As such, this problem is gradually gaining weight in international and national environmental politics, because all these are threatening the common future of humanity. This has refocused the world's attention on the urgency of researches and practical steps on environmental issues. These issues require global solutions in accordance with their global characteristics.

In the EU programme called *"Environment 2000: Our Future, Our Choice"* 4 major topics have been selected as priority targets.
Climate Change
Biological Diversity
Environment and Health
Management of Natural Resources and Waste
Sustainable development is the solution that leads towards a strategy that will consider the environmental problems for future generations.

Most important guidelines for Sustainable Development are:
-Demographic control.
-Reforestation.
-Protection of agricultural areas.
-Energy saving.
-Development of renewable energy sources.
-Improvement in the implementation of existing legislation.
-Integrating environmental concerns into other policies.
-Working in cooperation with the business.
-Educating people to change their unfriendly behaviors towards the environment.
-Environmental accounting in land-use planning and management decisions.

Global Environmental strategy is a must.

ENVIRONMENT DOES NOT UNDERSTAND POLITICS.
IT HAS NO BOUNDARIES OR BORDERS.

The main message of our Conference will contribute to the worldwide debate and create a multi-disciplinary discussion forum where experts from various disciplines will be able to discuss environmental issues in 21 fields such as culture, biodiversity, health, education, business and economy, environmental technology, climate change and energy among others.

Dear Guests,

Environment: Survival and Sustainability Conference is going to give you all an opportunity to get to know Near East University. The Grand Library collection has reached to more than 500,000 while 52 million articles are accessible through electronic databases. The Grand Library is fully computerized and linked to many major world libraries and research institutions throughout the world. It is open 24 hours a day, serving not only the university but the whole community. In other words the Grand Library functions as a national library.

It is my pleasure to extend our gratitude to the members of the Scientific Committee and the International Advisory Board whose active role raised the scientific level of this conference and also increased the number of participants. Unfortunately, some of the Scientific Committee members withdrew due to non scientific letters they received.

In my opinion, as pointed above

**SCIENCE HAS NO BORDERS and NO BOUNDARIES.
IT IS OF THE HUMANS and FOR THE HUMANS.**

Coming to our SLOGAN:
RIO 1992
Johannesburg 2002
Nicosia 2007
We do not have much time to lose.

On behalf of the Organizing Committee, I would like to extend our special and sincere thanks to our Founding Rector Dr. Suat Günsel, whose basic aim is to provide generous support for the improvement of continental lifestyle capabilities of the island.

We extend our gratitude to Islamic Development Bank and to the Secretary General of Islamic Conference Organization, Prof. Ekmeleddin İhsanoğlu for their invaluable contributions.

I would like to convey our thanks to the government of Turkish Republic of Northern Cyprus for their support.

Our special thanks go to the Organizing Committee Members and the students who worked day and night for the success of this conference.

Last but not least, we would also like to extend our gratitude to H.E. Mr. Ban KI-MOON Secretary General of the United Nations, for his kind moral support.

I believe this conference will scientifically contribute to the solutions of environmental problems, and hope you will enjoy your stay in our beautiful country.

Thank you.

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Rahmi KOÇ
Honorary Chairman & Founding Member of TURMEPA, TURKEY

Mr. President, Mr. Prime Minister, Your Excellencies, distinguished guests, Ladies and Gentlemen

I would like to express my gratitude to Mrs. Sıdıka Atalay for inviting us here for this very important international conference today. As founder of TURMEPA, The Turkish Marine Environmental Protection Association, I would like to share my views with you regarding our activities and accomplishments in Turkey. Why and how did I found TURMEPA? You can call it luck, you can call it coincidence. I was the Chairman of the Turkish-Greek Business Council for six years. During this period, every effort that I made to get the two countries' businessmen to cooperate failed. The Greeks never said no, but they never got their act together either. Again on one occasion in Athens, though I had great enthusiasm to continue to join forces for an interesting project, unfortunately I was very disappointed by their lack of response. At the end of the meeting just before we had lunch, the late shipping Tycoon, George Livanos, who was sitting at the very back of the conference room, called me and said, "Look here, I've been following you and your efforts for sometime and see that you are not getting anywhere and are becoming frustrated. If you really want the Greeks and Turks to cooperate in one area, that will be the environment." He also said, "I founded HELMEPA, Hellenic Marine Environmental Turkish Association, called TURMEPA and let them two cooperate to keep our seas clean. So in 1994, 24 friends believed in the cause and we founded TURMEPA, the first NGO specifically dedicated to keeping the seas clean. At that time, HELMEPA was already eleven years ahead of us and the World Bank had been gathering data on Turkish seas and marine life from HELMEPA. Soon, I found out that this was a long term project and would at least need one generation's commitment. During our efforts, we learned that there are four very important points. Point number one: It's more economical to keep our waters clean than to clean them after polluting them, this was very important. The second important point: the subject is a major undertaking and cannot be done by one association alone and requires a nationwide awareness of the problem. Our third finding was that it needed education; education is most important in achieving our goal. The last important point was international collaboration that is a must as the environment does not have borders, does not have barriers, religion, race or different languages and no politics are involved. With these four points in mind, we first trained teachers in primary schools in coastal areas and then distributed hundreds and thousands of books to these students and pupils. We also held a drawing competition with the subjects of clean seas, we made films for television and cinemas, we used newspaper advertising to get our messages across, and we worked with several universities to test water quality. In the 30 years, from 1960 to 1990 the number of species in the Marmara Sea, believe it or not, came down from 148 to only 14. Now they are coming back. We have started to see dolphins in the Bosphorus and this is good news because when dolphins come, other marine life generates itself. We set up a data room to collect and store information about marine life, our seas, inland waters and currents.

We learned to our surprise again that only 10% of sea pollution comes actually from shipping. The risk comes from domestic and industrial waste; therefore, we set up a system to monitor waste being dumped in our seas. Clean seas are of most importance to tourism which is a major source of revenue for our economy. Therefore to this end, we collaborated with sea side hotels, holiday villages, restaurants and cafes to ensure their compliments with environmental regulations. We then hoisted our TURMEPA flag on their premises. When they did so in the summer months, we put together a team of students to collect garbage from boats and yachts free of charge, we set up garbage containers in coastal areas where garbage can be deposited by banks, businesses, industries and then collected by municipal authorities. Our financing is usually organized on a project basis. With all this said and done, Ladies and Gentlemen, our efforts are still only a drop in the ocean if awareness is not felt by our citizens. Therefore, we are constantly telling the public at large that we have ignited a spark, which we must still help to spread throughout the country.

I am happy to say that the Turkish government and its Ministers, especially the Ministry of Transportation, our Governors, Mayors, academicians and businessmen have realized that clean seas are one of the most important issues we are facing. Clean seas mean life and oxygen. Polluted seas not only kill marine life but also tourism and give third world nation appearance.

I am delighted that I am joined today by our Chairman Eşref Cerrahoğlu, who is himself a ship owner and our Board Member Mr. İbrahim Yazıcı who is himself a sailor, and our General Secretary Levent Ballar who never stops coming up with a new project.

Before I finish, I would like to ask our Chairman, who made contacts yesterday, to give good news to our Cypriot friends.

Thank you for bearing with me.

Eşref CERRAHOĞLU
Chairman of Executive Board of TURMEPA, TURKEY

Mr. President, Mr. Prime Minister, Ladies and Gentlemen,

My Honorary Chairman addressed TURMEPA's activities. I am very pleased and honored to announce our work carried out in North Cyprus. Today, we will be opening a branch of TURMEPA in Girne, and more importantly, we will open a sea and shore observation center in Girne in partnership with the Municipality of Girne and the Near East University, and before the summer of 2009, our training and education program will start.

I would like to thank Mrs. Sıdıka Atalay for accepting the coordination of TURMEPA activities in North Cyprus, and I am confident that we will have all the backing of our President and our Prime Minister, and the people of Northern Cyprus.

Thank you.

Cemal BULUTOĞLULARI
Mayor, Turkish Municipality of Lefkoşa, TRNC

Honorable President, Prime Minister, Secretary General of the Islamic Conference and distinguished guests,

Welcome to Lefkoşa.

The habitat mentioned and diversity of living creatures are shrinking everywhere due to an increase in the fragmentation of landscape. The situation in Cyprus is heading towards a formidable shortcoming in terms of environmental resources. In Cyprus, we have already started to see the danger. There is a great need to improve the diversity and human health on the island. Despite the efforts put forward on these specific issues and existing threats, we still need to stress the fact that deeper collaboration is needed amongst the developing nations.

The conclusion that will be reached at the end of ESS 2007 conference will be a torch light for our municipality and we shall consider balanced use of sources in the future services and activities for Lefkoşa. I wish you all a fruitful conference during your stay in Lefkoşa and North Cyprus.

Thank you.

Asım VEHBI
Minister of Environment and Natural Resources, TRNC

His Excellency, the President of the Turkish Republic of Northern Cyprus,
His Excellency, the Secretary General of the Islamic Conference Organization,
Honored guests,

I would like to welcome you all to our conference on Environment, Survival and Sustainability here in the Near East University in the Turkish Republic of Northern Cyprus. Northern Cyprus is honored to host you with this international conference. I believe that the conference will be an important recognition of the issue of this week's environmental topics which concern not only Cyprus but also the whole world. This conference is bringing together almost 1,500 academicians from more than 100 different countries and there are 21 major topics that reflect all areas of environment such as business and environment, environment and health, global warming and a lot of others.

With the industrial revolution in the late 18th century, human beings started to change the global environment. Prior to industrialization the only unsustainable loses from human economic activities were forest cover topsoil. Most societies were relatively based on small and simple technologies using limited amounts of energy with limited territorial area, but the industrial revolution in Europe has changed this. After the revolution, large scale exploitation of fossil fuels enabled the human societies to consume natural resources, the potential of which seemed limitless. Most of our environmental problems today have a global dimension precisely because of the process of development initiated by the industrial revolution. After the 2nd World War, the world population increased rapidly. With this increase, the world started to use more fossil fuels, but these human activities effected the world adversely and we started to loose biodiversity in the environment. It is stated that every year we are losing at least 50 different species of live hood and every year a vast coverage of agricultural land has been lost due to unplanned development and soil erosion. The forests of the world are declining every year. Waste management of all kinds of waste is another problem including domestic waste and hazardous waste. Societies are producing more waste and waste amounts are increasing every year. The uncontrolled dumping of waste is still continuing specially in developing countries and polluting the soil, air and water resources.

Water shortage is another important problem. The amount of drinkable and usable water is decreasing while we are polluting these resources. Almost two weeks ago, IPCC released the draft project from its fourth assessment report where it puts forward that our climate is changing mainly because of inter human induced efforts. Global atmospheric concentrations of carbon-dioxide, methane and nitrous-oxide have increased as a result of human activities and now far exceed pre industrial values determined from many thousands of years. The global increases in carbon-dioxide concentration are due to primarily fossil use and land use change while those of methane and nitrous-oxide are primarily due to agriculture. The net result of these effects is a global average temperature rise of $6^{o}C$ in the last century. When we compare its greenhouse gas emissions within those other developed countries, Cyprus as an island may not have significant effects on the global warming but on the other hand, we may be one of the most effected countries

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from this problem. According to different United Nations scenarios, the temperature of the island may increase 2 to 4 degrees Celsius in the following century. It is also foreseen that we may have serious water problems and shortages in the near future due to increasing water demand and up to 40% decreases in the precipitation values according to the climate model predictions. Another effect of the climate change expected for Cyprus is an increasing loss of productive land leading to the desertification of the island. We have also been facing serious environmental issues like other developing countries such as problems in waste, waste water management, copper mining related problems such as the CMC and a lot of others. To solve these problems and harmonize with the European Union, the present government of the Turkish Republic of Northern Cyprus has agreed to form a separate ministry for environment: The Ministry of Environment and Natural Resources. The main mission of the ministry is to protect the environment in Northern Cyprus and ensure the sustainable use of its natural resources as well as to preserve its cultural heritage. The role of the ministry is to develop and implement the government's environmental policies in order to achieve its mission in environmental protection, sustainable use of natural resources and preservation of cultural heritage. In particular, our responsibilities include establishing coordination between different ministerial departments internally and with other ministries externally, mainly with Turkey, the European Union and others on issues of sustainability and environmental protection. We have also started to develop necessary policies and legislation. We are reviewing and endorsing different policies and legislation, submitting draft legislations to our Parliament for discussion and approval. We communicate with the media and the public on environmental issues. We provide support for environmental education in all levels of the education system. The environmental policy concerns of the Turkish Republic of Northern Cyprus should be based on economic prosperity and social coherence, taking into consideration the following three key elements.

The first one is sustainable development. Social and economical development will take place in a way that preserves our natural and cultural heritage and resources. The second one is to follow the European Union rules and standards on environmental protection. Our laws will be harmonized with the European Union environmental legislation and policies to protect and preserve our environment and the health and life of our people. The third element will be the establishment of the environmental governments' partnership model among the administration, all sectors of the economy and our people through processes which will both inform about environmental issues and standards and involve people in the associated decision making processes.

Before I finish my words, I would like to express the importance of sustainable development. All of the problems I have mentioned show us that we have to develop in an environmentally sustainable way. We have to protect the environment and preserve our natural and cultural heritage while we are developing.

I would like to thank all of the participants who came from other countries and also I would like to thank the Near East University for this wonderful organization and their great team for their outstanding efforts. I hope that this conference will shed light on most of our regional and global environmental problems.
Thank you.

Tahsin ERTUĞRULOĞLU
Leader of the National Unity Party(UBP), TRNC

Distinguished contributors, participants and honorable guests,

It is indeed an honor for all of us here in the Turkish Republic of Northern Cyprus to welcome you in a country that supposedly does not exist. Your presence here in the name of knowledge and academic freedom, and above all, in the name of service to humanity will hopefully give a valuable lesson to those who tried so desperately to prevent your participation and contributions to this conference.

Dear friends, you shall be subject to further propaganda and will be delivered misinformation about the circumstances here upon your return to your respective countries. The challenging spirit that you have, the spirit of not bothering about those that stand in the way of knowledge, friendship and partnership and service merit will guarantee the success of this most valuable conference.

In closing, I wish to thank the Near East University for working so hard and for so long in making today a reality.

I wish to thank you all for being with us here today. I wish the conference every success.

Thank you.

Assoc. Prof. Dr. Turgay AVCI
Deputy Prime Minister & Minister of Foreign Affairs of TRNC

Your Excellency, Mr President,

Your Excellency, Prime Minister,

Honorable Secretary General of the Organization of the Islamic Conference Prof. Dr. Ekmeleddin İhsanoğlu,

Your Excellencies, distinguished participants, Ladies and Gentlemen,

Today is the day. It is the day of pride and success, the day of international victory. It gives me great pleasure and honor to address a conference of which timing is very important, and welcome you all to the Turkish Republic of Northern Cyprus.

 I also would like to thank the Near East University, particularly to its Founder Rector and Honorary President, Dr. Suat İ. Günsel, and the Rector, Prof. Dr. Hüseyin Gökçekuş, and many others who have patiently and continuously carried out efforts to bring this very important conference into life. A thousand papers from over 100 countries are going to be presented today. I, myself being an academician for 15 years before being a politician, know the importance of presenting a paper in such a conference. I know the excitement, the feeling, the success of presenting, asking questions and the feeling of success at the end of such a conference. I have participated in many conferences internationally. I have presented many papers in many countries. It is a great feeling; it is a great pleasure. I know your feelings and I know the success and pleasure that you will get at the end of the conference. Even under normal circumstances, conferences and organizing conferences would have been a drowning task, but in a country like this which is under an inhuman political, economical and cultural isolation and embargoes due to Greek Cypriot's political blackmail and pressure, it is much more difficult to organize such events. It is very much appreciated that you have stood up against these immoral efforts by putting science and survival of global environment first in the line rather than politics. The future of our world and of our children needs courageous scientists, thinkers and writers like you who are able to transit between politics and political pressures wherever they are fighting for the survival of humanity and the global environment. The bounties and rich resources of our planet have given their best to civilizations throughout the past, but we have reached a point in time and technology that our activities have exceeded the life saving abilities of the earth. The global challenges and the level of distraction we have caused are too great now.

The issue of globalization of environment and conservation is the most crucial and urgent issue that the whole of mankind face today. The survival and sustenance of our environment and biodiversity has importance for our future, and just opened our commitment to fight and fight hard for our world. Businessmen, scientists, intellectuals, artists, politicians, indeed the whole of humanity, must stand and strengthen our struggle in this issue. The results of this conference must provide us with the strategies of sustainable environmental management through the development

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of environment friendly technologies and legislation. We must also show the way for social survival to all global citizens, local governments and non-governmental organizations, and because of this, we have a very challenging but at the same time a noble task. In this context, we also strongly believe that institutions from primary schools to universities throughout the world should make in learning the most important attempts to teach about the environment and to train about the protection of environment. I am pleased to inform you that we have a coalition government in the Turkish Republic of Northern Cyprus and we have a Ministry called the Ministry of Environment and Natural Resources. My friend who spoke a few minutes ago is in charge of this ministry. With these thoughts in mind, I would once more like to take this opportunity to thank Near East University and its Honorary President Dr. Suat İ. Günsel for organizing and hosting the Environment, Survival and Sustainability Conference and wish you success in your deliberations.

I thank you for being here in the Turkish Republic of Northern Cyprus and I am sure you will enjoy your stay here and you will remember us and tell the rest of the world the Turkish Republic of Northern Cyprus is a place to be, a place to visit and a place to enjoy.

Thank you.

Türkekul KURTTEKIN
Turkish Ambassador to Lefkoşa, TRNC

Mr. President, Mr. General Secretary of the Organization of the Islamic Conference, Ministers, Members of the Parliament, Distinguished Party Members, Members of the Organizing Committee, Members of the Media,

Let me first comment on the Near East University for organizing this conference and express my pleasure that I have the opportunity to say a few words about the conference.

From my perspective, the conference is significant for a variety of reasons. Firstly, a very important topic will be addressed throughout the conference. It reminds me the 1972 United Nations Conference on the Human Environment held in Stockholm, the 1992 Earth Summit or the United Nations Conference on Environment and Development held in Rio, and the 2002 World Summit on Sustainable Development held in Johannesburg.

The world constituted combined efforts by the international Community to face a common challenge, that is, the protection and preservation of the environment while achieving developmental objectives in the rapidly changing world. In spite of these efforts, the challenge stays pretty much alive. We, the human beings, have disturbed the balances of nature and the environment. However, we have no luxury for skepticism. A few minutes ago, we heard about the cooperation between TURMEPA and HELMEPA from Mr. Rahmi Koç which proved to us that if there is a will this challenge will be gradually met. You, experts from various disciplines, from academy, various policy makers and executives responsible for the implementation in many countries will be discussing ways to overcome this challenge. Major topics of discussion in the conference show the multi dimensional character and the magnitude of that, and the outcome of your discussions and your deliberations will contribute to the efforts to increase world awareness on this important challenge, and I hope it provides useful material for the decision makers by strengthening the bridge between theory and science.

Secondly, the meaning of this conference in my opinion reflects the severity faced by the Turkish Republic of Northern Cyprus with its people and its institutions. Environment, the problems, economic and industrial development are interrelated issues. The importance of minimizing the environmental damage while achieving sustainable development is widely realized in the Turkish Republic of Northern Cyprus, which is a country going through a remarkable development in the recent year with a growth rate approaching 14% in 2005 and with an increase of 7% in 2006. The increasing public awareness in the Turkish Republic of Northern Cyprus about institutional measures such as the establishment of the Ministry of Environment and Natural Resources constitutes a good, encouraging example. Thirdly, this international conference, which we were told is the 12th of its type organized by Near East University, demonstrates the important role of universities in the Turkish Republic of Northern Cyprus. As many of you have mentioned, education was amongst the fields falling within the problems of the community in the 1960's. The progress achieved by the Turkish Cypriots in this field is commendable and demonstrates the

unacceptability of the isolation the Turkish Cypriot people have been subjected to for many years. Even in such circumstances, the Turkish Cypriots have been demonstrating their will and determination to move ahead and to combine forces with the international community to face the common challenges to humanity.

Let me conclude by hoping that this conference will create more awareness around the world and in this respect, the recognition of the Turkish Cypriot People will no more remain unattended. Let me also wish all the distinguished participants of this conference every success and express my sincere hope that your deliberations will contribute to the combined efforts to give a better world to the next generations.

Thank you.

Ferdi Sabit SOYER
Prime Minister of TRNC

His Excellency, Mr. President,
His Excellency, General Secretary of the Organization of the Islamic Conference,
His Excellency, Minister and Members of Parliament and the very important scholars who have came to our country for this conference,

I would like to greet and welcome you all.

Today is the beginning of a meaningful conference where very important environmental issues will be discussed in this conference hall. As you can see, all the flags in this hall symbolize a different color and a different history of all the nations, and as we also know, the colors of nature are reflected by these flags in this beautiful atmosphere. If nature had been just one color, just yellow or just green, the richness and beauty of living would not be seen and people would not have even been able to fall in love. This colorful atmosphere reflects also the dynamism of human beings. Also, this dynamism provides the humans with the ability to find and change everything in nature which they need. It is because of this developing dynamism that human beings take what already exists in nature and turn it to their benefit. Although there are many differences among all nations we should still cooperate together to protect nature. I strongly believe that this conference will bring very important conclusions. I also believe that although the Turkish Republic of Northern Cyprus and Turkish Cypriot society have been isolated both politically and economically, this conference will have very important outcomes. We want to be recognized in the world with our nation, with our national identity. This conference also gives out this message to the world.

I would like to thank the Near East University, the valuable Rectors, and Scholars for participating in such a conference. I would also like to thank and welcome once again the valuable scientists for coming to our country.

 Thank you.

Prof. Dr. Ekmeleddin İHSANOĞLU
OIC Secretary General

Your Excellency Mr. President, Mr. Prime Minister, distinguished scholars, Ladies and Gentlemen,

I sincerely greet you all. It gives me great pleasure to be with you here. It is a great pleasure to be at the opening ceremony of this important event: The International Conference on Environment, Survival and Sustainability organized by the Near East University. I am grateful to Near East University for their kind invitation which has enabled me to address such a distinguished gathering. I would also like to thank you all who have worked hard, took part in preparation and realization of this project.

Let me share with you my honest feelings. I am not a newcomer to this island and I have heard a lot about Near East University and I have also heard of its good reputation. Some of my friends' sons and daughters were here as students. I have heard all the facts and data about the universities. I am really impressed.

His Excellencies, Ladies and Gentlemen,
I am not an expert on environment issues but the convening of this important conference is very timely as the subject matter has become a very serious global matter. We read all the reports on a daily basis about the dangers of climate change. Climate change and environmental degradation affect the whole world. Meanwhile we hear the frequent comments of the world leaders about the lack understanding and cooperation on environmental issues which might lead us towards the destruction of our planet and humanity. Global pandemics, deforestation and natural disasters are only a few of the issues that presently affect the globe. All these problems are at the heart of sustainable development that we all need to achieve. We find ourselves helpless today when we see rich nations of the world continuing to load the atmosphere with carbon-dioxide; compromising the well being of human race and pushing our planet to an unknown future. It is obvious that these acts have contributed to a rapid change of climate which has caused global warming, rising sea levels, extreme droughts, erosion of soil, loss of the forests and extinction of the species. Sadly, most of the environment degradation is severely affecting the developing world. Its population is facing severe droughts and dry rivers, while some other areas are facing excess floods, rainfalls, mud slides and loss of properties. I am just back from a long trip to Indonesia and I have seen the negative side of the phenomena there. Ladies and Gentlemen, the catastrophes have also negatively affected ecological imbalance. Hence, they have been posing a serious threat to the genetic pool with ramped out breaks of disasters and leading to more poverty in the undeveloped parts of the world. Recognizing the important role played by the environment in the development and in the progress of its member states, the OIC ten year plan of action, a joined action development for the Muslim world to face the challenges of the 21st century, was developed by the 3rd Extraordinary Summit convened in Mecca in 2005 and attended by all heads of state from 57 OIC countries.

In this context, I would like to bring to your attention the fact that the heads of state present in this Summit in December 2005 made a very strong appeal to all OIC member states and their institutions on the issue and were able to coordinate their environmental policies and positions in the international environmental issues so as to prevent any adverse effects of such policies on their economical development.

Following the adoption of the OIC ten year plan of action, I have organized several meetings with the OIC institutions and stakeholders in the framework of the implementation of the OIC ten year plan of action. The OIC General Secretariat itself is committed to the world capacity and policies to contribute to the global efforts to counter the environmental challenges. The OIC also notes with pleasure that the majority of its many initiatives and activities reflect the facts of important organizations such as UNEP and our parties to various international conventions on environment in particular to the protocol. Joining such conventions reflect the fact that the OIC member states are giving their attention to the international laws and requirements. Such devotion shall certainly provide us with a solid basis for our future efforts suggested by the OIC ten year activity program.

I would like to praise the Near East University for providing the opportunity for the conference participants to address a wide range of crucial issues such as redefining the business of conservation and management of biodiversity, culture heritage and environmental factors, economics, development and sustainability, energy and development, environment and health, the threat of global warming, ecological balance and sustainable environment and social and psychological dimensions of the environmental issues.

Mr. President, Your excellencies, Ladies and Gentlemen,

I am of the view that the environment issue can be viewed from at least two major perspectives: The perspective of science and technology and the perspective of effects and impacts of environment on economic development. The important contributions and inputs from science and technology to ensure sustainable development cannot be denied. However, environmental challenges that we are talking about are mostly trans-boundary ones and cannot be faced with individual efforts of the nations. The very nature of these challenges require that these states should combine their efforts and facilities together. In this context, the OIC member states are called upon by the conclusions of various OIC gatherings and decisions to join hands to collaborate and to synergize their efforts in performing and undertaking research and development to reduce some of the environmental effects and challenges faced by them. Assessing the effects of environmental challenges on economical development also requires regional and global cooperation and coordination. In the domain of sustainable development perspective, one should address the quality and sustainability of our natural resources, the threat of global environmental changes on ecosystems, quality of life in our cities, impact of the use of energy which is essential to our economies and to the way of life. We should be making use of the technologies available with the view of reconciling economical development with environmental sustainability. The achievements of all mentioned goals require coordination, harmonization and synergizing of our entire actions. In other words, we need to follow up very closely all our activities to monitor their progress, to evaluate and assess the impacts and to take recognition of all possible shortcomings.

Naturally, addressing you today in one of the heavenly parts of the world, I cannot emphasize as much as I would like to the importance of environmental studies and undertakings aimed at the protection of the Mediterranean Sea and its ecological diversity.

Ladies and Gentlemen, as I value the timely initiative of organizing this conference on an issue of great relevance for my organization and for our member states considering the excellent academics and research qualities and standards of the Turkish Cypriot Universities, I would also like to mark an appeal from this platform to the universities and scientific institutions around the world particularly those based in the OIC.
Thank you.

Mehmet Ali TALAT
President of TRNC

Distinguished guests, dear participants,

As you may have expected, I will not make many remarks about environment or raise much concern about the environment. My remarks will be mainly political but in the concerns of the environment. Possibly you can claim that environmental concerns should cause an impact to unify humanity because the solutions to environmental problems can only be found by cooperation. So, this unifying factor must be a point of consideration, and we, the Turkish Cypriots know the importance of this fact. We know the importance of being unified with the international community because we are under severe isolation on all aspects of life including environmental issues. My Prime Minister mentioned about the lack of cooperation between the two sides. We are under continuous pressure from our neighbors. Everywhere in the world, we are in a struggle against this isolation issue and try to be unified with the world, and I wish that this conference will give fruitful results to the scientific life and to humanity.

Thank you for your participation and I wish you all success.

FINAL REPORT OF THE INTERNATIONAL CONFERENCE ON ENVIRONMENT: SURVIVAL AND SUSTAINABILITY

Environment is a subject that must be brought to the top of international agendas if the threats to sustainability and survival are to be countered. It cannot continue to be seen as something to be added on to the plans of commercial enterprises or as a minor component of poverty-alleviation programs. Economic development cannot eliminate poverty without conserving natural resources and maintaining ecosystem services. Nor can productive activity ignore the significant effects of resource extraction and waste generation. Environment must be the central focus of national and international programs at all levels.

The International Conference on Environment: Survival and Sustainability, held at the Near East University, Nicosia, Northern Cyprus 19-24 February 2007, dealt with environmental threats and proposed solutions at all scales. The 21 themes addressed by the conference fell into four broad categories:

1.Threats to Survival and Sustainability

Global warming and other climate changes pose a major threat to natural and human systems throughout the world. Major impacts addressed ranged from dieback of tropical forests to altered ecosystem functions in temperate and boreal systems, changes in sea level and in polar and alpine systems, as well as impact on water supply, agriculture and extreme weather events. Pesticides threaten natural ecosystems and human health. Health is also threatened by diseases, pollution and many forms of environmental degradation. Natural and human-made disasters interact to threaten societies in many ways.

2.Technological Advances towards Survival and Sustainability

Environmental science and technology are advancing rapidly, but are not in themselves sufficient to counter the growing threats to environment. Important areas include integrated water management, new and renewable energy sources, and conservation and management of biodiversity.

3.Activities and Tools for Social Change

Activities and tools that can be applied to move society towards greater sustainability were emphasized at the conference. These included environmental law and ethics, environmental knowledge and information systems, media, environmental awareness, education and lifelong learning, the use of literature for environmental awareness, the green factor in politics, international relations and environmental organizations.

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4.Defining Goals for Sustainable Societies

The new directions that societies must take include considerations of economics, development and sustainability, redefinition of the interests of business, incorporating cultural heritage, the seas, ecological balance and sustainable environment, and the social and psychological dimensions of environmental issues.

The breadth of the issues addressed at the conference made clear the need for greatly increased interdisciplinary and international collaboration if survival and sustainability are to be achieved. The exchanges at the conference represent a step in this direction.

Cyprus is getting an equal share from these developments and 51 species are under a threat of extinction. Out of 10 regional mini-hotspots within the principal foci in the Mediterranean, and also considering that Cyprus is island number two with a rich plant diversity and narrow endemism, there is a need for protection of its biodiversity.

The matter of global sustainable development actually has a connotation for change of life styles. This calls for
-interactions and understanding of people the world over,
-fair and equitable distribution of benefits derived from
 resources,
-conservation of biodiversity and protection of our resources,
-the water use efficiency is very important as the availability
 of water is becoming scarce,
-we need more international collaboration and research for
 wider and reliable speculation,
-management of plans and their implementation to save the
 critical aspects of our heritage and environment,
-cooperation of scientific disciplines is necessary to address
 the situation,
-countries must work together and minimize the impact of
 borders on science and maximize the benefit for all mankind,
-in order to obtain global sustainability, the curses of over-
 consumerism should be overcome by an appeal to social and
 spiritual values,
-for making the world a happy home for everyone, transfer of
 knowledge has to take place across nations,
-environment and sustainability have to be treated globally,
 not just locally, before time runs out.

About 2,052 participants from 108 countries from all around the world joined us to make 1,413 presentations and discuss environmental issues from a variety of perspectives.

Global Environmental Strategy is a Must.
As I mentioned on the first day of the conference,
"ENVIRONMENT DOES NOT UNDERSTAND POLITICS".
"IT HAS NO BOUNDARIES OR BORDERS".

This Conference has contributed to the worldwide debate and tried to create a multi-disciplinary discussion forum where experts from various disciplines were able to discuss environmental issues in 21 different fields.

Thanks to the 2,052 participants from all over the world for making this interdisciplinary conference a success. Their active role raised the scientific level of this conference.

I believe this conference has scientifically contributed to the solutions of environmental problems, and hope you have enjoyed your stay in our beautiful country.

Thank you

Prof. Dr. Hüseyin Gökçekuş

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THE ASSESSMENT OF THE ENVIRONMENTAL BENEFIT OF FAST-GROWING ENERGY WILLOW CULTIVATED FOR RENEWABLE BIOMASS SUPPLYING

Aleh RODZKIN, Siarhei PAZNIAK, Cheslav ROMANOVSKY
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Republic of Belarus has not a big potential in traditional fossil fuels and state program was approved in order to increase the input of local renewable recourses to 25% till 2012. The most perspective resource of renewable energy in Belarus is bioenergy. Belarus has 5.7 million hectares of arable lands, and part of them may be used for bioenergy crops production. Fast growing willow plants may be successfully grown on different types of lands and also have the potential in reclamation of degraded and polluted soils.

In the field experiments we estimated the potential of willow plants for reclamation of post-mining degraded peaty soils. The area of the same lands in Belarus is 20-30 thousands hectares. The problem is absence of adequate technology of willow production on degraded peaty soils. This type of soils is very heterogenic, poorly drained, with massive structure and poor contents of nutrients. We researched the efficiency of application of stimulators and fertilizer, methods of weed control and influence of different kinds of peaty soils on willow plant growing. Our experiments confirmed that degraded peaty soils may be used for willow cultivation. It is necessary to apply special cultural practices.

Background

Republic of Belarus has not a big potential in own fossil fuels supplying and nowadays we use about 5% of Belarus demand of energy at the expense of local renewable recourses. The Republic state program was approved in order to increase this input to 25% till 2012. The most perspective resources of renewable energy in Belarus are bioenergy, wind and hydroenergy. Belarus has about 9.5 million hectares of forests, 5.7 million hectares of arable lands, and 3 million hectares of pastures. Part of lands may be used for biomass production on the base of cultivation of fast-growing crops like willow. The yield of willow biomass crops may achieve 10-15 tons of dried wood or 5-6 toe per hectare. The potential area for willow biomass production in Belarus estimates in 0.5 millions hectare. It means the annual energy potential of willow biomass systems in Belarus is 2.5-3 millions toe.

Willow biomass cropping systems simultaneously produce not only energy and economical, but environmental and social benefits. These include reduced SO_2 and NO_x emission, no extraction of additional CO_2 to the atmosphere, reduced soil erosion and pollution from non-point source of agricultural lands, and enhanced agricultural landscape diversity. Willow plants may be successfully grown on different types of lands and also have the potential in reclamation of degraded and polluted soils.

At the result of Chernobyl disaster the area of contaminated by radionuclide agricultural soils in Belarus is about 1.3 million ha, including 0.8 million ha of arable lands. The optimal system of cultivation of this type of soils in contaminated area is complicated problem, because traditional crops such as grass and cereals may accumulate extra radionuclide. The willow not accumulates a lot of radionuclide and can be used as wood for bioenergy purpose. Another environmental benefit of willow plants is reclamation of post-mining degraded peaty soils. The area of the same lands in Belarus is 20-30 thousands hectares. The problem is absence of adequate technology of willow production for the degraded peaty soils. This type of soils is very heterogenic, poorly drained, with massive structure and poor contents of nutrients.

There are some publications concerning cultivation of willow on peaty soil.

Bullard and others researched yield response in two morphologically diverse varieties of Salix spp on different types of soils [1].

An experiment comparing the dry matter yield of intensively managed short rotation coppice (SRC) under factorial combinations of two plant varieties (S. viminalis cv. Jorunn and S. x dasyclados), five planting densities (10,000-111,000 plants ha(-1)) and two harvesting frequencies is reported. Data are presented from the first biennial and triennial harvest cycles at two sites (East Anglia and Warwickshire, UK) planted in spring 1996 and flailed in autumn 1996.Higher annual yields were attainable by more intensive packing of plants combined with more frequent harvesting. With S. viminalis cv. Jorunn, yield increased by 34% between: the lowest and highest planting densities. Biennial harvesting increased yield compared with triennial harvests. S. viminalis, on average, yielded 2.7 t ha(-1) yr(-1) more than S. x dasyclados, with peak yields of 11.4 t ha(-1) yr(-1). Significant differences in yield between sites were noted, with an average of 1 t ha(-1) yr(-1) benefit on a mineral soil compared with a peaty loam.

Nevertheless, Heinsoo, Sild and Koppel found that in conditions of Estonia, willow growing may be successful on organic soils and even have advantage to poor mineral soils [3].

Shoot biomass production was estimated in two Estonian short rotation forest (SRF) plantations during the first rotation cycle (1994-1997). The plantations were established with six clones of Salix viminalis and one clone of Salix dasyclados in 1993. The plantation, located on well-composed organic soil, was characterised by higher productivity (6.2 t DM ha(-1) per year) compared with the plantation on poor mineral soil (5.2 t DM ha(-1) per year). Fertilisation of the latter plantation increased its productivity to 11.0 t DM ha(-1) per year, which is the value close to a predicted maximum for Swedish climatic conditions.

Cooper and Macdonald investigated restoring the vegetation of mined peatlands in the southern Rocky Mountains of Colorado, USA, by means of willow [2].

South Park is a high-elevation, semi-arid, treeless intermountain basin in central Colorado. A few extreme rich fens occur on the western margin and in the center of South Park where regional and local groundwater flow systems discharge to the ground surface. Over the past 40 years there has been extensive peat mining in these fens, but restoration methods have yet to be developed and successfully applied. The first part of this study compared the naturally reestablished vegetation on six mined peatlands with six pristine sites, while the second part of the study tested different revegetation techniques in 27 plots with varying depths to the water table.

The revegetation experiments seeded eight species, transplanted Carex aquatilis (water sedge) seedlings, transplanted rhizomes from six species, and transplanted four species of willow cuttings. Willow cuttings had differing patterns of survival with respect to the annual maximum height of the water table. Experimental results indicate that the willow species can be successfully reintroduced to mined surfaces with the appropriate hydrologic conditions, but human intervention will be necessary to rapidly re-establish these species.

These publications indirectly confirm that willow is very flexible to soil structure crop and may be cultivated on different types of crops, including post-mining peaty soils. Nevertheless, it is necessary to research a lot of problems yet. Some of them we tried to solve in our experiments

The materials and methods

A two-year field study (2005-2006) was conducted at Lida region, in western Belarus. The willow clones (Salex viminalis) were planted on peaty soils of post-mining landscape.

The soils of experimental plots have been characterized as heterogenic and in our experiments were researched three types of soils.

Table 1. The characteristics of the soil of experimental sites.

The experimental plot number.	Soil characteristics			
	pH	P_2O_5 content	K_2O content	The peat layer depth (cm)
1	5.54	25	18.3	50
2	5.65	17.2	17.2	50
3	5.65	12.25	5.65	30-50
4	5.58	4.25	1.5	10-20

Available water capacity was moderate to high.

The aim of the experiment was to research opportunity for willow cultivation on degraded post-mining peaty landscapes characterized by unfavorable soil conditions.

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The practical experiment included some blocks:

1. The investigation of influence of plant stimulators on survival and first year growth of willow.
2. The investigation of influence of different types, rates and terms of fertilizer application.
3. The investigation of methods of weed control.
4. The investigation of influence of different types of peaty soils texture on willow clones cultivation.

The experimental design was randomized complete blocks of four treatment replicated four or five times. Each elementary plot was 7 m long by 7.2 m wide ($50m^2$) and contained 4 double rows of plants.

The willow clones were planted and the beginning of May. At the end of first growing season willow plants were coppiced. The cuttings were planted back at the beginning of May 2006.

The results

The investigation of influence of plant stimulators on survival and first year growth of willow

The degraded peaty soil conditions are not favorable for successful plant cultivation. At the result after ending of peat mining it is not possible to grow any cultural plants during some years. We considered that the same problems may be typical also for willow plant and the complicated problem is the first period after planting. It concerns as rates of willow surviving so and rates of willow growth during the first couple of month. It is crucial period for weed control. It is very important because of competition between weeds and willow plants at the beginning of cultivation. In accordance with mentioned it is very important to enable adequate rates of survival and growth of willow by means of treatment of stimulators.

In the experiment we researched 3 types of stimulators that usual for agricultural crops:
A – Designed on the base of peat extraction.
B – Designed on the base of plant extraction
C- Designed on the base of plant extraction with addition of microelements.
The control variant was without treatment.
The stimulators were added in the time of willow cutting preparation for planting.
Our experiments confirmed that the stimulators improve the willow plant surviving and accelerates the rates of growth (tables 2 and 3).

Table 2. The percent of survival willow plants (15 of June)

Variant	% of survival plants for replications (см.)					
	1	**2**	**3**	**4**	**5**	**In average**
1. Control	66	77	63	66	66	67
2. A	61	65	73	66	72	67
3. B	78	86	94	72	72	81
4. C	100	88	83	100	89	92

The definition of percent of survival plants were fulfilled twice at the middle and at the end of June. The results showed that willow cuttings that not started to sprout during the 3 weeks from the beginning of planting were perished in future. So, it is very important to enable best conditions for start.

Most effective was C stimulator. The rates of willow plants survival were more than 90%. It is good result even for more optimal mineral types of soils [4]. Fact is both designed from plant extraction stimulators were more effective to compare with control and they may be used for willow cultivation on peaty soils.

The almost similar results were obtained for willow height. More effective to compare the control were B and C stimulators, but only for C the results were confirmed by the statistical methods.

Table 3. The height of willow plant (15 of June)

Variant	The height of willow plants for replications (см.)					
	1	**2**	**3**	**4**	**5**	**In average**
1. Control	11	11	15	8	6	10
2. A	9	7	14	10	7	9
3. B	13,5	11	12	9	13	12
4. C	13	10	21	16	11	14

The investigation of influence of different types, rates and terms of fertilizer application

The degraded peaty soils are characterized a low contents of N, K, P and microelements. So, the effective fertilizer application it the crucial factor for successful willow cultivation.

In the experiment we used a 2 factorial design, which consisted of different nutrient treatments crossed with different types of peaty soils: adequate contents of peat (50 cm) and mixed sandy-peat soil.

The efficiency of fertilizer application was defined twice during the vegetation period, by means of the measuring of height of willow plants.

Our results showed that it took place considerable differences of plant height in accordance with variant, but some regularity were observed.

1. The most effective was the application of complex fertilizer, including not only N, P, K, but and microelements especially Co, Zn, Mo.
2. The positive effect were obtained by fertilizer application for willow growing after planting
3. The positive effect of fertilizer was remarked for peaty so and for poor mixed soils (tables 4 and 5).

Table 4. The height of willow plant on the mixed soils (30 of August)

Variant	The height of willow plants for replications (см.)				
	1	**2**	**3**	**4**	**In average**
1. Control	62,4	63,2	99,0	89,6	78,55
2. N + P +K	103,4	74,0	102,6	73,0	88,25
3. N,P,K + microelements	73,6	87,2	97,6	106,6	91,25
4. N, P, K + stimulators	87,0	73,0	97,4	91,0	87,10

Table 5. The height of willow plant on the peaty soils (30 of August)

Variant	The height of willow plants for replications (см.)				
	1	**2**	**3**	**4**	**In average**
1. Control	78,6	64,0	66,4	71,6	70,15
2. N + P + K	101,0	109,4	93,4	97,8	100,40
3. N,P,K + microelements	134,2	91,4	11,8	104,0	110,35
4. N, P, K + stimulators.	66,6	92,8	112,0	125,0	99,10

The treatment of microelements and stimulators was conducted after planting. The results of experiments showed that the fertilizer application enables to increase of willow plant height from 20 to 50% in accordance with variant. More positive effect took place for peaty soil with richest contents of nutrients.

The investigation of methods of weed control

In accordance with publications the most effective for weed control it is twice treatment of herbicide, before and after planting [4]. In our experiments the sites have been sprayed by post-emergent, translocated herbicide "roundup" before willow planting. The degraded post-mining peaty soils are characterized of active weed vegetation in time of second year cultivation. So, the effective weed control it is crucial factor after willow planting. In the experiments we used 4 variants:
1. Hand-made control
2. Herbicide "Gezagard" – 3 liter per hectar
3. Herbicide "Gezagard" – 6 liter per hectar
4. Control (without additional treatment)
The results of experiment represented in the table 6.

Table 6. The efficiency of methods of weed control (30 of August).

Variant	The willow plants		% of killed weeds
	Height (cm)	**The quantity of sprout per plant**	
1	150-180	2.8	95
2	120-150	1.8	70
3	150-170	2.5	85
4	40-70	1.5	-

The positive efficiency of "gezagard" with the rate of 6 liter per hectare was close to hand-made treatment. The rate of 3 liter per hectare was not so effective. The herbicide treatment after planting on peaty soils is obligatory method. It enable not only to control the weeds, but improve the willow state. The effect appears as intensive growth of willow and increasing of quantity of sprouts per plant. Oppositely, the absence of weed control conducted to decreasing of these parameters.

The investigation of influence of different types of peaty soils texture on willow clones cultivation.

As we were mentioned before the degraded peaty soils are very heterogenic with different contains of nutrients and different decomposition of the peat. So, it is necessary to apply cultural practice more suitable for concrete type of peaty soil. In the experiments we investigated opportunity of willow cultivation for some types of soils distinguished by depth of peat layer and level of peat decomposition.

The field experiment included 4 variants:
1. The peaty soil with depth of peat layer more than 50 cm and high level of peat decomposition.
2. The peaty soil with depth of peat layer more than 50 cm and low level of peat decomposition.
3. The peaty soil with depth of peat layer more than 30 cm and high level of peat decomposition.
4. The sandy-peaty soil with depth of peat layer less than 30 cm and sandy insertion.

The measuring of the height of willow plant was conducted several times during the vegetation (tables 7 and 8).

Table 7. The height of the willow plant. (11 of July)

Variants	The height of willow plants for replications (см)				
	1	**2**	**4**	**4**	**In average**
1	44	40	42	41	41
2	33	35	38	34	36
3	41	36	41	40	39
4	29	27	31	30	29

The difference between variants took place in 2 month after planting. The most active growth of willow was observed for soil with depth of peat layer more than 50 cm and good decomposition. The lowest plants were on the poor sandy-peaty soil.

The familiar results were obtained for quantity of survival plants. The next measuring were conducted 45 days later.

The positive dynamic of development of willow plants for the 1 and 3 variants was marked. The plants of the 2 variants were almost the same as for previous measuring and the growth of plants of 4 variant was very slow.

Table 8. The height of the willow plant. (8 of August)

Variants	The height of willow plants for replications (см)				
	1	2	4	4	In average
1	100	80	100	99	99
2	52	44	48	55	53
3	91	88	78	87	87
4	75	70	79	72	72

Fact is the weather conditions during the summer were not optimal for willow growth (hot and dry July and August).

The final measuring conducted in September supported that the willow plants on the fourth and especially on the second variants were low and weak.

Apparently the crucial factor for willow plants development not only the contents of nutrients in the soil, but also the level of peat composition. Fact is the contents of P and K in the soil of the second variant mote than in the third, but the results of height of the plants are opposite. This conclusion confirms by illustrations.

The Figure 1. The state of willow plants on the site with low level of decomposition of the peat and depth of layer more than 50 cm.

The Figure 2. The state of willow plants on the site with high level of the decomposition of the peat and depth of layer more than 50 cm

The Figure 3. The state of willow plants on the site with high level of the decomposition of the peat and depth of layer 30 cm

The Figure 4. The state of willow plants on the site with poor sandy-peaty soil.
Conclusion

1.   The successful cultivation of fast-growing willow required the introduction of adequate special adopted technology. The questionable problem is the selection of special forms of willow, more suitable for the degraded post-mining peaty soils.

2.   The peaty soils after post-mining activity are very heterogenic. It concerns contents of nutrient, water supplying, and the depth of peaty layer, level of decomposition and so on. Apparently it is necessary to use different method of cultivation for successful growing willow on concrete site.

3.   The crucial factors for willow cultivation on post-mining peaty soils are soil structure, contents of nutrient, weed control. So, it is necessary to use best conditions for willow growing during the first month of vegetation. It is very important to use adequate fertilizer and plant stimulators supplying. Successful weed control for post-mining peaty soils required applying of herbicides not less than twice.

4.   The most suitable for willow cultivation sites with high level of the decomposition of the peat and depth of layer more than 30 cm. The sites with depth of layer more than 50 cm, but with low level of the decomposition of the peat and the sites with poor sandy-peaty soil are not so suitable. Apparently it is necessary to apply special methods for the preliminary preparation of these sites before using for agricultural purpose.

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5.   Nevertheless our experiments confirmed that degraded peaty soils may be used for willow growing. It is necessary to apply special cultural practices. The successful technology should include following elements:

- The preliminarily monitoring, testing and mapping of the plot.
- Selection of adequate technology in depends of soil characteristic.
- Selection and using willow clones adapted to peaty soils.
- Preliminary site preparation for establishment of willow biomass planting including plowing and cultivation
- Application of plant growth stimulators and chemicals
- Weed control
- Between rows tilling for best soil structure, and air and water supplying.

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SEWAGE BIOGAS USED FOR ENERGY GENERATION

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The PUREFA (Program of Rational Energy Use and Alternative Sources), compound by 14 purposes, is about a project of the USP – University of Sao Paulo, financial backer FINEP – Financier of Studies and Projects. This project had three main objectives: to implant measures of management and action of energy efficiency, to increase the distributed generation in the USP from the renewable resource and not conventional energy and to introduce incentive permanent politics to the efficient and rational use of energy.

In the context, the Brazilian Reference Center on Biomass was responsible for two purposes, related to the biogas use for electricity generation.

The first, purpose 11, had main objective to implant the generation system, to capture and to stock the biogas, produced by biodigestor in the Technological Hydraulically Center (CTH – USP).

The biodigestor is a UASB (Upflow Anaerobic Sludge Blanket), whose outflow of the biogas produce is near 4 m3/day, opera rates 24 hours per day and utilize the sewer from the residential buildings located in Sao Paulo University, inside the campus.

For the biogas utilization, was made its outflow, chemical composition and heat value identifications, parameters that allowed to determinate the real potential for generation and to shown the necessity of the previous treatment, as H2S removal.

Finished this stage, was started the purpose 12, regarding biogas used as fuel for electricity generation using a generator group Otto cycle.

Nowadays this project is a demonstrative project. In this article the technical and environmental project results obtained will be presented.

Keywords: *Biogas, renewable energy, energy generation.*

1. INTRODUCTION

The PUREFA (Program of Rational Energy Use and Alternative Sources), compound by 14 purposes, is about a project of the USP – University of Sao Paulo, financial backer FINEP – Financier of Studies and Projects. This project had three main objectives: to implant measures of management and action of energy efficiency, to increase the distributed generation in the USP from the renewable resource and not conventional energy and to introduce incentive permanent politics to the efficient and rational use of energy.

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Nowadays this project is a demonstrative project. In this article the technical and environmental project results obtained will be presented.

2. ANALYSIS AND PURIFICATION OF THE BIOGAS

The biogas purification system (Figure 1), which aims to remove sulfidric components and humidity from biogas, occurs in tree steps. In the first step the most of biogas humidity is removed, by a recipient where the water is condensed. After that, in second step, biogas is directed to purification system, composed by two molecular screens, removing the remainder humidity and the sulfídrico components (H_2S). In the third step, biogas pass trough an amount of iron chip, removing the H_2S residual.

To prove the purification system efficiency and to determine the biogas chemical composition, two analysis were required, one before the purification process and other after it. These results are presented on Tables 2 and 3.

Figure 1 – Biogas Purification System

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3. THE CIVIL CONSTRUCTION

A civil construction (Figure 2) was made to shelter the gasholder, the mass flow measurer and the biogas engine.

Figure 2 – The Civil Construction

4. MASS FLOW MEASURER

At first, a biogas mass flow measurer was installed on biodigestor side (Figure 3), allowing the electric energy potential determination, achieving values between 2 to 7 m^3/day.

Figure 3 – Biogas Mass Flow Measurer

Having this data and the civil construction completed, it was moved to the civil construction and reinstalled before the gasholder to monitor the biogas storage.

5. BIOGAS STORAGE

Due to the low biogas mass flow values, it must be stored before it use as fuel to produce electric energy. Thus this project includes a gasholder (Figure 4), able to store 10 m^3 of biogas, made by PVC. Its dimensions are: external diameter 2 m, length 3,2 m and thickness of 2 mm.

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Figure 4 - Gasholder

6. ELETRIC GENERATION ENGINE

The appropriate purification system contributes to improve the combustion fuel conditions. Other data obtained from biogas analysis is referent to the low heat value that combined to the efficiency and biogas consumption is important to estimate the electric generation potential, as showed in equation 1

$$\eta = \frac{W}{}$$

W – Estimated Power;
Mb – Biogas mass flow consumption;
LHV – Low heat value;
η - Efficiency

To procedure the calculation above is necessary to admit the efficiency, which depends on technology used in biogas conversion, basically including three different technologies: gas turbines, microturbines and Otto Cycle engines. In this project, due to the low mass flow of biogas produced, Otto Cycle engine has been pointed as the appropriate technology.
The Otto engine (Figure 6) selected presents 18 kW of installed power and it biogas demand is around 5,6 m^3/ hour.

Figure 6 – Engine

7. PROJECT INSTALLATIONS

After the biogas has passed in through the tubing, the water accumulator, adsorbent material, the molecular screen and the iron chips, it is ready to be stored in a gasholder (flexible tank made with PVC) and be employed in Otto engine as fuel to produce electricity. A project scheme is present in figure 5, jointly with the equipments description on table 1:
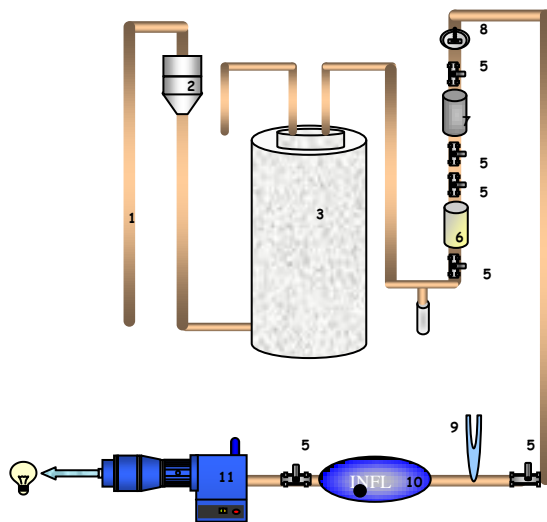
Table 1 Equipments employed description

Equipament	Number	Amount
Tubing	1	1
Sewer Measurer of Outflow	2	1
Biodigestor	3	1
Water Accumulator	4	1
Valve Sphere	5	6
Molecular Ciever	6	1
Iron Chips	7	1
Biogas Measurer of Outflow	8	1
Manometer	9	1
Pillow Tank	10	1
Engine/Generator	11	1
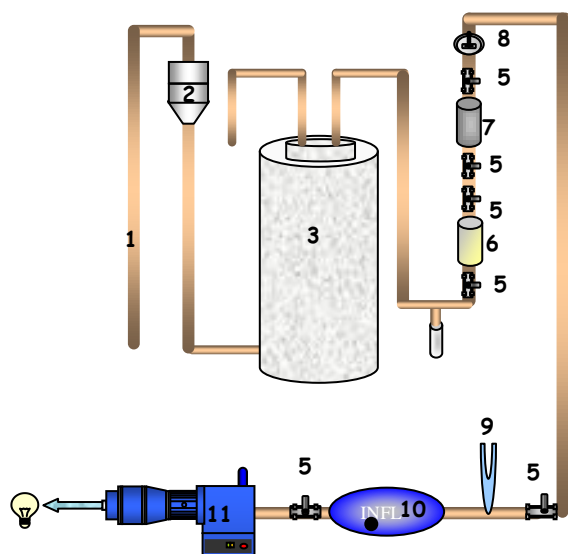
Figure 5 – Project Scheme

8. RESULTS AND DISCUSSIONS

The tables 2 and 3 present the results of the biogas composition before and after the purification system, respectively. The cost of each gas analysis (biogas composition and exhaustion gases) was around U$ 1000, 00 (U$1, 00 = R$2, 40).

Table 2 Biogas Composition before the Purification Process

Chemical Components	%Vol or ppm
O_2 (Oxygen)	1,23%
N_2 (Nitrogen)	15,5%
CO_2 (Dioxide Carbon)	4,75%
CH_4 (Methane)	75,8%
H_2S (Sulfate Hydrogen)	649 ppm
H_2O (water)	2,62%

Table 3 Biogas Composition after the Purification Process

Chemical Components	%Vol. or ppm
O_2 (Oxygen)	0,89%
N_2 (Nitrogen)	13,2%
CO_2 (Dioxide Carbon)	4,07%
CH_4 (Methane)	80,8%
H_2S (Sulfate Hydrogen)	< 1,0 ppm
H_2O (water)	0,98%

According to that analysis occurred a significant reduction of H_2S and water in biogas composition, achieving safe values to engine operational conditions, allowing the continuity of this project. The civil construction, where the biogas engine and gasholder would be installed, could be done.
Having all equipments installed and the gasholder full of biogas, the engine was started. The electric demand was simulated by a test panel (Figure 7). The demand was 2,4 kW.
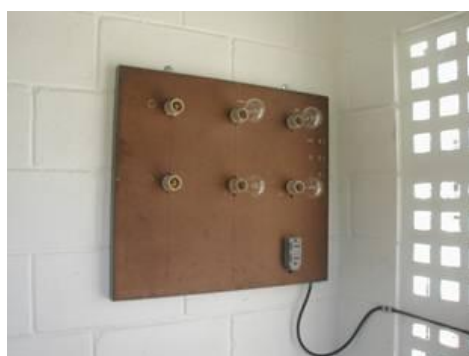
Figure 7 – Test Panel

It is in this scene that the analyses of the exhaustion gases had been made and its results are presented in the table 4.

Table 4 Exhaustion gases

Component	Analyses			
	10:38 h	11:00 h	11:10 h	11:20 h
Total hydro-carbons as CH4	3,1%	0,67%	2,7%	0,19%
Carbon monoxide (CO) ppm	641	929	787	922
Carbon dioxide (CO2)	8,8%	*	8,4%	*
Nitrogen oxides (NOx)	5 ppm	15 ppm	48 ppm	65 ppm
Oxygen (O2)	3,7%	5,4%	5,7%	*
Sulphur dioxide (SO2)	< 1 ppm	< 1 ppm	<1 ppm	<1 ppm

At first, the engine functioned pretty well, but when the pressure inside the gasholder goes down, the engine starts to fail. Therefore we had to put some weights on top of the gasholder to increase its pressure, and so, the problem was solved.

9. CONCLUSIONS

Despite the fact that this project has been developed experimentally in Sao Paulo University's campus, in urban area, one of the expectations is that the results obtained provide information about biodigestor´s operational conditions. This allows defining appropriate areas where this project could be applicable.

Especially in rural areas, the use of swage as fuel to produce electric energy is able to contribute with electrification programs already structured in Brazil, increasing decentralized electric generation, what creates important benefits to the country.

The most important environmental contribution associated to this project is the mitigation of greenhouse gases (GHG) emissions, especially verified trough methane conversion in carbon dioxide, which presents a dangerous level around twenty five times lower than methane.

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SOUTH ASIA AND MANAGEMENT OF ENERGY SECURITY

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In current international relations; the energy realism has become the main arena for political conflict. Energy defines the pursuit of state power; international economic relations have dominant tinge for the purpose of energy security. The international or regional energy systems are not managed via economic forces only; they are manipulated by political systems. But it has to work with public economics linking energy security with the welfare of human beings in holistic manners in different regions of the world. This paper is significant to flash **South Asia** in international energy system as growing economically, and shaping the future development of world as well. The tapestry of conflict related to energy security vis-à-vis South Asia with horizontal and vertical perspectives leads to propose 3-D Strategy for management of energy security for South Asia. 3-D Strategy includes the; Management of Regional Interests at National Level, Management of Regional Interests at Regional Level, and Management of Regional Interests at International Level.

Key words: *Energy Security, Conflict*

South Asia and Management of Energy Security

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South Asia and Management of Energy Security

*"*The destruction wrought by hurricanes in the US Gulf of Mexico and the recent exercise by Moscow to curtail gas supplies to neighbouring Ukraine and states downstream from there bring into focus just two of the many existent threats to energy security. Whether it be attacks carried out against Iraq or **Pakistan's pipeline networks**, or al-Quaida's No. 2 ayman al-Zawahri calling on Jhaidists to carry out attacks on oil facilities in the Gulf region, the world's energy of spikes in the price of oil and gas that hurt the world's poor the most."

The Director of the NATO Forum on Energy Security Technology,
NATO Forum on Energy Security Technology, Feb 22-26, 2006

International system intact between and among nation states is vivid towards energy security hinging the *demand and supply* systems. Energy security means smooth transaction of energy between supply and demand systems. (See Table. 1) The demand for energy is increasing as the population of the world will be triple in twenty years, plus the stress caused by economic growth. The major demand for energy exists in USA, Europe, and in growing economies of China and India. A great sense of competition exists among nations for energy security as energy is one of the basic requirements of economic development. Energy security is webbed by social, environmental and political issues, political issues are overwhelming because of instability in international political system; this study has focused political issues.

Table. 1
Energy Security Index

The ESI measures the energy status of states in three dimensions:

Dependency
Know how, as measured by availability (one third weight) and utilization (one third weight) of *energy resources* as per set of politics (one third weight).
Certainty
A certain supply of energy, as measured by costs incurred to insure the security of energy supply.
Affordability
Affordability as measured by per capita energy consumption at purchasing power parity (PPP) in USD.

Source: Self made

The significant of energy security is more for small nations like South Asians (where the demand for energy is increasing by 7 to 8 percent per annum) needs to be assessed and managed; so that the local economies may be maneuvered to face the contemporary challenges for economic development. This study will focus on energy supply and demand systems crossing South Asia on confluence of Central-Asia and Middle East. South Asia has specific energy security issues; growing demand for energy and in her adjacent economy of China accentuating the cost of energy. Gas pipelines from Turkmenistan and Iran may fulfill needs of South Asian countries; but the barrier politics are being played by extra regional actors to impede the development of energy system for South Asia. The *region* established for this study includes India, Pakistan (future supplier and route supplier) from South Asia, Afghanistan (route supplier) Iran (supplier) from Middle East, China and United States of America as the two geo-economic contenders in international affairs. The study descends upon to facilitate management of contested energy security vis-à-vis South Asia while locating it in international demand and supply systems. The study relies on generative approach for management of energy security (See Table. 2). The study may shape some strategies to manage external diverse trends and processes effecting energy security of South Asia pivotal for economic development. Following questions are taken in study:

1. How central is energy security for competition and cooperation in international system?
2. How national-regional-international politics inflate complexity in the process of energy security?
3. How South Asia can manage its energy security vis-à-vis regional-global energy security?
4. How to add new values to manage energy security to deal with the emerging challenges of time to facilitate with *comprehensive* energy security?

Table. 2
Generative approach for management of Energy Security

Concepts	Narratives
1. Suitability	To complex situation
2. Systematic	To think
3. Repulsive	To preconceived notions
4. Pragmatic	To provide a course of action

Source: Self made

The study is divided into five sections; following the introduction; section two discusses the, "Centrality of Energy Security", section three elaborates the, "Tapestry of Conflict related to Energy Security vis-à-vis South Asia", section four flourishes, "3-D Strategy to Manage Energy Security for South Asia", and section five is the conclusion.

Up to now studies have not really focused on two aspects in international energy politics, one is the location of South Asia in Global Energy Security System, and second is geo strategic tip of South Asia (Pakistan) thumbed by the international conflict to energy demand and supply systems. This study tries to cover these two gaps.
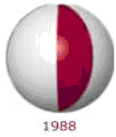
While looking at South Asia in Global Energy Security System Pakistan and India need to be more focused as India is the second burgeoning economy of the world, and Pakistan has the following qualifications:

- Pakistan is on the confluence of Central Asia, Middle East and South Asia.
- Pakistan has the economic potential to grow i-e she recorded the economic growth rate of 8.4% in 2005.
- Pakistan has to conduit energy resources from, Central Asia to South Asia and to rest of world.
- Pakistan has to cater trade to and from Central Asia to South Asia and rest of the world.
- *Pakistan has to establish her own foothold in all these transactions to support the international system.*

US-South Asian, EU-South-Asian and Sino-South Asian countries are in the ambit to make strong endeavors on a series of high level consultations and negotiations for free and preferential trade and economic ties. The development of energy system to cater South Asia and its immediate neighbour China has raised many suspicions related to both consuming and supplying states profits incurring because of development of such energy system.

States, institutions, systems and patterns that sustain flow of energy are the hub of politics. It looks that all the states are dependent on each other when the politics overwhelm the supply and demand of energy. It includes an all sort of system comprised of sources of energy, their routes and the consumption pattern. At the same time other dimensions of lateral systems of security related to geo politics, and socio economics effect the energy security, as it has become the ultimate weapon to maim the enemy, no matter the state is large or small.

History reflects the same reality: During the 1973 Arab Israeli war, oil had been used by the Arabs as an effective weapon of war. The West was alarmed. On August 2, 1990 Iraq invaded and occupied an independent neighbouring state, Kuwait. The reasons advanced by the Iraqi government related to economic factors. Iraq accused Kuwait of stealing oil from the common wells during the eight years Iran-Iraq war for which Iraq had demanded damages.

Secondly, Iraq wanted to increase her oil income by enhancing oil prices so that Iraq could be able to pay 75 billion dollars debt, which she incurred during the eight year war with Iran. Iraq then blamed Kuwait and Saudi Arabia for their refusal to enhance oil price in the Organization of Petroleum Exporting Countries at the instigation of the United States.

Apprehending that more than 25% of oil production among the Gulf States might be controlled by Iraq alone and to ensure the smooth and unhindered flow of Gulf oil the U. S. and the West at a price of their choice, the allied powers sent their forces to Saudi Arabia and other Gulf states and inflicted a crushing defeat on Iraq in 1990-91.

II
Centrality of Energy Security

"There are few issues as important to people in their daily lives as energy supply. It dominates domestic and business activity like few other factors. That is why energy security – both in supply assurance and physical terms is one of the key issues of our time. I have no doubt at all that energy security will be a dominant one in the next decade and it will be in finding solutions which will largely determine how safe we all will be."

Lord Robertson of Port Ellen,
Former NATO Chief,
NATO Forum on Energy Security Technology, Feb 22-26, 2006

Energy Security is accented in international economy because of *demand growth, dependency portal, functionality of barrier politics, and international instability.*

The value of energy is inelastic in international economic system, because of two market conditions as: (1) a lack of responsiveness to prices by consumers-----whatever the price they will not stop to buy it, and (2) a lack of responsiveness in the supply of the commodity growing out of increases in its price. These conditions are known technically as the price inelasticity of demand and supply. Energy particularly oil and gas are price inelastic as demand and supply are not responding to price even the demand is increasing and supply is not matching, because of instability in international relations and political barriers in the development of energy resources.

In the international Energy Outlook 2005 (IEO2005) reference case, world marketed energy consumption is projected to increase on average by 2.0 percent per year over the 23-year forecast horizon from 2002 to 2025. World wide, total energy use is projected to grow from 412 quadrillion British thermal units Btu in 2002 to 539 quadrillion Btu in 2015 and 645 quadrillion Btu in 2025. In the case of mature economies, well established energy consumption patterns and infrastructure, growth rate for energy demand that averages 1.1 per cent over the projection period, compared with 3.2 percent per year in the emerging economy i-e India. According to an estimate, the existing oil consumption of the Chinese economy is lower than the European level; it would be consuming around 50 per cent of world oil production, as opposed to 20 per cent oil production by the U. S. Growing demand for fossil fuel energy in the developing world is related to rapidly rising population, high economic growth rates, and structural changes resulting from the development process,

Third World energy consumption in 2020 could be as much as three times higher than 1985. South Asia's energy demand as a percentage of the world's energy demand increased from 2.4% in 1987 to 4% in 1998. The US Energy Information Administration (EIA) estimated a 52% growth in the primary energy demand in the period 1993-2003, in South Asia. This figure however excludes the traditional energy forms that account for more than half of the energy demand in the region. However despite rapid growth in energy demand, the per capita energy consumption in South Asia continues to be amongst the lowest in the world, while energy consumption per unit GDP is amongst the highest.

India's energy demand, which by far makes up the dominant share of the South Asian energy demand, is projected to increase by 3.8%-4% a year through 2020. The oil demand growth rate for India is projected at 2.3% per year and is the highest in Asia. Pakistan needs 240,000 barrels per day but produces 63,000 barrels only. Around 1,75,000 barrels of oil is imported. Studies suggest that Pakisata's gas shortfall will start from 400 million cubic feet per day (mcfgd) in 2010 and will rise to four billion cubic feet per day (mcfgd) by 2025, as the economy grows at the rate of over 7 % annually. The demand for gas is increasing by 7 to 8 percent per annum and further delay in completion of pipeline projects would create supply problems for Pakistan.

Dependency factor is dominant in energy supply and demand systems. *Dependency portal* sustains either it is referred to world super power like U. S. (having influence over world energy resources) or a country like Pakistan labeled as Third World country with an increasing demand of energy about 10 percent annually. Logically a country like U.S.A may have developed an independent energy system with less dependency; but the case is different as the lines of oil are attached to other security lines of international systems as well and they are assessed and protected via energy lines.

Washington spends $ 1billion a week to maintain 150,000 U. S troops in Iraq. After thirty years of 1973 oil embargo, the United States finds itself even more vulnerable than it was three decades ago. In 1972, the year before the embargo, U. S. oil imports were 27.6 percent of consumption. In 2003, they stood at 56.8 percent, more than twice the 1972 level. The flood of foreign crude imposes an economic penalty of enormous proportions. The hidden cost is comprised of three elements: military expenditure specifically tied to defending Persian Gulf oil, the cost of lost employment and investment resulting from the diversion of financial resources and the cost of periodic "oil shocks" the nation has experienced. The place to begin with the cost of Persian Gulf oil is the U. S. Central Command. Its area of responsibility encompasses 6.5 million square miles that holds 25 countries with populations totaling 522 million people. Indeed it grew out of the Rapid Deployment Force created in 1979 in response to the Iranian revolution and general tensions in Middle East.

Central Command is also responsible for conducting the operations against Al Qaeeda and the Taliban in Afghanistan as well as Operation Restore Hope in Somalia, where the "Blackhawk Down" incident occurred. Allowing for this roughly $42.8 billion of Central Command's budget goes to defending Persian Gulf oil. When special one time costs and contingency funds are included, the total rises to $49.1 billion ----and amount equals to adding $1.17 to the cost of a gallon of gasoline.

The loss of economic activity resulting from the diversion of financial resources is even larger. Direct economic losses come to $36.7 billion annually and indirect losses to $123.2 billion for a total of $159.9 billion ---each and every year. To put these figures in human terms, the loss of $ 13.4 billion in tax revenues and royalty payments that state and federal treasuries do not receive. The oil shocks of the 1973-74, 1978-80 and 1991 have cost between $2.3 trillion and $2.5 trillion.

The critical dependence on foreign currency makes the countries to go for foreign investment in energy development and production. Pakistan is trying to attract $37-40 billion in foreign direct investment (FDI) in the energy sector to offset looming energy shortages as a result of around 10 percent annual increase in energy needs. It is in addition to attract investments in the oil and gas exploration sector and development and privatization of energy sector units, including oil and gas and power generation and distribution. The investors are invited to finance its $3 billion plan for import and supply chain of liquefied natural gas (LNG), enabling the country to meet fast approaching energy shortfalls, as it is vital to fill the gap in energy supply between 2007 and 2011-12 when pipelines for gas import might start functioning after the total energy consumption increased from the current 55 million tons of oil equivalent (MMTOEs) to over 80 MMTOEs in 2011-12. The government is also mobilizing international investors for $7 billion Iran-Pakistan-India gas pipeline and $8 billion Qatar-Pakistan-India gas pipeline. Similarly, about $8 billion investment is being sought for generating over 32,000MW of hydroelectric power to increase the share of indigenous resources in the overall electricity production. Further about $ 1-2 billion worth of projects are being offered to foreign investors for coal projects, besides $5billion for thermal power plans to meet immediate power shortages.

Functionality of barrier politics: The energy security provides *psycho-political base for hegemony*: first the control on world energy resources, second the control on other commodities produced in the world, and the third is to protect the markets, which so ever driven by the economic forces. One may visualize the post petroleum world where the DCs may become less dependent on oil by developing other technologies, but in international system the powers would like to check the petroleum resources utilized by adversaries, for example the counties in Central or Middle East and South Asia may develop their energy system which may not in line with US interests. The objective is to increase the cost of production in adverse economies i-e China, to annihilate the export power of Iran, and to maintain the dependency of Pakistan.

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The impact of oil price and production policies on the world political economy derives from the uneven distribution of the demand and supply of energy, and essential resources as 9.38 million barrels per day is used by USA. Washington's anti-Iran thrust has deep implications for South Asia. India and Pakistan are in the process of negotiating a gas pipeline project with Iran. The Bush administration has been blowing hot and cold on the issue but it is plain that Washington would not want the Iran-Pakistan-India gas pipeline project to be undertaken.

International instability: The increase in oil prices beyond $60 per barrel in the global market led to an increase in the oil import bill of Pakistan during the first six months of the current fiscal year from $1.87 billion to $3.0 billion and it is likely to double by the end of the current fiscal year. Moreover, the import bill is expected to hit $26 billion against anticipated exports of $ 17-18 billion.

The term of haves and have-nots in energy sector becomes opaque as the haves are manipulated in power politics and they turn to be as de-facto owners of energy resources and routes, for example political barriers in Iran-Pakistan-India pipeline. The mix of geo-strategies with economics makes the conflict related to energy more complex; the point is elaborated in section three.

III
Tapestry of Conflict related to Energy Security Referred to South Asia

Based on plain idea of economics the energy resources best be utilized on the bases of demand and supply but they are not; where they are managed they are contested at political level either it is the energy supply from Balochistan to Pakistan or from Iran to South Asia or from Middle East to U. S. A.

In international relations two paradigms effect the energy security; one is state's endeavors to *energize* herself by comprehending the security risks while managing world energy resources in her interest, second is states endeavors to *de-energize* other state to support the first paradigm. The conflict of interest would prelude to energy politics matching to different factors of power with in the state and around regional and international environment. When these two paradigms are placed along South Asia it seems that emerging Energy Security System vis-à-vis South Asia has been invaded.

The Energy Security System meant for South Asia is determined by horizontal and vertical perspectives. India is the second largest growing economy of the world. Pakistan: with numerous terrain confluences Central Asia, South Asia and Middle East. These factors are most of time churned by the national-regional and international energy security interests, the study takes the horizontal perspectives first (See Figure. 1).

Increasing population	Diminishing energy resources	Internal political conflicts	Law and order situation	Economic growth	Geo-economic goals

Horizontal perspectives of Energy Security of South Asia
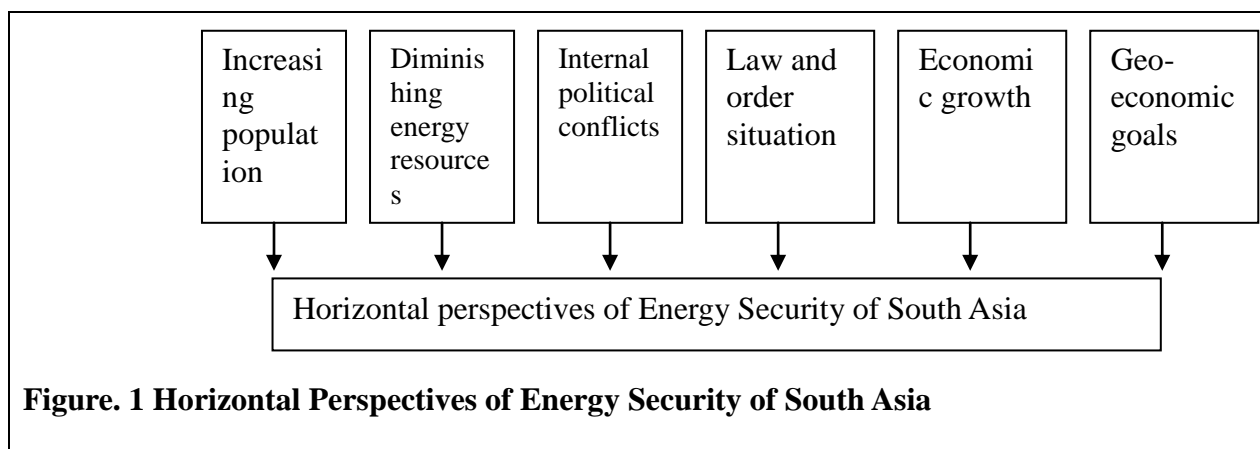
Figure. 1 Horizontal Perspectives of Energy Security of South Asia

The situation has become complex referred to conflict related Energy security in South Asia: as the factors like increasing population and diminishing energy resources are envisaging the conflict trends, internal political conflicts and law and order situation cause the loss of opportunity in energy security, while economic growth and geo-economic goals emphasize the energy demand.

Both Pakistan and India are endowed with large *populations*, comprised of nearly 95 per cent of total population of South Asia. Nearly 400 million in India and 30-40 million in Pakistan now belong to the middle class with purchasing power. As raw producing and semi industrialized countries they have enough human material and sizeable managerial skills to export; besides they have capacity to absorb foreign investment and undertake joint ventures. *Diminishing energy resources:* World energy consumption is projected to expand at an average annual growth rate of 2.1% by 2020. About 70% of the increase would be accounted for by non OECD member economies, two thirds of which are from the Asian region.

Internal political Instability and law and order situation: Pakistan worked with the prestigious World Economic Forum (WEF), Davos, Switzerland, which enlisted its support in Pakistan's pusuit of several cross-border investment projects relating to Central Asian opportunities, including energy and infrastructure related projects. After two years of discussions and presentations, the WEF was convinced of the potential and viability of these projects, and agreed to co-host a major regional economic summit for the first time in Pakistan. Called (Central Asia-South Asia) Economic Summit, it was to be the first and the largest event of its kind so far. The Economic Summit was finally scheduled to be held in Lahore in 1997 to coincide with the 50th anniversary of independence. The presence of over 2,000 top government and business leaders from OECD countries but more particularly from Central Asia and the Gulf regions was arranged by the WEF which was jointly organizing the summit with Board of Investment of Pakistan.

Political change in Nov 1996 due to palace coup by Nawaz Sharif against Benazir Bhutto in Pakistan; the WEF split into two---with one organized in Istanbul and the other in New Delhi; *so Pakistan lost the opportunity*. As follow up of President Bush's visit to South Asia and U. S. Pak expectations, the United States has demanded an indirect expropriation and compensation mechanism. Under that clause, the U. S wants that incase of losses to any intended U. S investor, because of the change of the policy, the government or the law and order situation in Pakistan, the government of Pakistan would be responsible for payment of losses to the investor. It will increase the cost of foreign investment for Pakistan which would finally incur upon people of Pakistan in the long run.

Economic growth, Geo-economic goals: Pakistan's oil import bill will surely cross the $6 billion mark in the current fiscal year 2006 and given the current trend of increasing oil prices, the situation is expected to aggrevate. Countries comprising energy system vis-à-vis South Asia have prominent economic growth trends (See Table. 3).

China is the fast growing economy of the world having great impact on world trade, and resources (See Table.4). India is the second largest growing economy of the world (See Table. 5). In 2005 the inflow of foreign investment (FDI) in Pakistan increased impressively up to 61 percent; the country received $445 million as foreign direct investment against $277 million in previous year. The key sectors which attracted a significant amount of FDI; were oil and gas $107.1 million, United States took the lead and China followed. Iran being South Asia's immediate neighbour is rich and has an edge in terms of natural gas reserves. Since the discovery of natural gas reserves in its South Pars field in 1988, the Iranian government began increasing efforts to promote higher gas exports. The prospects for profit are especially high in South Asian countries like India, and Pakistan and even in China, where natural gas reserves are low and energy demand exceeds supply. The three countries (India, Pakistan, China) definitely need the smooth flow of the gas for their growing economies.

Table. 3
Economic Growth Trends as projected in 2005-6

Counties	Economic Growth
America	3.7-8 percent
China	9-8 percent
Iran	5.4 percent
India	8-7 percent
Pakistan	8-7 percent
Afghanistan	6-5 percent

Source: http://web.worldbank.org

Table. 4
Economic Strength of China
Growth:
- Real GDP grew stronger than expected **9.5 percent** in the first half of 2005
- GDP growth is projected about 8-9 percent in 2006
- As Asia's fastest growing economy over the past 20 years, China saw 6-fold increase in GDP from 1985 to 2004.
- In 1985 average income in China was $280, I 2005 the average income became $1.290.

China and the Global Economy
- China achieved 12 percent of the world economy on purchasing power parity basis in 2004 (second to the United States)
- China contributed one-third of global economic growth in 2004.
- In 2004, China accounted for half of global growth in metals demand and one-third global growth in oil demand.
- China's economy has high energy intensity. The country uses 20-100 percent more energy than OECD for many industrial processes; China has 20 of the world's 30 most polluted cities, largely due to coal use and mororization.
- Foreign exchange reserves exceed $700 billion (second to Japan).
- About 40 percent of China's exports go to the United States.

Source: China Quick Facts http://web.worldbank.org

Table. 5

Economic Strength of India

India: the fastest growing telecom market in the world

India produces 3 million graduates, 700,000 post-graduates and 1,500 Ph. Ds every year.

It is estimated that 10% of researchers and 15% of scientists engaged in the pharma/biotech R&D in the US are of Indian origin.

2 million new telecom subscribers are added in India every month.

Indian foreign exchange reserves are over US$ 140 billion.

AT Kearney ranks Indian as the 6th most attractive investment destination.

1/3rd of start-ups in Silicon Valley are by Indians.

18 Indian companies in Forbes magazine list of 200 successful companies outside the United States.

India is among the select group of six nations with satellite launch capabilities.

India is the second most entrepreneurial culture in the world.

Global economic survey ranks India as the sixth-fastest growing country in terms of construction.

Over 70 MNCs have set up R&D facilities in India in the past five years.

Source: INDIANOW, http:// www.indianow.com

The vertical perspectives of Energy Security System of South Asia include; global energy politics, barrier politics played by international powers, inconsistency in multinationals, regional powers and their stakes, conflict in Afghanistan, dependence on f. investment (See Figure. 2).

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          ┌◄────────┤  Global Energy Politics │
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          │         │  by international        │
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                    │  Afghanistan             │
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Figure 2. Vertical Perspectives of Energy Security
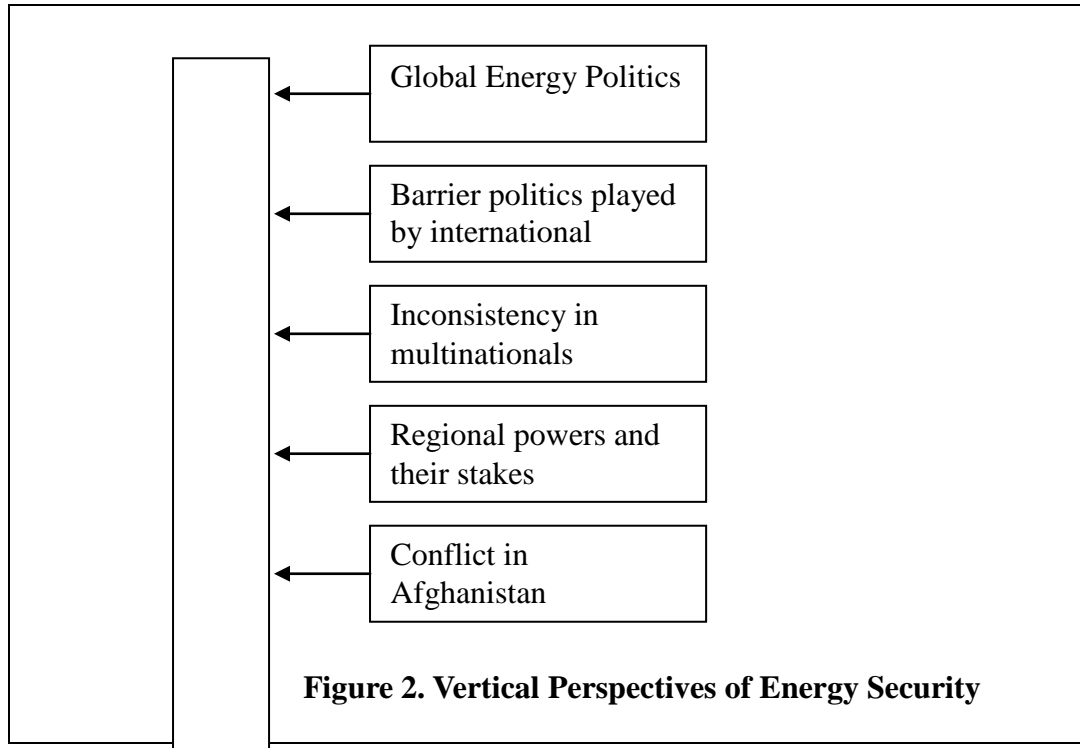
Global Energy Politics: While dilating the external perspective of energy security of South Asia one has to refer it to global politics related to energy. Today's global energy system is more vulnerable than ever before. Long supply chains separate producers from consumers and increase risk. Demand for global energy resources is outsourcing supply. International geo-economic terrorism creates uncertainties in the markets, and there is little excess swing capacity to ease the pressure on an increasingly tight oil market. As a result, in interdependent global economy, disruption of critical energy infrastructure could bring economic and social catastrophe to any of the world's economies. Yet uncertainty continues to surround the security of the world's energy systems.

Global reforms envisaged by U. S. A. erecting India as her partner in international-regional politics rest upon the energy factor. In 2005 while attending the 60th anniversary of end of II World War President Bush launched a mini presentation to the First Lady Laura Bush, "India is growing fast; India has an energy crunch; India has the second largest Muslim population and not one belonged to al-Qaeda." Bush then turned to Prime Minister Manmohansingh and said, "You and I need to talk civilian nukes".

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In recent three days (Feb-March 2006) visit of President Bush to India according to nuclear energy deal America has offered India access to the world's nuclear expertise to help build India's atomic energy program. In return India would pledge to use the imported nuclear fuel only to generate power. It would have to split its existing 23 reactors into military and civilian stations. Such an expansion of nuclear power could encourage the illicit trade in plutonium and uranium, the essential ingredients for nuclear weapons. To better police the flow of nuclear materials, the White House has unveild a proposal for Global Energy Partnership, in which a core approved supplier nations would provide nuclear fuel to users. The trade would be done under international monitoring and on condition of non military use, and the suppliers would recycle the waste rather than let it be diverted to weapons programs. Recently India has also signed agreements for nuclear deal for civilian purpose with France.

Despite having the biggest arsenal of aerial power, "US troops on the ground" are a sine qua non for any operation. Here Pakistan figures high in the scheme of things. If Pakistan refuses to provide bases for fear of public reaction, what prevents Baloch leadership from entering into an arrangement with the Americans to provide them bases in consideration for an independent Balochistan and the Americans will have an easy time establishing bases in such a vast expanse of land with so little population And who knows, Balochistan might emerge as another Dubai in the future. The Americans will have their bases and in the process would displace the Chinese from Gwadar. Drawing attention to China's "String of Pearls" strategy a report points out that China is building strategic relationships along the sea lanes from the Middle East to the South China Sea in ways that suggest defensive positioning to protect China's energy interests, but also to serve broad security objectives. The port and naval base in Gwadar is part of the "string of pearls". The other pearls in the string include facilities in Bangladesh, Myanmar, Thailand, Cambodia and the South China Sea that Beijing has acquired access to by assiduously building ties with governments in these countries.

U. S. sees China's efforts to defend its interests along oil shipping sea lanes as "creating a climate of uncertainty" and threatening "the safety of all ships on the high seas". This perception overlooks the fact that China's String of Pearls" strategy has been triggered by its sense of insecurity. The United States overwhelming presence in the Gulf and the control of its exercises over the Malacca Strait through which 80% of China oil imports pass, has contributed enormously to Beijing's fears that Washington could choke off its oil supply in the event of hostilities over Taiwan.The recognition that China is a major factor in the rise in oil prices; the fact that Chinese oil majors have become players in countries such as Sudan and Iran; the (un successful) attempt to take over the US oil company UNOCAL; the recognition that Chinese companies will increasingly become global players (of which Chinese involvement in Rover is a forecast); the almost universal dawning that Chinese production is driving down the prices of footwear and clothing, and western fears for domestic textile industries; and the Pentagon report warning that Chinese military expenditure will grow significantly and that it might be driven by energy concerns and expansionary desires. China wants more energy not to fuel its cars but to produce power, instead of depending on coal that causes pollution.

Barrier politics played by international powers: The Iran-Pakistan-India gas pipeline 2,600-kilometer (1,600) pipeline, estimated to cost more than seven billion dollars. The White House is pushing against Iran for suspected "nuclear weapons programme". A $4 billion planned pipeline sending Iranian gas through Pakistan to India is under threat. Not only would the scheme mean greater energy security for India and Pakistan, but it would give Islamabad, Delhi and Tehran stakes in regional stability. America intends to have comprehensive control on energy region while contending with European and Asian contesters.

U. S. has suggested that Pakistan could lay the Qatar gas pipeline but it will cost double to Pakistan. The Iranian pipeline is cost effective for all the three parties. US also suggested to lay the gas pipeline from Turkmenistan via Afghanistan to Pakistan. A territorial accord was signed between Turkmenistan, Afghanistan and Pakistan in May 2000 and negotiations with an American oil company were in progress for the construction of the proposed pipeline from Daulatabad gas field of Turkmenistan to Multan and from there to Gwadar. The Clinton administration opposed it since the Taliban then ruled Afghanistan. Under US pressure the American company backed out but an Argentine company, Bridas, agreed to construct the pipeline and offered to contribute 46 percent towards the cost of project. The deal was finalized. Meanwhile, the US and NATO allies decided to invade Afghanistan at a meeting of the NATO council of ministers in Berlin in July 2001, that is one month before the September 11 incident, to reemphasize the same project is an example of blatant subjecting its economic policy to US strategic considerations.

While the gas pipeline diplomacy was underway the Bush administration conveyed its concern over the proposed deal to New Delhi and Islamabad. The US invoked the Iran-Lybia Sanctions Act, a domestic law that forbade any investment of $40 million or more in any oil enterprise in Iran and Lybia. This is tantamount to exercising extra-territorial jurisdiction, especially when neither Iran nor Pakistan nor India had solicited any loan from the US. The threat did not work on Iran or India but it was bound to give Pakistan government anxious moments, given the nature of Pakistan-American relations.

Regional powers and their stakes: India and Iran signed a memorandum of understanding in 1993 for gas pipeline through Pakistan but it was not materialized because of tense relations between Pakistan and India. In 1995, Pakistan and Iran signed an agreement of construction of a natural gas pipeline linking the Iranian South Pars natural gas field in the Persian Gulf with Karachi, Pakistan's main industrial port located at the Arabian Sea. Iran later proposed an extension of the pipeline from Pakistan into India.

India had tried to play hardball on he issue and there are reasons of it. The normalization aside, India is not prepared to let Pakistan go one-up on it. India began work on the LNG project in the nineties. New Delhi has gone ahead and cut a $40 billion deal with Iran over the next 25 years on LNG (liquefied natural gas). By now, it has already spent a major chunk of the upfront cost of carrying the LNG and decompressing in it. The deal just signed gives India 20 percent stake in upstream participation in the Yadavaran and Pars fields. Moreover, in the current deal, the price has been worked out over the entire period until 2036.

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Similarly, India has developed a fleet of its own ships to carry LNG. Given all these costs as well as working out security risks, it does seem like the LNG is also good for India. Keeping in view the great Indian potential and expected rate of globalization the LNG option could prove far more expensive than an overland pipeline. Experts say India's requirement is likely to increase more than it has determined at this moment. If that is correct than Islamabad could expect India to try and work both options at the same time: LNG as well as overland pipeline. It has started with LNG because that gives it a better handle on negotiations with Pakistan over the pipeline. Since the LNG project would kick off in 2009, there is still time for India to drive a hard bargain with Pakistan. As for Iran, all the deals work to its advantage. It has signed the LNG deal with India and China and has signed one with Pakistan on the pipeline. If India involves itself in the pipeline deal at some point in the near future, Iran gets more, not less. In November 2004, the Indians linked the overland pipeline project with Pakistan granting them MFN status. Pakistan dismissed the linkage and pointed out that Pakistan needed the pipeline for its own domestic consumption and would go ahead with it regardless of India joining in or staying out. However, the Pakistani premier emphasized that India must inform Pakistan of its decision because that would help determine the technical parameters of the pipeline.

Iran signed two deals to supply gas to Kuwait and Oman and no adverse US reaction has been reported on the deals. Iran would start exporting 10 million cubic meters of gas per day as of late 2007, and would export 10 billion cubic meters of gas a year to Oman as of 2006. Taking current prices as the bases, the contract with Kuwait would earn the Iran $7billion a year for a period of 25 years.

Conflict in Afghanistan: Increases the vulnerability of foreign investment in Pakistan, as the situation in Afghanistan emancipates the conflict trends in Pakistan. The networks of conflicts of drugs and war lordism effect not only Pakistan but effect rest of South Asia and world.

The tapestry of conflict related to energy is tantamount to glaring challenge for security; section IV flourishes 3-D Strategy to Manage Energy Security for South Asia.

IV
3-D Strategy to Manage Energy Security for South Asia

To interlock the national regional and international energy strategies the market forces should be allowed to work, but factually only the economic forces are not at work to supply the energy to South Asia. As this study deals with energy security at macro level, so it focuses on *availability* of energy to South Asia, and *efficiency* of supply of energy to South Asia. The 3-D strategy is comprised of; Management of Regional Interests at National Level, Management of Regional Interests at regional Level, Management of Regional Interests at International Level.

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Bases of Action

The development of energy system in and around South Asia depends for supply from, Middle East, Central Asia and may facilitate the demand up to South East Asia.

- Since the advent of industrial revolution energy has been remained important but it is only recently that energy interests define the state's ambitions. Energy diplomacy has now become even more important in view of the need to compete economic and commercial interests in this era of globalization.
- The energy supply-demand systems present a complex situation of conflict.
- The objective is to provide a strategy for efficient supply of energy. Efficient energy supply means the utilization of available energy resources in the best interest of the region; as region may become efficient part of international economic system. In this way non energy conflict trends can be managed to support the energy security.

- With the available resources and acquired energy technologies and the neighbourhood among the states at regional level, it seems more logical to go with the available fossil fuel to develop energy system for South Asia; as the countries in this region are not able to go with the concept of post-petroleum age. The problem is that the smaller Third World countries are the ones at greatest risk. They may fail to keep pace with new technology and not be able to absorb the high prices of oil. In Pakistan 65% oil price has been increased in two years.

- South Asia may have difficulty to manage nuclear energy because of technology lapses; cost and benefit analyses in socio-political and environmental terms.

To spearhead 3-D strategy it is pertinent to stand by the available energy resources (+ alternative resources) in and around South Asia.

The IPI project is more profitable if it is extended to India, as Iran stands to make US$3.06 per MBTU (million British thermal units) of gas sold to India, but would get only $ 1.48 if the gas does not go beyond Pakistan. Pakistan hopes to earn about $14 billion in 30 years from the project, including $8 billion in transit fees, $1billion in taxes and $5 in savings. Trilateral economic and energy cooperation is in the interest of all the three. India intends to have gas from Iran and from Myanmar via Bangladesh. The Indian government may be hard-pressed to satisfy its energy requirements, but on the other hand Indian oil companies –like the Oil and Natural Gas Commission, Videsh and Oil India--- have made bids in oil exploration and production deals in Lybia, Iran Russia and Central Asia. There is also an opinion that the Iran pipeline, if materialized, would partially meet the shortfall and Pakistan would again have to look for more options and avenues for bridging the supply gap. One pipeline would not be sufficient for the increasing needs. There is a need for going for two pipeline projects, one from Iran and the other from Qatar as they have safe routes as compared to Afghanistan, which still passing through turmoil. The Iran gas project must start immediately otherwise delay in execution would result in a bigger supply-demand gap.

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Out look on gas production in Bangladesh is optimistic. The oil major, UNOCAL has struck significant gas finds—Jalalabad, Bibiyana, and Moulvi, Bazar---in Bangladesh. The company is keen in exporting gas from the Bibiyana gas field to India. While the Bangladesh government is evaluating the proposal, the idea has run into opposition, as the government would consider gas exports to India only if the domestic resources are enough to cater to home requirements for the next 50 years. India accounts for about 50% of the total production, but it is expected to decline in the future. As per estimates made by the group on India Hydrocarbon Vision 2025, domestic gas production by 2025 would decline by 45%. Indian gas requirements are, thus, likely to be met primarily from gas imports. Pakistan's offer of, "an energy corridor to India", is justified by the increasing needs of both counties for imported energy. India has already announced plans for a $2 billion pipeline that would run from Myanmar to eastern India through Bangladesh. According to the Wall Street Journal, the Pakistani project would be even more ambitious. A third of the gas would serve Pakistan and the rest would go to India as Iran is the most convenient supplier geographically for both the countries.

The Middle East and Central Asia are two primary reservoirs of oil and gas while on the other side two ever growing and principal engines of growth in Asia are China and India. Kazakhstan, Azerbaijan and Turkmenistan have lots of oil and gas. *All that oil and gas is going to pass through Pakistan.* The three primary reservoirs of oil and gas in the region are: Apsheron Trend Oil Field, Daulatabad Gas Field and South Pars Gas Field.

Alternative energy scenario may also be depicted vis-à-vis South Asia. Based on the current ratio of reserves to production, coal will last for more than two centuries. There would be slowdown in the coal boom as environmental concerns.

Hydropower: Hydropower accounts for about 7 percent of world energy use. Hydropower has distinct advantages over fossil fuels in that it does not pollute the atmosphere, but water availability, land management issues, and financial considerations its development.

Nuclear Energy: In 1990 nuclear power accounted for 5.7 percent of global energy use. Technical and financial problems have forced countries to reduce or abandon their programs, and Two well-publicized nuclear accidents, one in the United States at the Three Mile Island nuclear power plant in Pennsylvania in 1979, and a second at Chernobyl in the Ukraine in 1986, dramatized the risks and seemed to vindicate the skeptics who had warned about the dangers posed by nuclear energy. How and where to dispose of highly radioactive nuclear wastes, for example, is a continuous political issue. Spent fuel from nuclear-generating facilities must be removed periodically. It is then "cooled" in water to remove some of the most intense radioactivity before being reprocessed; a procedure that separates still-useful uranium and plutonium from other waste materials. No safe procedure for handling nuclear waste-some of which remains dangerous for hundreds of thousands of years ----has yet been devised. In the meantime, large quantities have accumulated, posing a substantial threat to environmental safety. All these issues are yet to be discussed between India and USA to accord the recent deal.

Natural gas is cleaner and more convenient to use than either oil or coal. Natural gas supplies, based on the current reserve/production ratio, will last for nearly sixty years. However, the gas market is different from the international oil market. There is no history of supply disruption in the international gas trade, which is now around 40 years old. Gas prices are not set by a cartel, they are negotiated bilaterally between the buyer and the seller. Although these prices are generally indexed on oil prices variations but are not as sharp as in the case of oil. Energy experts are of the opinion that liquefied natural gas (LNG) would become the fuel of choice for power generation by 2030 in the face of the growing energy needs. "Demand for LNG has increased five-fold over the last 20 years and it is expected to increase five times again by 2030, gas could become the preferred fuel of choice for power generation in the 21st century. We expect it to play an increased role in world's future needs. We do think gas will overtake oil in 2025. It is economical and there is a big environmental impact, a lot lower carbon dioxide", said Ann Pickard, Shell Gas and Power's director of global business and strategy.

I
Management of Regional Interests at National Level

Specific education to people to conserve energy (as the per capita energy consumption in South Asia continues to be amongst the lowest in the world, while energy consumption per unit GDP is amongst the highest) and to decision makers for conflict management related to energy; may lead to build regional vision at national level to facilitate energy security. It pronounces the idea that the demand for energy should be managed by increasing efficient use and supply of energy by creating linkages between national and regional interest.

The rationale for this approach is to manage internal conflicts via energy security; as greatly felt that the energy security seems must to ensure the welfare of the people based on provision of livelihood and provision of education and health services. This will lead to manage conflict internally and at the same time the non-conflict development will support the regional stability.

This Strategy is faced with undeniable fact that energy is scarce relative to demands; the power structure must deicide how to cope with limited resources. It must choose among different potential bundles of goods (the what), select from different options of production (the how), and decide in the end who will consume the profits (for whom).

Some specific education is required to bring changes in decision-making support system over which the socio political structure seems dependent. Along with investment, transfer of technology and human resource development, a stable domestic institutionalized political system is equally essential in gaining self-confidence as well as confidence of the global and regional players. Given the circumstances, Pakistan should start exploring other gas pipelines projects. A prospective candidate is the pipeline from Turkmenistan. The pipeline from Turkmenistan (TAP) would be easier to implement than the Iran-Pakistan-India line as it already has the backing of the Asian Development Bank (ADB). The proposed natural gas pipeline would stretch from the Turkmenistan/Afghanistan border in southeastern Turkmenistan to Multan, Pakistan (790 miles, 1,271 kilometers), with a 400-mile (640-kilometer) extensions to India.

In view of the ever growing energy demands, it is advisable that Pakistan should not rely on a single energy project but instead redouble its efforts to utilize the huge reservoirs of indigenous energy sources available within the country. Be it small and medium hydel power projects, renewable energy and optimum utilization of huge coal reserves in Thar, the way to the future is exploration and efficient utilization along with looking for opportunities with in the region for cheap and efficient gas supplies.

The economic vision 2030 focuses on energy, water and food security. There is a need to develop at national level *"Regional vision of Pakistan"* to assert herself and to facilitate the regional and international powers. It must establish its linkages with region to attain the vision. The shortage of energy increases the cost of production, lowers the volume of industrial output and reduces the export competitiveness in an increasingly competitive world. But one major result of the high oil price is that bigger investment is being made around the world in oil and gas exploration and Pakistan is part of such moves. Power obtained from hydel source is getting less and less as enough dams have not built in time. India is pressing ahead with the use of Indus system at its upper reaches to obtain more power, through in highly contentious manner. There is a great pressure on Pakistan not to develop the nuclear technology for civilian purposes and it is being discriminated while granting this capability to India. Given the scarcity of fossil fuel reserves, Pakistan needs to generate 8,800 megawatts of nuclear power by 2020. Present generation capacity of approximately 500 megawatts is far below the international average share of nuclear energy in the total energy output figures as well as Pakistan's domestic energy needs.

The Balochistan province of Pakistan is in focus in future development of Pakistan. It is an accepted fact that stronger Pakistan will deal strongly the regional challenges.   The construction of a deep sea port at Gwadar is just one component of the Greater Gwadar Plan. A network of roads, connecting Gwadar with Karachi, Pasni, Ormara and Turbat will be constructed in four phases. The coastal Highway linking with Karachi with Gwadar (675 km) is being built simultaneously with the port. Other highways, from Pasni to Gwadar (135 km), Ormara-Gwadar (275km) and Gwadar Turbat (188 km) will be built in phase II of the project. The first two phases of the project, costing about 3 billion, will be completed with Ormara and in the fourth phase, Pasni will be connected to Gupt at the Iranian border. The networks of the roads will be finally connected with China through the Indus Highway Under an agreement, Pakistan, China, Kazakhistan, Kyrgistan and Uzbekistan are already committed to developing extensive railroad links from Central Asia and the Chinese province of Sinkiang to the Arabian Sea Coast. The completion of this communication network will facilitate the movement of good from China and Central Asia and the Chinese province of Sinkiang to the Arabian Sea Coast. In this scenario Gwadar port emerges as a place of great strategic value, giving tremendous boost to Pakistan's importance in the whole region extending from Persian Gulf through the Indian Ocean to Southeast Asia and the Far East. The development of port provides China a strategic foothold in the Arabian Sea and the Indian Ocean, although to the alarm of India and the unease of the U. S. sitting opposite the srait of Humoz, through which 80% of the world's energy exports flow the Gwadar port will enable China to monitor its energy shipments form Persian Gulf, and offer it, in the case of any hostile interruption in such shipments, safer alternative passage for its energy imports from Central Asia.

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To go with the development projects in Balochistan; rational measures should be taken to harmonise the center province relations; by accentuating the 'We' points between center-province, national and regional and international interests.

II
Management of Regional Interests at Regional Level

Intra South Asia linking the energy security to trade and welfare may bring conflict resolution to water stress, Kashmir dispute.

South Asia has to do together what they are no longer capable of doing alone; as it is facing double edge challenges, one is the inertia set by regional and international opportunities and threats, the other is urgency to create a geo-economic sense of security that may enable the nations of South Asia to fight the contemporary challenges. Integrating economies are more likely to gain from improving intraregional market accessibility than from tougher external trade policies; which may become an opportunity for the regional states. Regional integration has not become a survival strategy for South Asian nations. The states have remained apart because of interstate tensions caused by conflicts like Kashmir or due to cold war politics which the states were unable to evade. Still the extra regional powers are active to dissuade the South Asian States to behave like European Union countries.

Possible trends have already emerged. After 9/11, however, Pakistan has focused on trade rather than the old strategy of trying to create a balance of power in the region. It now looks at its neighbours a prospective trading partners using Pakistan as a transport hub. Its relations with Iran are on the mend, buttressed by the prospect of a gas pipeline that would be equally crucial to Iran and South Asian economies. The policy of recasting regional inter-state relations on the basis of trade will directly result in regional prosperity. The region should not be deprived of the coming trade boom. The Indian and Pakistani advance towards Iran with attractive trade and construction deals might moderate geographical thinking in the region.

The Indian apprehensions can be resolved by citing the example of Soviet gas pipelines that fed Western Europe through Eastern Europe even during the Cold War. There should be no problem as long as the suppliers is firm and Pakistan is told that if it interferes with the supply of gas its own supply of water will also be stopped. The Indus Water sharing agreement between India and Pakistan, brokered by the World Bank in the 1950's survived the 1965 and 71 wars. Pakistan may be given a contract for the security of the 760-km stretch of the Iran-India gas pipeline transiting through Pakistan for an annual fee of $100 million. The fee would be in addition to the transit fee Isalamabad would earn for allowing the pipeline to pass through its territory. At the meeting of the task force on Iran-Pakistan-India gas pipeline in Tehran on May 2-4, 2005 the Iranian side proposed that "the entire security of the pipeline be handed over to Pakistan for a fee of $100m per year. India and Iran are also interested to have the partnership of China in this respect. The Pak-Qatar Gas pipeline is matter of interest for Chinese, parallel to the proposed oil pipeline from Saudi Arabia to China through Pakistan. The possibility of an extension in Pak-Qatar Gas Pipeline up to China is equally bright as Iran

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underlines China as prospective buyer from the IPI through an extension from India up or from Pakistan. Pakistan is seeking greater energy cooperation in almost every sub-sector of energy starting from nuclear power generation to coal exploitation and development and subsequent power generation as well.

Pakistan should grant MFN status to India as it may encourage lowering the cost of industrial product by importing chemicals and technology at cheap rate from India. A cost analysis may be invented by comparing the loss in other trade between India and Pakistan and the profit which may occur due to energy trade from Iran to India. India may also like to develop a regional energy set up, because of such understanding, as energy trade is also inclusive to trade potential. In 1996, India accorded the MFN status to Pakistan. The latter is yet to reciprocate. Though Pak-India trade has more than doubled from $237 million in 2002-3 to $476 million in 2003-4, it is merely 0.29 percent of the total trade of the two countries. During the last five years, total Indian exports have increased by nearly 68 percent, while during the same period; the country's exports to Pakistan have gone up by 200 %. The share of imports from India to Pakistan has risen to 2.47 percent from 1.36% in 2002-3. The balance of trade remained in favour of India.

The Association of Chambers of Commerce and Industry estimated that trade between India and Pakistan could touch the $10-billion mark by 2010 provided the execution of the South Asian Free Trade Agreement is not thwarted and the trade basket is diversified.

SAFTA agreement among India, Pakistan, Sri Lanka, Bangladesh, Nepal, Butan, and Maldives, effective from 1st January 2006, as having the potential to pave the path to prosperity in one of the most economically underdeveloped parts of the world. The seven countries of SAARC, which includes an eighth partner, Afghanistan---account for nearly one-fifth of the world's population that resides in barely three percent of the planet's geographical area. According to the Confederation of Indian Industry (CII), trade volumes could grow substantially in the coming years on account of the SAFTA agreement. A CII statement notes that "the share of intra SAARC trade in world trade is today at five percent and needs to grow at least 10 percent by 2008.

The focus of Pakistan's energy strategy should be on reviving its Central Asian option and structuring energy and infrastructure links including the gas pipeline from Turkmenistan. The Asian Development Bank has termed TAP gas pipeline project viable. Afghanistan will provide separate task force to provide security to the TAP pipeline. The project is of $3.3bn 1,600-kilometre pipeline, which is yet to be finalized and would depend on the availability of investors and terms and conditions set by them.

With the emergence of giant Asian consumers (India and China), the continent is "set to become the gravity centre of the world's energy consumption." That needs long –term energy supply security. Energy producing countries are concerned about demand security. This is where regional interdependence may best serve the interests of all parties. Regional countries need to strive to establish a structure in which regional producers would charge less from regional consumers on the bases of reciprocity in the region.

The construction of a natural gas pipeline linking Iran, Pakistan and India will help further improve relations between the three countries as the pipeline could be an important CBM and if a similar line is extended from Pakistan to China or form India to Bangladesh and then possibly extended to Thailand, Asia will get an interlinking gas system.

With economic agenda of SAARC countries gaining importance, the idea of setting up an energy grid in the region is very encouraging. In this regard the pipeline would be an outstanding example of regional cooperation. Indian Petroleum Minister Mani Shankar aiyar while inaugurating the third Asian gas buyers' summit in February 2005 proposed that the gas pipeline form Iran via Pakistan should be extended to China, a move that could look beyond a national gas grid. Asian region was rising as India, Pakistan and China were turning major buyers of gas. Aiyar also stressed that the Asian gas grid would enable the countries in the region to maximize the gains, end the wretched western dominance and ensure energy security and economic growth in Asia. "It is essential we develop a sophisticated Asian market for petroleum and petroleum products to ensure supply stability and reduce price volatility." Indian Oil Minister Mani Shankar Aiyar told a regional energy conference. India which has a vital interest in stable oil markets as it sources 70 percent of its crude oil needs from abroad is interested in promoting supply security through regional linkages. Booming economic growth has turned Asia into one of the main buyers of Gulf oil but a lack of partnerships between producers and consumers has made Asian nations vulnerable to global oil price volatility. Aiyar enthusiastically spoke about 'pipeline diplomacy' through which he hoped to bring about a change in India's relations with its neighbours.

Mony Shankar Air was granted with Petroleum portfolio, while looking at the regional demand and supply of energy he proposed a plan to integrate the gas reservoirs of Asia particularly interlinking India, China, Iran, and Turkmenistan and Myanmar. He tried to comprehend the oil of the region by signing an agreement with China to facilitate the oil companies from both the states to avail the oil of the region for their development; if the plan was implemented the states from Russia to Sirilanka would have been self sufficient in oil. In this way the two leading joints economic level could have better partnership while challenging the hegemony of U.S.A in the region. But the idea has been shelved and the Shankar Air has been deported from petroleum portfolio. The Indian politics behaved differently as compared to past in foreign policy by deporting Mony Shankar Aire from managing regional energy interests.

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III
Managing Regional Interests at International Level

If the 21st century is to be an 'Asian century,' Asia's passivity in the energy sector has to end".

Siddharth Varadarjam, Deputy Editor,
The Hindu.

The potential for economic gain from natural gas will help the countries to reassess their roles and policies. Economic collaboration will also lead to a possible transformation of social and political discourse between the countries, perhaps even lead to free trade, mediation and resolution of regional conflicts, and ultimately regional economic integration for better bargaining in international forums.

This strategy faces the challenge of barrier politics played by extra regional powers and entities inclusive of international institutions and multinationals. If Pakistan and India present a unified front against US pressure, it would not be easy for Washington to have its way on the issue. If they join hands with other like minded government on the issue—Russia and China---they could successfully resist US pressure. This is possible only if the countries, which are more directly affected by the happening in this region, develop a common approach on energy matters and economic cooperation. A positive development is that steps have been taken to facilitate the participation of India in TAP (Turkmenistan-Afghanistan-Pakistan gas pipeline project). India, Pakistan and Iran already enjoy observer status in the Shanghai Cooperation Organisation which groups China, Russia and four Central Asian republics together under one banner. India has also requested that it be made a partner in the Qatar-Pakistan-pipeline project and its participation is a possibility. By creating this energy network in the region, India and Pakistan would not only benefit themselves, they would also create a countervailing force against America's unilateralism.

Environmentalists may be activated for IPI pipeline as it is more environments friendly. America should let the pipeline up to China as it will facilitate to check the global warming; because of coal's environmental hazards, its heavy use by china is a growing international concern. Carbon emissions in China account for 37 percent of the Third World total emissions (Flavin, 1992: 30-31).

In 2005 India, China, Russia called for a "democratization of international relations, a consistent application of the principles of multilatrality in problem settlement, and the strengthening of the role of the 'United Nations.' In July 2005 Chinese President Hu Jinato and Russian President Vladimir Putin issued an important joint statement on 'the international order of the 21st century', which addresses 'US hegemony' in several less-than-oblique passages. The text emphasizes non interference in internal affairs, mutual respect for other nations' sovereignty, and stresses the role of 'multipolarity' in dealing with conflict. In addition to previous themes (terrorism, separatism, and extremism) of Shanghai Cooperation Organization, the July 2005 meeting in Astana Kazakhastan demonstrated that the organization; which represents nearly 50 percent of the world's population, desires to be serious force in international affairs.

This can be seen in the granting of observer status to India (at Russia's request), Pakistan (at China's insistence), and Iran (to the delight of all members).The SCO sought to limit Washington's presence in the region ---Uzbekistan, Kazakhstan, Kyrgystan, and Tajikistan. The joint declaration issued at the end of the summit took aim at Washington by rejecting attempts at monopolizing or dominating international affairs' and insisting on non-interference in the internal affairs of sovereign states.

The United States in the early 1950s imposed stiff controls on the export of oil and gas technology to the Soviet Union in an effort to dissuade Western Europe from completing the pipeline and to punish the Soviet Union for its role in imposing martial law in Poland. To the United States, Western European dependence on Soviet energy supplies would compromise Western security by making Europe subject to Moscow's dictates and providing it with much-needed hard currency. European leaders did not agree and argued that in the end Soviet gas would account for a relatively small proportion of Europe's total energy use. Furthermore, the alternative ---greater dependence on politically insecure sources of gas and oil in Africa or the Middle East---was less palatable (Ebinger, 1982). Eventually the United States backed away from its efforts to stop the Siberian pipeline project, South Asia particularly; Pakistan should try to have the support of European Union to go with IPI gas pipeline.

Nuclear energy option may be formulated with prospective analysis. India has clinched a nuclear deal from the USA by compromising its non-aligned foreign policy. Pakistan looked up to the USA for similar deal, which did not come through. Washington did not oblige Islamabad to provide 1000mw nuclear parks for US entrepreneurs to establish power plants like IPPs (independent power producers). Despite Washington's clod shoulder, Pakistan plans to increase nuclear energy from a mere 437 mw to 8,800 mw during next 15 years. Presently Chashma unit-2 is under construction with Chinese help and is expected to generate 325 mw.

A forum or consortium should be established with India, Iran and China and USA, Pakistan and Afghanistan; all these states are playing their stakes in the development of energy system for South Asia. They should be brought on table to bear the responsibility as well. Pakistan should take this initiative she may also take the situation in Balochistan to this forum to manage the conflict related to energy. The level of conflict may go down in this way. In the present context, we should oppose any military action to deal with Iran's nuclear issue which must be resolved through peaceful means. While our relations with the US have their own unique importance, we should, to use an American term, dehyphenate them from our relations with Iran. The IPI gas pipeline project which is in the interest of all the three countries should be pursued vigorously.
Pakistan should try to make linkages with think tanks particularly working on energy politics to create a soft corner for Pakistan's energy supply which will finally serve the international conflict management strategies.

V
Learning Statement

The structure of energy is subservient to political system. The ultimate goal of energy pursuing powers is to accumulate wealth and power. At the same time energy resources determine the states foreign policy and geo-political designs. In both ways South Asia can be forwarded as a case. The energy security is decreasing because of amalgamation of energy security with other paradigms of conflict (See figure. 3). Energy security is a complex mixture of technical, economic, environmental, political, and security issues.

The gap between energy demand and supply is increasing. The provision of energy to elite of the world is increasing the energy divide. It is found that the energy demand in Third World is increasing because of Western economic and geo-economic endeavors to fulfil their energy demands in Third World countries. The energy system of South Asia has been invaded in two ways, one: politically as U. S has impeded the way of regional development of energy system, two: the existing energy resources in and around South Asia bestowed by nature are contained from utility through India-US nuclear deal is **invasion** of natural environment **of South Asia**.

The external invasion of South Asian energy security would affect the trade capacity of China as well. US face contradiction in its opposition to the pipeline. The main energy alternative the US suggesting for India more nuclear power –bumps up against another US foreign policy goal-stemming the flow of nuclear materials.

Pakistan would be the main looser if IPI is not materialized. Techically and financially if the project at the start is meant for Pakistan, India then it would subside the cost for Pakistan as compared to other situation to take it individually. Pakistan will loose the energy corridor benefit which may accrue in the shape of transit and security fees. At the global level South Asia as a region has failed to appreciate the importance of the growing trend towards economic strength and energy security. South Asia is in sync with the global energy security.

Preparing world with energy security; therefore requires a frontal attack on a multitude of well-entrenched challenges, not the least of which is preservation of the standard of living to which much of the developed world has grown accustomed and to which others aspire. Mustering the political will to address the challenges constructively may prove the most formidable task. A world interdependent economically multiplies the opportunities to use economic instruments, but because interdependence implies mutual sensitivity and vulnerability, resorting to resource power will also result in domestic disruptions. The disjoined energy policies and practices of the world's nations often work at cross-purposes with the reality of an increasingly ecological interdependent world. The challenge political leaders face; is shaping an energy system for world beneficial to all and harmful to none. The challenge is creating a sustainable energy.

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Energy security for one state may cause insecurity to another state, while at the same time increases the cost of energy security. India is Washington's grand partner in global reform while Pakistan a partner, an errant partner to be kept on track to fight terrorism. US India deal made India to rule but reduced to lead. The nuclearized containment of powers is not practical. These destructive trends can be averted through justice, through processes of inclusion and ending marginalization. The task of global reform has to be an inclusive one, addressing the concerns, frustrations and needs of the states that are located in global heartland of Asia.

Pakistan may turn in a situation like Afghanistan, as the major cause of drugs and war lordism in Afghanistan; the loss of livelihood during the period of war over 25 years. Constrains in development of economic systems particularly of energy may deprive the people of Pakistan from developing new livelihood system, as when the economy suppose to grow on 7-8 percent it needs energy trade. As per future predictions of loss of water resources to Pakistan as lower riparian state Pakistan stands in need of new livelihood systems based on energy and mineral resources.

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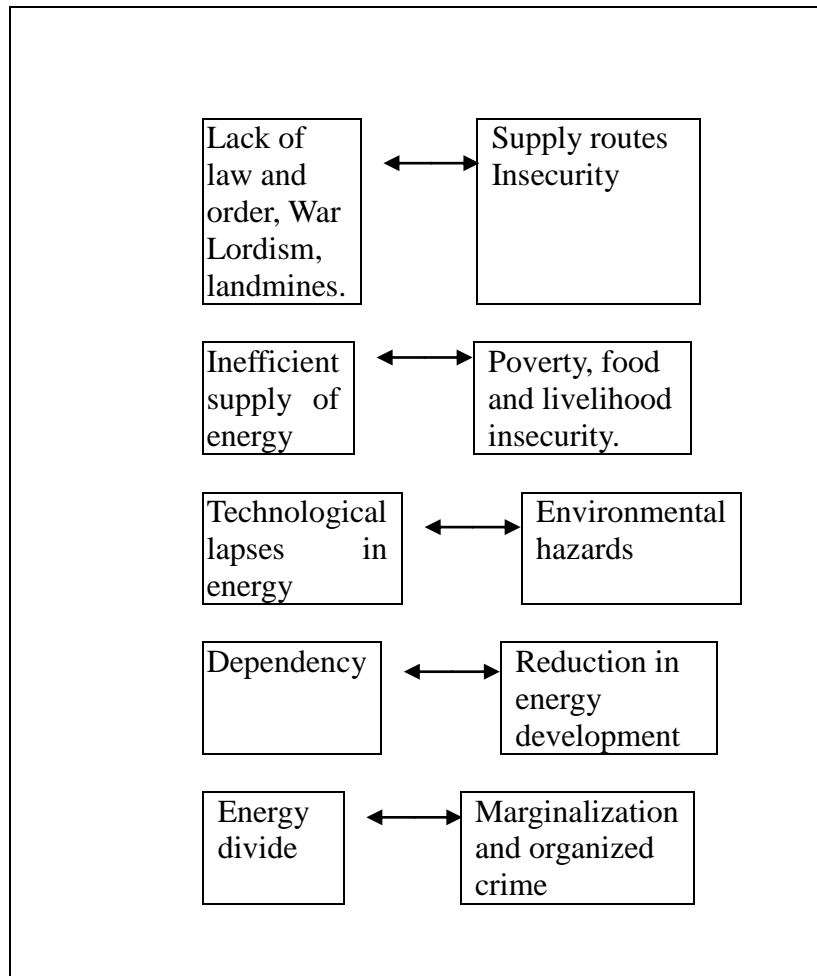
Figure. 3: Crises of Energy Security: Cause and Effect

Russia and China, bilaterally and along with the members of the Shanghai Cooperation, may pose a serious challenge to US interests in Central Asia region. China is India's third largest trading partner after the EU and the US. India and China are also united in their quest for energy to fuel their growth. A Sino-Indian convergence also exists in the WTO where both are championing the developing world's cause of greater market access to the developed world including the US. To enlist India's support to counter Sino-Russian influence in Central Asia as India and China also have common interests that may produce friction in the US-Indian relationship. The threat of potential economic and social dislocations that could accompany major oil supply or price disruptions could constrain U. S. policy makers in foreign affairs, national security and military matters where oil supplies might be affected. The developed countries would have to facilitate oil and gas in Third World as beginning with the post petroleum world they will be in need to create demand for their obsolete technology. The broad based economic development in 21st century would depend on the implementation of far-sighted policies and pricing mechanisms to encourage greater energy system.
In today's interdependent world, however, the quest for security is rapidly becoming a positive-sum process, whereby national well-being is achieved jointly by all countries- or not at all.

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HYDROPOWER ENERGY SOURCE COMBINING WITH OTHER RENEWABLES, IN THE TERITORY OF KOSOVA

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With the continuous growing of population and the economical needs in the Balkan region, as in the whole world, the need for new energy resources is getting more reasonable than ever. Considering the nowadays exponential growth in development of the renewable energy sources, in this paper, is generally presented a comparison of the hydropower energy capacities with the wind and solar energy sources, in the territory of Kosova.

Today, the territory of Kosova, has1513MW installed capacity of electricity, which is generated from two thermo-power plants KOSOVA A and KOSOVA B.This energy generation capacity in proven to be insufficient for pleasing the entire electricity needs of the 2 million populations and the overall economical development.

In this paper, a specific attention is given to the electricity generation by the renewable energy sources as the wind and hydropower.

A specific emphasize is given to the combination of hydropower with wind power, in Kosova, as a optimal solution for the generation of the renewable energy sources. In this paper is given one concrete idea for combining the ZHUR hydro-powerplant system with the numerous wind turbines which could be placed in the near zone of this hydropower-plant.

In combination, these electricity regenerators, would promise, a more reliable energy source, and would contribute to the fulfilment of the overall electricity requirements of Kosova.

Energetic system of Kosova, past, present and future
In the period between 1962 and 2002 some 115 TWh of electrical energy was produced by KEK, of which 45% was exported. The electrical energy balance is shown in Figure 1.
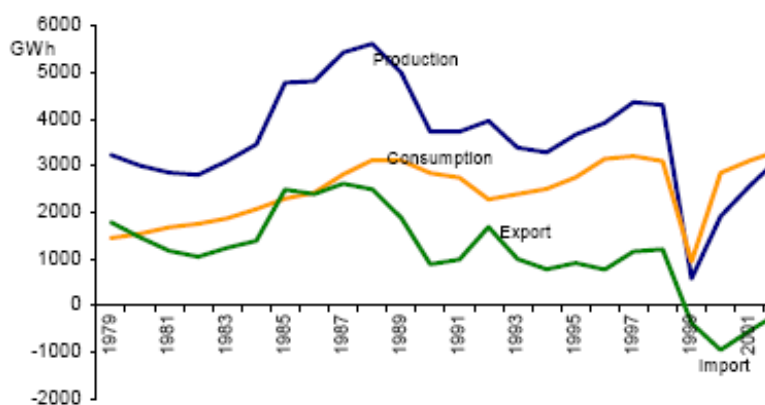
Figure 1. Development of production, consumption and exchange

The past two decades, the Kosova energetic system has pased along three main periods, whilch together have made significant contribution for its difficult present situation (Figure 1).

- First period (during 1980-1991) is characterized with a considerable increase of the energetic consumption (energetic needs) and with the instalment of two units of TPP-s, namely Kosova B1 and Kosova B2, which together had 678MW instaled capacity.

- Second period (during 1991-1999), was known as a balanced marked and with increases in the energetic needs. Nevertheless, during this period there were no additional investments in the aspect of new TPP-s instalations. Simultaneously, the degradation of the extisting TPP-s was becoming evident, as a result of lack of maintainance. From Figure 1 can be clearly seen that along its functioning period until the year of 1999 Kosova was a net electricity exporter.

- Third period began after the war of 1999, with considerable support in the aspect of energetic sector stabilisation, by the financing of the international community and the energetic indysty of Kosova. The problems of stabilisation of the energetic sector are still evident. Due to continuous increase of energy consumption needs and degradation of the existing TPP-s, the electricity consumption reductions are applied, espetialy in the periods when the consumption needs are considerably high.

Considering the retrospective, by the "Master plan" of Kosova was planned that during the year 1980-2000 the energy generation, because of the high resources of coal in the territory of Kosova, has been evaluated that till the year of 2000, will be installed thermo-power plants with a capacity of 8000MW. By the same "Master plan", it has been calculated that in Kosova by the end of the year 2000, to be designed hydropower plants with over 550MW electricity generation capacity. However, this plan, considering the political factor, was not even been initiated.

Today, energetic system of Kosova generates energy by two TPP-s, namely "Kosova A" and "Kosova B", and by also including the HPP in Gazivodë (Ujman), the total installed energy capacity is about 1513MW. For the moment its effective production capacity is 834MW (Table 1).

Table 1. Existing power generation facilities in Kosova

Power Plant	Unit	Gross Installed Power [MW]	Net Power [MW]	Start of Operation
Kosova A				
	A1	65	58	1962
	A2	125	113	1964
	A3	200	182	1970
	A4	200	182	1971
	A5	210	187	1975
Kosova B				
	B1	339	309	1983
	B2	339	309	1984
HPP Gazivodë/Ujman				
	G1	17.5	17.5	1983
	G2	17.5	17.5	1983

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Most of the power generation units of the two thermal plants are in poor operating conditions. Overhauling and rehabilitation works in the power plants have been carried out or are still under way.

In July 2002 there was a fire in Kosova B, which contributed to the reduction of the available capacity of the system to only 640 MW. By winter 2004, was anticipated the increasing of the installed energy capacity to approximately 900 MW after the repairing of two units of Kosova B. Unfortunately, the production will still remain limited to approximately 650 MW due to continued constraints in coal supply, as a consequence of a major landslide in one of the two mines in November 2002. This will have severe negative impacts on production in the short term period, and in order to maintain the full-time power supply, the lacking power to the anticipated peak of approximately 800 MW should be imported. The total production in 2000 was 1,914 GWh; this rose to 2,568 GWh in 2001, and again to 3,153 GWh in 2002 despite the above-mentioned incidents.

Considering the continuous growth of electricity demand in Kosova, there are formulated different strategies for solving this problem. By the year of 2002 was proposed a development of 2 TPP-s by the year of 2009, which would bring a lasting improvement and stabilisation in the power supply system of Kosova.

By the World Bank supported ESTAP project was developed a forecast of the total electricity consumption by the year 2020, Figure 2. In the absence of an official economic development strategy for Kosovo, two scenarios were analyzed: Medium and High-Growth, and they provide a range of future energy demands, Figure.2.

Figure.2. Energetic consumption forecast, i.e. scenarios of electricity demand growth

	2000	2005	2010	2015	2020
HG – annual growth rate 7%					
GWh	2,869	3,769	4,988	6,519	8,353
MW	653	796	1,061	1,424	1,960
MG – annual growth rate 5%					
GWh	2,869	3,586	4,272	5,137	6,168
MW	653	749	890	1,081	1,296
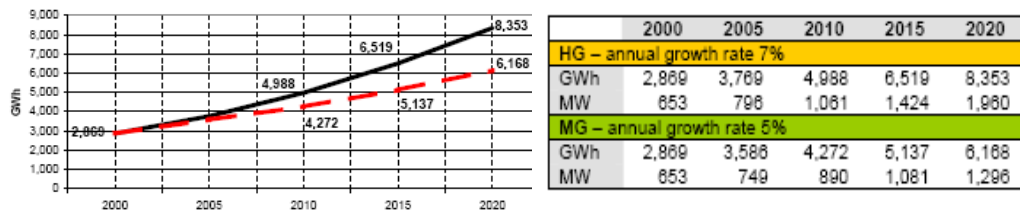
Different types of Energy sources and their potential in Kosova region

Today, there are different types of classification of energy resources that are used for energy production. In the following, in a graph format we will name the most common types by classifying them in two major groups, namely, non-renewable and renewable energy resources, *Graph 1*.
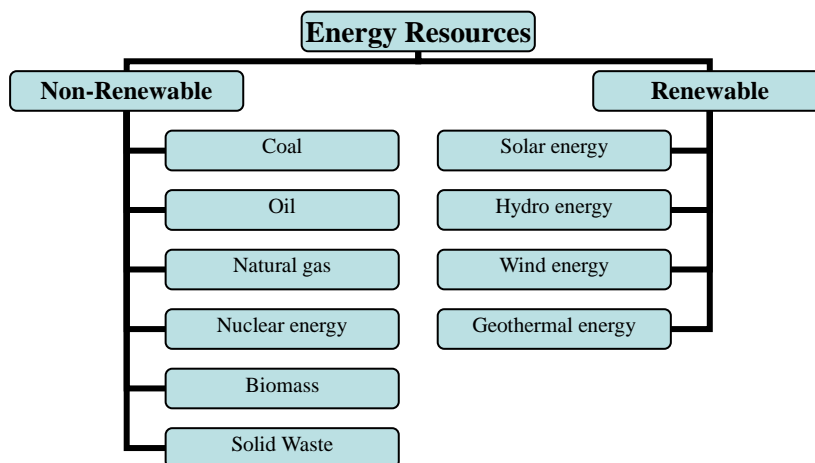
Graph 1. Energy resources classification

Coal: In Kosova region, the predominant energy resource applied is coal. The coal resources in Kosova region are evaluated to be in very large amounts, therefore it is believed to be the main energy resource for electricity production in this region even for the coming several decades. Coal is considered to be used from the existing TPP-s and the new TPP-s (planned for construction in the near future) as well. Coal resource quantities in Kosova region are showin in Table 2.

Basin	Area [km2]	Resources in exploitation		Potential resources	
		Milion tons of mass	Milion tons of oil equivalent	Milion tons of mass	Milion tons of oil equivalent
Prishtinë	264	11500	2957	9804	2521
Dukagjin	95	2737	782	1625	464
Others	14	87	22	74	19
Total		14324	3761	11503	3004

Table 2. Coal resources in Kosova

In figure 3, below, are shown the coal basins within the Kosova region, the existing ones, as well as the future potential places where the coal can be exploited for energy production purposes.

Figure 3.: Map of coal basins in Kosova
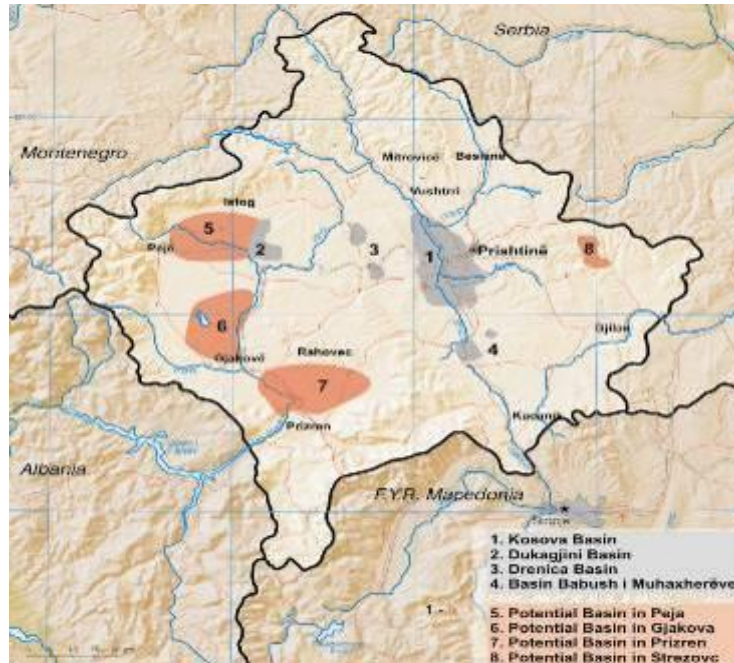
Oil and natural gas: In Kosova region, untill now hav not been detected oil and natural gas resources. Therefore, for their application, Kosova must import it from other countries.

Biomass: This type of energy is generated from different processess (mainly from burning process) of organic materials. In Kosova there in not yet studied this type of energy generation

Renewable energy resources : Although that the interest for application of renewable energy resouces varies for different coutries, there are significat facts that prove that the recent decades, all over the world in general, there is an exponential increase for renewable energy application for energy generation. Their wide application for the future looks very optimistic and it is all on account of the recent technology advancements and the mere fact that renewable energy sources are inexhaustible, (in contrast to oil, coal, and natural gas).

Solar energy: In the latest decade, this type of renewable energy is exponentially advanced, and in the most of the developed countries is, evidently, finding its application. Nevertheless that this technology is relatively new and continuouslly advancing, the results obtained from it in practice are quite remarkable, and its perspective for future wider application is quite promissing.

For the present time its application in Kosova region is not evaluated as a strategic investment which would significantly facilitate to surpass the present difficulties in the energy sector of Kosova. Its been evaluated that for the future 15 years, solar energy can nat be expected to be applied in Kosova region.

Geothermal energy: In Kosova region, the application of Geothermal energy, as well as in other countries, is considered to be applied in residential buildings. However their application in Kosova has not started yet..

* * *

Apart from the above mentioned energy resouces, for the Kosova region, considering the existing energy production facilities and the recent studies on renewable energy generation in Kosova, it has been concluded that the hydropower and wind energy generation, excluding the thermal energy generation, are very reasonable and strategic options for application in Kosova region.

The application of hydro and wind energy in Kosova, could significantly improve and stabilise the energy sector, positively affect the ecology, reduction of pollutant emissions from TPP-s, economical rehabilitation, reduction of unemployment, and provide environmental protection.

In the following, the possible utilisation of these two renewable energy resources for energy production in Kosova, will be elaborated in more detail, and ther influence in the overall energy sector will be determined.

Hydro-energy resources in Kosova
Apart from the idea of developing new TPP-s, after the year 2000, it has been greatly revitalized the idea of regenerating electricity by hydropower plants, especially ZHUR hydropower plant with an installed electricity capacity of 293MW. This idea has been provoked considering many factors, as the economic aspect, ecologic and political aspect as well. This project is considered that in a very effective way would contribute in the future stabilization of energetic production.

Kosova territory, is characterised with a hydrographical network of rivers and streams that posses insufficient hydro-energy potential for satisfying the overall energy need of Kosova. Nevertheless, hydro-energy potential in Kosova can play a significant role for the energy sector, and ought to be considered for generation of energy from it. Observing the hydrography of Kosova, it can be concluded that the west side of the territory consists the bigger part of the total hydro energy potential. In table 3, given below, can be seen the hydro-power potential of the 5 main watersheds of Kosova.

Watershed	Technical electricity potential (GWh)	Economical electricity potential (GWh)
Drini i Bardhë	554	554
Ibri and Sitnica	103.27	102.17
Morava e Binçës	8.57	8.57
Lepenci	23.8	16.53
Total	689.64	681.27

Table 3. Possible economical and technical hydro-power potential in Kosova

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The overall applicable hydro-energy potential in Kosova is considered to be 700GWh/year. About half of this hydro-energy potental can be generated in the "Drini i bardhë" watershed, respectively by utilization of a new HPP near the Zhur district. This hydropower plant is evaluated to annually generate 377GWh/year of electricity, or 53% of the overall hydro-energy potential of Kosova. Merely due to this fact, it is noteworthy to briefly elaborate the main characteristics of the Zhur HPP, that would eventually be realised, and also to determine the economical benefits from its utilisation in practice.

The idea for realisation of ZHUR hydropower plant exists since the beginning of the 50-ies of the XX-st century, when it was assumed the realisation of a hydropower plant with installation discharge of , and with an installation power of . In the year of 1969, the Serbian electro-economy, considering the fact that in those years existed a united electro-energetic system in a ex-Yugoslav level, decided the expansion of the hydropower plant capacity in 293MW. All of this was made as a function of reduction of hydropower plant working time from 4000h in 2000h.

The ZHUR hydropower plant, represents accumulative hydropower plant with derivation, located in the south-west part of the Kosova, between the municipality of Prizren and Dragash. The existing slope of the terrain is used by two hydropower plants: ZHUR 1 situated in the Zhur country and ZHUR 2 in the close area of the "Drini i bardhë" river.

ZHUR hydro-energetic system is planed to use the waters flowing from the SHAR mountain streams, starting from the accumulation of the Çajle river and its branches, the waters of the Plava river and its branches (as Brod and Rastelica branches, and other branches). All these waters accumulate in the accumulative Plava lake, from which, with the aid of a tunnel, are conducted in to the accumulative lake of Llapusha.

The location of the ZHUR hydropower plant can be visually conceived in the figure below, Figure 3.

Figure 3. ZHUR HPP position in Kosova region and the accumulative lakes
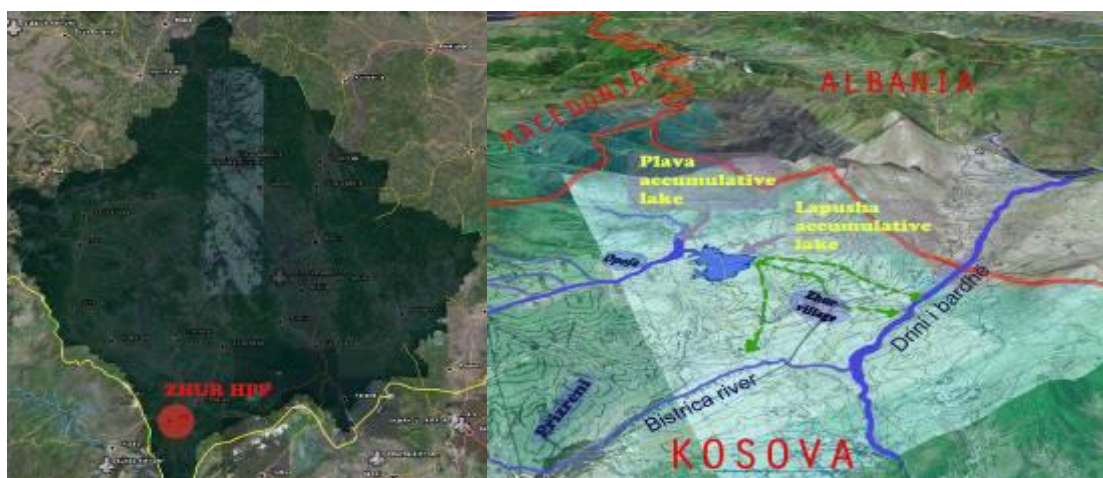
The annual production of the ZHUR hydropower plant with a production capacity of 398GWh is a very considerable value, and as it is, affects in the improvement of the annual energetic balance.

The exclusive positive attribute of the ZHUR hydropower plant in the overall energetic system of Kosova, will undoubtedly be, the phenomenon that the variable portion of the daily consumption diagram which unable to be covered by the Kosova A and Kosova B thermo power plants, will be covered by the hydropower plant.

If this hydropower plant would be realised in the present period would also prolong the need for developing of a thermo power plant with a capacity of 300MW, considering the aspect of electrical power deficiency (not energy deficiency).

ZHUR HPP, in addition to its peak hydropower character, it will also have an intervening character for insuring the continuous energy supply in the case of TPP-s malfunctioning. It also would serve as an insurance for energy selling to other consumers outside Kosova, but this case, however, would be in question only when the Kosova energy production would be extremely improved.

ZHUR HPP, represents around 53% of the overall hydropower capacity in the Kosova region, and considering the present thermo power installed capacity of 1513MW (arond 600MW of present generation capacity) in comparison with the 293MW capacity of ZHUR HPP, we could simply conclude that the influence of ZHUR hydropower plant in the development of energetic system of Kosova is considerably important. It's eventual realisation, would considerably improve the energetic system of Kosova, and exceed the present energetic production insufficiency.

Wind-energy resources in Kosova

The last decades, due to the new technology acheivements in the area of wind energy generation by wind turbines, it began the development of the wind industry worldwide. Due to the latest technology acheivements, this type of renewable energy source is very much promising. The attractive positive feature that possesses wind energy generation, such as: pure environmental energy, high installed capacity, application for industry energy, low electricity prices, no fuel requirement, non-exhautible energy resource, and many other features, makes this industry competitive even to the thermal energy generator industry.

In Kosova region, the application of wind turbines hasn't yet stareded. However, the last two years, there have been considerable analyses of wind energy potential for the Kosova region, in order to detect potential regions where the installation of wind turbines for energy generation would be economicaly feasible (Idrizi I. and Idrizi Z.).

Infigure4. It is shown the Kosova region wih several cities where meteorologic measurements were taken for a considerable time period. Also in Figure 4, it is shown the topography of the region, i.e. the most influencing spatial factors that dictate the main current flows of the wind in a local point of view.

Figure. 4. Kosova cities where wind meassurements are taken and terrain topography

In graph 2. can be seen the years of available data of daily wind speed and wind direction meassurements for different cities. However, it has to be pointed out that these meaurements are taken to a hight of 10m; therefore the precise evaluation of wind speed at wind turbine hub height is not possible presently. According to these meassurements, it has been determined the main wind currents within the entire region of Kosova, i.e. wind roses.
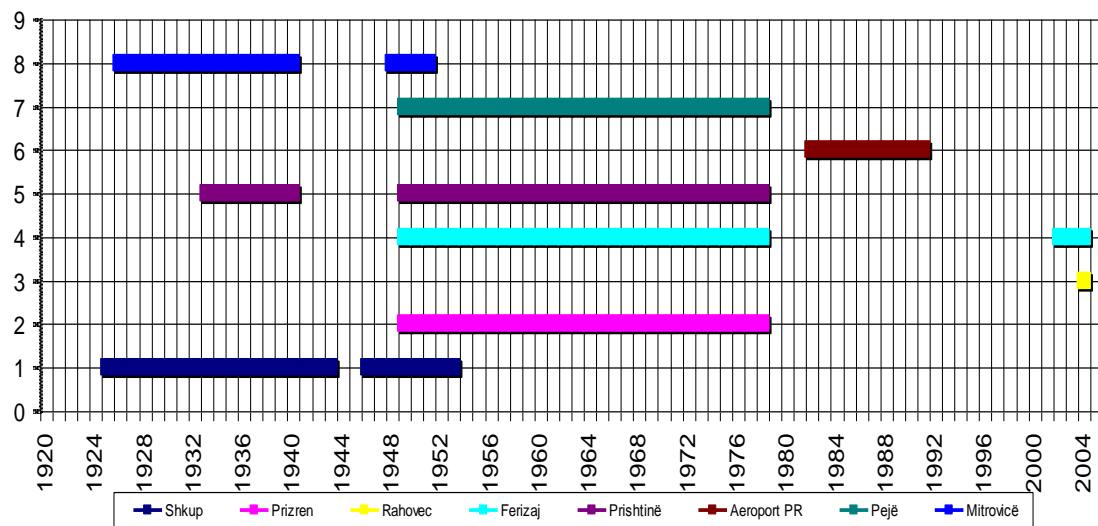
Graph 2. Years with available database of meteorological measurements for different cities

Considering these measurements, the mean wind speed at 10m height for different cities was in the range of 2-3m.

Experimentally is shown that the wind speed is continuously increasing with the increasing of height and dependantly of the terrain orography. Also the terrain effects (natural tunnel, hills,

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and mountains) have a considerable role in wind speed increasing (in th range of +2.5-+3m/ms).

Eventually, taking in to consideration all of these factors, it has been concluded that there are several regions in Kosova territory where strong winds for wind energy industry development are considerably good (mean annual wind speeds higher than 6m/s). In the previous analysis taken by Idrizi I., and Idrizi Z. the detection of these places with high wind energy potential has been done, figure 5.

Figure 5. Detected places with average wind speed of greater than 6,0m/s

Combination of hydropower with wind power in Kosova region

The main concept of this paper, consists of the idea of rationally combining the hydro and wind energy in order to obtain the maximal benefit by minimal financial investments. This kind of approach is more than necessary, especially for a poorly economic developed country as is Kosova.

The benefits obtained by incorporation of Zhur HPP and wind turbines in the existing energy sector of Kosova, can be clearly conceived by the following graph. 3. By graph 3, can be seen that the present energy consumption needs of Kosova, can be fulfilled by installation of Zhur HPP with installed energy capacity of 270MW, and wind turbines with installed energy capacity of 150MW.

The competitive cost of HPP and wind turbines installation in comparison to TPP costs, as well as the short time of their installation and incorporation in the existing energetic system of Kosova, puts these alternative energy generation equipments in serious consideration for their future realisation.
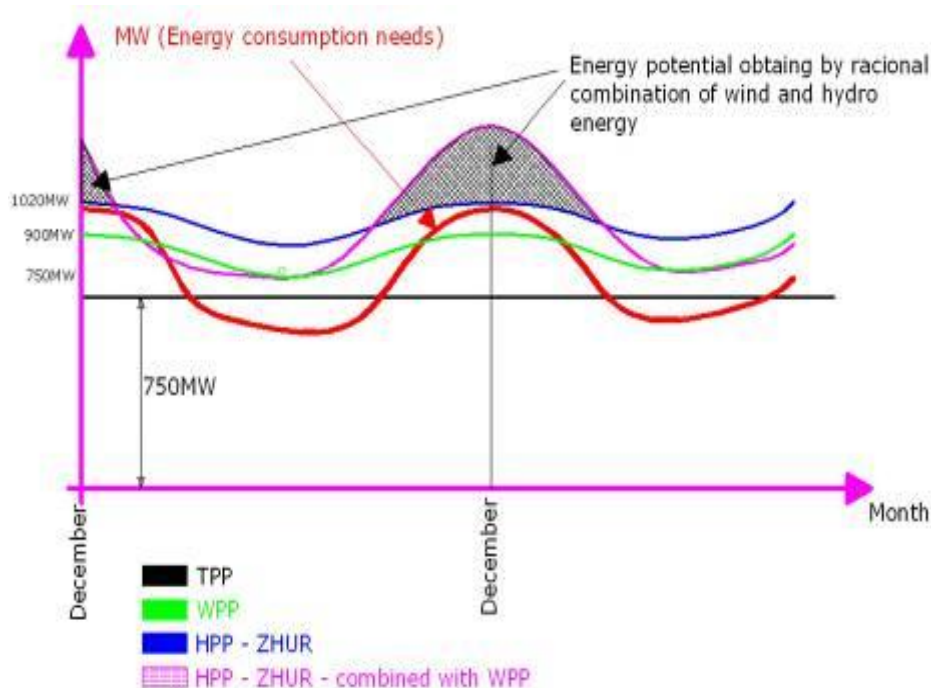
Graph. 3. Advantage of combination of wind and hydro energy

The philosophy of rational combination of HPP and wind turbines consists of the idea of preserving the hydro-energetic potential in times of high wind speed, i.e. high wind energy generation by wind turbines.

A very important phenomena, worth mentioning is that the wind and hydro energy generation potentials change in accordance with the energy consumption needs. In other words, when energy consumption needs are high, as in the winter period, the wind and hydro energy generation potentials are higher due to strong winds and high water levels.

Considering that the future development and maintainance strategy for the energy sector of Kosova, where the "Kosova A" TPP is highly damaged (need considerable maintainance works, or total reconstruction), it is very clear that the deficitary energy needs must be replenished by alternative resources as well as new TPP-s.

While installation of new TPP-s are planed to be completed by the year of 2020, and on the other hand the installment of alternative energy generation equipments can be made within a short period of time (wind and hydro), it is more than nacessary to be considered the application of alternative energy resources as well as their incorporation within the existing energetic system of Kosova.

From the above presented results, it is evident that, Zhur HPP, wind turbines instalation in Kosova and several micro-hydro-power plants, could considerably improve the present state of overall energetic system. It could also stabilise the electricity consumption, increase the variability of energy resources, decreas the unemployment, reduce oil dependence economy, and it would definately place Kosova in the group of electricity exporter countrien in the wider region, as it was before 2 decades.
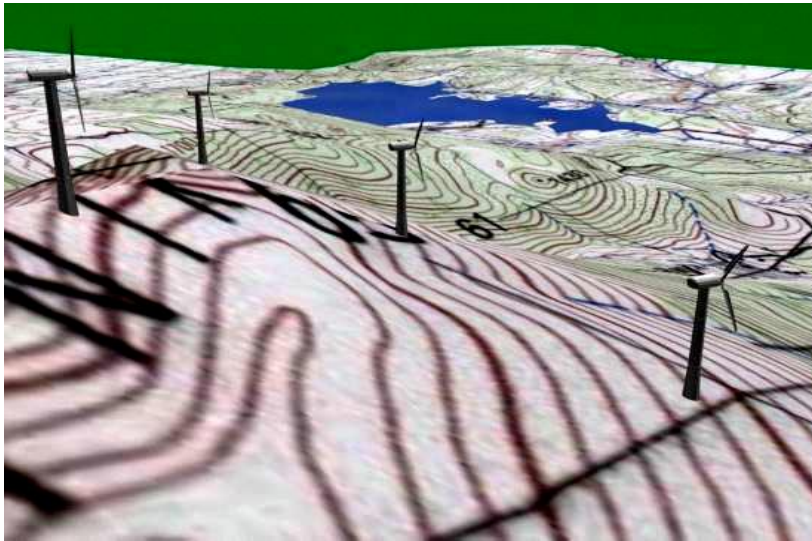
Figure 6. Situation scheme of ZHUR TPP and wind turbines

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EVALUATION OF ENERGY EFFICIENCY IN APRICOT GARDENS OF WEST AZERBAIJAN PROVINCE

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Agricultural ecosystems to day related to economy and community condition in worldwide. Supply maximum energy and using material in human is the main purpose of management in agricultural ecosystems. Energy cycles are a subject of agricultural ecology and in different agricultural ecosystems that calculate amount of input and output energy. Away of estimation agricultural true development to product stability in agricultural location using of energy flow methods. Evaluation of energy balances in this farm, with preparation questionnaire, from province farmers and grabble statistic, information per agricultural office west Azerbaijan province pluralization and then used of formula and coefficients special are become equivalent value of output and input energy conversion and calculate the energy efficiency. Energy value of used factors and input of this type gardens was 20453372 and output (production) energy value of apricot yields 1405000 Kcal/ha and dried apricot yield is 2941100 Kcal/ha   respectively. This energy can supply requirement energy of 7025 and can be supply requirement protein of 3333 persons in day. Energy efficiency value (output: input ration) was 0.2 that energy efficiency of apricot and dried apricot yield is 0.06 and 0.14 respectively. Finally data show that more input energy related to irrigation (53.4%) and nitrogen (34.5%) in the west Azerbaijan province. Inputs costs and net income values in apricot were 855400 and 10694600 and inputs costs and net income values in dried apricot were 8964000 and 2171560 thousands Rials (9000 Rials =1$) per hectare, respectively. Income: cost ratio for apricot was 12.5 and for dried apricot was 0.24 that can be increased by applying appropriate cultivated management.

Key words: Energy efficiency, cost, input, output, apricot

Introduction

Apricot since name is ***Prunus Armenica*** or ***Americana Vulgaris*** that it ilk is ***Rosaceae***. Apricot is one base tree that usually planted in north hemispheric. That in this research calculates the input and output energy efficiency in apricot gardens in west Azerbaijan province in the northwest, Iran.
Energy cycles are a subject of agricultural ecology and in different agricultural ecosystems that calculate amount of input and output energy (9). Away of estimation agricultural true development to product stability in agricultural location using of energy flow methods (16).

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Apprehension distribution energy method very important in development agricultural design (5). Agricultural ecosystems depends two ecological energy and cultivation energy, ecological energy source is sun energy that using for photosynthesis and environmental temperature control, atmosphere currents and create rain. Cultivate energy divisible tow group biological and industrial. Principally need for energy in agriculture relative to change degree in natural ecosystem (8). Agricultural strongly need to energy, especially related to fossil fuels (9) Using fossil energy in agriculture increase the output energy (7) Different input energy that impossible cause the increase output energy (12) Analysis biophysical and energy in agricultural ecosystems necessary to affective output energy (2,17) so in the agricultural ecosystems, coefficient return material is very few, because to remove the yield, all mineral materials out the ecosystem and plants remain usually using for feed so fertility ecosystem impossible only using the fertilizer or high manure (15).

Peterson et al (14) express that addition energy efficiency in using nitrogen depends to kind of previous yield and primary amount nitrogen in the soil. In this research maximum energy efficiency was 6.1 for corn, wheat and Soya alternation bout in the single cultivation this range is 4.7. They suggest that can improve energy efficiency if we know the available nitrogen of remain yield in past year and record yield, in this way, reduce environmental press derive increase the NO2 washing nitrogen and pollution under water or increase the green house gases.

Pimental et al (15) with restudy the energy efficiency organic system and ordinary system in corn, wheat and potato yield show that increase the energy efficiency in corn and wheat organic system is 29-70 percent than ordinary systems and conversely on potato that energy efficiency in ordinary system is 70-93 percent more the organic systems.

 Citable that using the input energy related to output energy very amount variable and depends to using the nitrogen amount and kind of plant (9) So central active in agricultural and increase using of chemical material (such as fertilizers, herbicides, insecticides, and another poisons), cause the problems in economic, environmental and ecological that major of environmental effect is: soil erosion, pollution under water and sub water by the chemical material and distraction on nature and unfavorable effect in human and animals live (10) Input, complete index of environmental effect on the plants and using for formulation manure that proper environment (16) Because the few input, increase using mineral manure, important effect to the yield crop but increase the amount manure, growth and reaction plants reduce (10). Can be result that, evaluation of energy balance, nomination, recognition kinds and extents using energy, can be scientific method proof the exist or no exist pollution and measure amount of fixity production in the one ecosystem.

Materials and Methods

The study was conducted during 2005 and 2006 in Uremia area of the West Azerbaijan province in the northwest, Iran.
In this consideration, the energy flow in the agricultural ecosystem of Potato was evaluated with the use of statistics and information derived from the local agriculture government organization (preparation of questionnaires from 25 local farmers).
A detail inventory of average different inputs (seed, labor, chemical fertilizer, manure, fungicide, nitrogen, phosphorus, potassium, herbicide, irrigation water, oil and Desiccation,

Enucleate, Calibration & Packing, Box, Collect dried apricot) and output (apricot yield and dried apricot apricot) was prepared following. Various inputs and output data's were converted to their equivalent values in input and output energy (Table1&2). Than the energy efficiency was calculated as output: input ratio. So calculate amount energy efficiency (input and output ratio) (8, 9).

$$\text{Energy efficiency} = \frac{\text{Input energy}}{\text{Output energy}}$$

Except preparation of questionnaires from the farmers for increase the amount of machinery energy, affect capacity each instrument (to the breadth work), efficiency each system and fastness of tractor calculate the below formulation (18).
Calculate the determination of fuel energy and amount of machinery using per hectare used the below formulation (8).

Amount of fuel energy (Gallon/h) = 0.06 * 0.73 * (transfer power efficiency) * (hp) PTO

The meaning of (hp) in this formulation tractor power to horsepower, the meaning of (0.06) is special coefficient of benzene tractors power and the meaning of (0.73) is related coefficient of fuel energy in gas oil tractors (11).
As for in Iran mainly using the tractor with power is %65-%75 horsepower so in this calculation mean tractor power is 66.36 horsepower and efficiency power is 75 percent and so calculate amount of fuel using energy (9).

0.06 * 0.73 * %75 * 66.36 = 2.18 (Gallon/h)

Tractor activities hours is 8 hour and one gallon is 3.78 liter therefore calculated using amount fuel energy to liter/hour

2.18 * 8 * 3.78 = 66 liter/hour

Apricot component percent obtain of chemical analyze in urmieh apricot factory (Table 4). So finally calculate the output and input energy ration or energy efficiency (Table 3) and energy calculates same method. Percent of apricot yield component determined and than consumption of energy / energy production were calculated (table 3). Percent of apricot component and energy produce in each hectare is the table 4 that calculate the input energy to output energy (6, 19). Input expenditure and apricot yield incoming estimated by using of gathering information and static data. Net income and rate of income /cost were calculated (table5). Desiccation of dried apricot in the field and using the sun.

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RESULTS AND DISCUSSION

Data showed that energy efficiency (output and input energy ration) for apricot yield was 0.2 (Table 3). In this sense, for a unit using energy 0.2 circa energy production in total form also energy efficiency (output and input energy ration) for apricot fruit was 0.06 and for dried apricot was 0.14 (Table 3). In this sense, for unit using energy 0.06 and 0.14 circa energy production in apricot and dried apricot respectively. As for the table 3, amount production of protein for production each unit protein shall using the 0.01 unit energy in apricot. If only production energy without contain it, for using food a human is 200-kcal\d. Apricot yields supply 7025-man energy in day and if a man needs 60g protein in daily there for apricot yield supply 1667-man protein in day (6). And calculate using energy for each input (Table 6).

As for table 6 the more using energy related to irrigation (53.4%) and nitrogen (34.5%) respectively. It reason weather condition in region and incompetent management and disorderly irrigation that caused using more energy for irrigation, there for, can be used the efficient irrigation systems, used the sprinkle system for increase the water efficiency in unit surface. Traditional irrigation systems in this region caused that irrigation efficiency near the 30 percent but in modern systems irrigation efficiency is 70 percent.

So we can be used the modern systems in irrigation and used the resistant variety for dray, used the green manure and compost and good management in using fertilizer.

Using the extra fertilizers (nitrogen) that in this study is (%34.5) in long time make the pollution soil, sub water, biological environmental and another factors (1). On development countries pay the more money for coal, oil, gas and electricity. That a like irrigation water caused the irregular using energy in the final (4). Increase using the fossil energy and another product food systems cause that notwithstanding increase yield in surface unit and total production, evaluation of energy reduce in comparison with traditionalize systems that only related to human and animal energy. But with increase the people in world and demand for food clear that the traditionalize systems cannot be answerable to food requirement but in ecological viewpoint this system (traditionalize system) is proper (3).

In the end can be key suggestion that consist:

Used of modern irrigation systems replace the locality systems, using of resistance variety to dry, cultivation on proper lands, used the green manure and apply the management systems in different agricultural ecosystems (Iran) should be used of combination methods, in this sense, used of modern methods in different farming and especially apricot gardens that should be notice to region potential and local capable (13).

Table1- Consumer and production energy in west Azerbaijan apricot product in 2005 -6

Input and output energy	Using amount in hectare	Unit energy (kcal)	Kcal/ha
Input energy			
Workers	497hour	465	231105
irrigation	40000 m^3	272.5	10900000
Oil	66liter	9583.3	632497,8
N	400 kg	17600	7040000
P&K	20 kg	47790	1197500
manure	4 ton	15000	60000
Insecticide	5 liter	27170	135850
Fungicide	8 kg	27170	217360
Total			20414312
Output energy			
Apricot yield	5000 kg	281	1405000

Table 2- consumer and production energy in west Azerbaijan dried apricot product

Input and output energy	Using amount in hectare	Unit energy (kcal)	Kcal/ha
Input energy			
Desiccation	7 hour	465	3255
Enucleate	21hour	465	9765
Calibration & packing	14 hour	465	6510
Box	28 hour	465	13020
Collect dried apricot	14 hour	465	6510
Total			20414312
Output energy			
Dried apricot yield	1667 kg	1764, 3	2941100

Table 3- Energy efficiency in apricot and dried apricot cultivating on the West Azerbaijan (Iran)

Production	Output energy	Input energy	Energy efficiency
Apricot fruit	1405000	20414312	0.06
Dried apricot	2941100	20414312	0.14
Total	4346100	20453372	0.2

Table 4- Percent of apricot and dried apricot component and energy produce in each hectare.

Component	Component percent	Energy in each gram (kcal)	Amount in hectare (kg)	Product energy in hectare (kg/ha)	Input/ Output (Energy)
Apricot					
Protein	1	4	50	200000	0.01
Oil	0.1	9	5	45000	0.002
Hydrocarbon	5.8	4	29	1160000	0.06
Dried apricot					
Protein	5.2	4	86.7	346800	0.02
Oil	0.4	9	6.7	60300	0.003
Hydrocarbon	38	4	632.5	2534000	0.12

Table 5. Total costs, net revenue values and income/cost per hectare of apricot and dried apricot cultivation.

Total cost of apricot (1000 Rials)	855400	**Total cost of dried apricot (1000 Rial)**	8964000
Gross income (1000 Rials)	11550000	**Gross income (1000 Rials)**	11135560
Net Income	10694600	**Net Income**	2171560
Net income/ Cost	12.5	**Net income/ Cost**	0.24

Table 6. Percent of input energy in each hectare of potato cultivation

Energy usage	Percent of energy
Labor	1.13
Irrigation	53.4
Oil	3.1
Nitrogen	34.5
P2O5 & K2O	5.9
Manure	0.3
Insecticide	0.6
Fungicide	1.06
Desiccation	0.016
Enucleate	0.05
Calibration & Packing	0.03
Box	0.06
Collect dried apricot	0.03
Total	100

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DEVELOPMENT AND APPLICATION OF A NOVEL SORBENT PRODUCTION TECHNIQUE FOR DETERMINATION AND EMPLOYMENT OF THORIUM AS GREEN NUCLEAR ENERGY FUEL

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Social, economical and industrial development, improving living standards and increasing population have increased the demand for resources including energy. Energy demand has nearly doubled itself since 1970's and the current demand is expected to triple itself by the end of this century. The energy demand must always be met by adequate, efficient, reliable, economic, continuous and environmentally benign sources as it is of paramount importance that our survival and well being depends on sustainability of the world and its eco-systems. Hence, nuclear energy, which is used to supply the majority of the energy and electricity demand of many developed countries, has been the preference of choice due to its un-intermittent nature unlike that of renewable energy sources. Nevertheless, increasing environmental consciousness created great controversies regarding this energy source due to the radioactive character of its fuel. However, thorium (Th) -a nuclear energy fuel the radioactive character of which is negligible despite its high energy content- can be a good substitute for uranium (U). On the other hand, continuous monitoring and detection of these elements is a prerequisite in their employment. Nonetheless, on-line monitoring and detection of nuclear energy fuels, such as that of U, is a great challenge to the analytical chemist and require employment of highly expensive and rarely found instrumentation, since these elements occur at very low concentrations (i.e.; parts per billion) in nature. Cost-effective methods of detection entail lowering of detection limits of analysis. The most efficient mean for accomplishing this is preconcentration- increasing the concentration of the analyte prior to detection and thus lowering the detection limits. However, the necessary sorbent materials and the techniques employed for producing speciality functional polymers, which would allow precise, accurate and rapid analysis via cost-effective and eco-friendly means is a great challenge. In this study, a novel sorbent production technique is developed and it is employed for detection of thorium via batch and on-line methods. The results of the study indicate that thorium is an efficient new energy fuel which may meet the current and the future energy demand without any adverse impact on the environment.

Introduction

Continuous development and the social, cultural and economic trends of the industrial age and the years following it have altered the world, the climate and the eco-systems in an irreversible way. Thus, the consequences of environmental change would involve more than an increase in average temperature. Climate change looms as one of the dominant social and economic policy issues of the next century. Global climate change carries with it significant environmental, economic, social and geopolitical risks. Due to the uncertainties in the magnitude, timing and effects of climate change the economic analysis of climate change is a risk assessment rather than cost-benefit analysis. The most firmly established consequences of

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climate change and global warming are raising sea levels, estimated changes in agricultural productivity, water quality and availability and increase in the intensity and probably the frequency of hurricanes. Moreover, there are both direct and indirect human-health related risks. Direct risks include heat- and cold- related illnesses (i.e., cardiovascular diseases), death from exposure to thermal extremes and to altered frequency and/or intensity of extreme weather events such as storms and floods. Indirect risks stem from disturbances of ecological systems, including changes in the range and activity of disease vectors and infective parasites, altered crop productivity. In addition to them are those associated with sea level rise, social and economic dislocations, and asthma and allergic disorders caused by biological impacts of changes in air pollution including pollen and spores (IPCC 1996b). Another risk created by climate change is the probable loss of species biodiversity, as environmental conditions and the characteristics of local habitats change more rapidly than species can adapt. Besides these risks, social and political systems would be threatened, too. Climate changes that reduce the habitability of low-lying coastal areas or island states and lead to desertification and local famines due to regional variations in rainfall patterns could create large numbers of refugees.

The major reason for climate change is the continuous emission of greenhouse gases and aerosols due to contemporary modes of production and human activities, such as burning fossil fuels. However, the increase in the rate these gases are produced is more fearsome than their present concentration. For instance limiting CO_2 increases to 550 ppm by 2050 is consistent with holding global average temperature increases to 2 below degrees centigrade. Thus, emission of these gases should be considerably cut. However current styles of production and life intensively rely on energy obtained from burning fossil fuels. Actually, energy intensive users- such as industry- are deeply concerned at the adverse impacts of high and volatile energy prices. [1-5] Thus, greater energy efficiency is the most effective long term means of reducing fuel poverty. [6-8] The scale of the new challenges requires a thorough rethink of the energy policy frameworks. The target should be:

- To cut CO_2 emissions
- To eradicate fuel poverty
- To secure energy supplies
- To provide affordable energy

A combination of supply and demand instruments is required to:

* Actively promote innovation and investment in new carbon-free/low carbon energy capacity;

* ensure a continuing well-balanced mix of coal, renewable and nuclear power generation, drawing on indigenous energy sources; and

* focuses hearts and minds on cutting energy demand, at work, at home and in the community.

* Incentives for investment in all lower-carbon generation technologies, including nuclear, should be supported for to ensure early progress in development of new generation capacity.

On the other hand, no single energy source is capable of meeting the demand. Thus, production of energy from sources with greater energy content such as the nuclear energy fuels has arisen as an inescapable necessity. The main principle that underlies the birth of nuclear energy is the desire for turning mass into energy. The fission reaction –splitting up a REE atom (i.e., U or Th) - releases energy of 200 MeV or $3.2X10^{-11}$ J (Contrasting with 4eV or $6.5X10^{-19}$ J/ molecule of CO_2 released in the combustion of carbon). Commercial nuclear

power generation involves containing and controlling the fission reactions so that the heat can be used to make steam which in turn generates electricity. Moreover, a study by Royal Academy of Engineering into the comparative costs of energy generation found that nuclear was at that time cheaper than other options and closely competitive with combine cycle gas turbine plant. Moreover, despite the controversies regarding the pollution and danger caused by the radioactivity of the REE's, the yearly dose emitted to the environment by nuclear power plants is much less than the yearly dose of the natural radiation. The average effective dose taken from the natural and synthetic radiation sources is about 2, 4 mSv/year (mSv=0, 0001 Sievert=0, 1 rem). Whereas the share that a nuclear power plant operating under normal conditions has in the total dose is between 0, 01-0,001 mSv/year and the yearly environmental radiation dose is between 1/100 and 1/300. As declared on the H.U. Nuclear Engineering Department's Homepage, a more dramatic exposure is encountered in the case of smoking. An individual, who smokes about 3/2 package of cigarettes per day, is exposed to 8000 millirem of radiation per year while the dose caused by the nuclear energy is 1 millirem/year and the dose caused by the nuclear missile experiments is about 4-5 millirem. The energy content, the environmentally benign character and the un-intermittent nature of nuclear energy made it the preference of choice for many developed countries, such as France, Canada and US. In Table 1 is the list of advantages and disadvantages of nuclear energy are presented.

Table 1. The advantages and disadvantages offered by different energy sources.

Source	Advantages	Disadvantages
Nuclear	- Its fuel is economical - It is the most dense source with respect to energy production - Its wastes can be compressed easier than those of other sources and thus occupy less space - It requires scientific information, which addresses to a great area, for the cycle - Its transportation is easy as the modern fuels - It does not cause effects such as acid rain and greenhouse effect	- It requires greater fundamental costs due to security, radioactive waste and storage the systems - In many countries it requires solution for the problem of long-term high level wastes - It may cause nuclear risk due to rapid production of nuclear power

The leading developed countries of the world obtain their energy need primary from nuclear energy. In Table 2, is presented the share of various countries in nuclear energy production.

Table 2. Nuclear shares of the countries in the world

COUNTRY or AREA	Nuclear Share (%)									Nuclear Electricity Production (TWh)	
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2002	2003
Argentina	11.4	11.4	11.4	10.04	9.04	7.3	8.2	7.2	8.6	5.8	7.0
Armenia	na	36.7	25.7	24.69	36.36	33.0	34.8	40.5	35.5	2.3	1.8
Belgium	55.5	57.2	60.0	55.16	57.74	55.3	58.0	57.3	55.5	45.1	44.6
Brazil	1.0	0.7	1.1	1.08	1.12	1.4	4.3	4.0	3.6	13.8	13.3
Bulgaria	46.4	42.2	45.4	41.50	47.12	45.0	41.6	47.3	37.7	20.2	16.0
Canada	17.3	16.0	14.1	12.44	12.44	11.8	12.9	12.3	12.5	76.1	70.3
Mainland	1.2	1.3	0.8	1.16	1.15	1.2	1.1	1.4	2.2	23.4	41.6
Taiwan	26.8	29.0	26.4	24.77	25.32	23.6	21.6	22.9	21.5	38.0	37.4
Czech Rep	20.1	20.0	19.3	20.50	20.77	26.73	19.83	24.5	31.1	18.7	25.9
Finland	29.9	28.1	30.4	27.44	33.05	30.0	30.6	29.8	27.3	21.4	21.8
France	76.1	77.4	78.2	75.77	75	76.4	77.1	78.0	77.7	415.5	420.7
Germany	29.1	30.3	30.6	28.29	31.21	34.5	30.5	29.9	28.1	165.0	157.4
Hungary	42.3	40.8	40.8	35.62	38.3	40.6	39.1	36.1	32.7	14.0	11.0
India	1.9	2.2	2.3	2.551	2.65	3.1	3.7	3.7	3.3	19.6	16.4
Japan	33.4	33.4	36.0	35.86	36*	33.8	34.3	34.5	25.0	313.8	230.8
Kazakhstan	0.1	0.2	0.6	0.18	na	na	na	na	na	na	na
Korea, S	36.1	36.3	34.1	41.39	42.84	40.9	39.3	38.6	40.0	113.1	123.3
Lithuania	85.6	83.4	81.5	77.21	73.11	73.68	77.6	80.1	79.9	14.1	14.3
Mexico	6.0	5.1	6.5	5.41	5.21	4.5	3.7	4.1	5.2	9.6	10.5
Netherlands	4.9	4.8	2.5	4.13	4.02	na	4.2	4.0	4.5	3.7	3.8
Pakistan	0.9	0.6	0.7	0.65	0.12	1.7	2.9	2.5	2.4	1.8	1.8
Romania	na	1.8	9.7	10.35	10.69	10.3	10.5	10.3	9.3	5.5	4.5

Table 2. Cont.

Russia	11.8	13.1	13.6	13.08	14.41	14.9	15.4	16.0	16.5	141.2	138.4
Slovakia	44.1	44.5	44	43.80	47.02	53.4	53.4	65.4	57.3	18.0	17.9
Slovenia	39.5	37.9	40	38.33	37.18	37.4	39.0	40.7	40.4	5.3	5.0
South Africa	6.5	6.3	6.5	7.25	7.08	6.7	6.7	5.9	6.0	12.0	12.7
Spain	34.1	32.0	29.3	31.66	30.99	27.8	28.8	25.8	23.6	63.0	59.4
Sweden	46.6	52.4	46.2	45.75	46.8	39.0	43.9	45.7	49.6	65.6	65.5
Switzerland	39.9	44.5	40.6	41.07	36.03	38.2	36.0	39.5	39.7	25.7	15.9
UK	25.0	26.0	27.5	27.09	28.87	21.9	22.6	22.4	23.7	81.1	85.3
Ukraine	37.8	43.8	46.9	45.42	43.77	45.3	46.0	45.7	45.9	78.0	76.7
USA	22.5	21.9	20.1	18.69	19.8	19.8	20.4	20.3	19.9	780.0	7637
TOTAL										2610	2525

Sources: UI/WNA, IAEA   (-): Data not yet available; (na): Not applicable; (*): estimate

Today there are two basic nuclear energy fuels –U and Th. Although it is not fissile itself, Th-232 will absorb slow neutrons to produce U-233, which is fissile. Hence like U-238 it is fertile. However, unlike U, of all the 26 known isotopes of Th only 3 have half lives sufficiently long enough to warrant a concern and Th-232 and 230, which are the isotopes of concern, do not have high specific activity and thus are not highly radioactive. A study of various nuclear fuels determined that after 100 to 200 years, Th produces only 1/6 of the actinide toxicity produced by other nuclear fuels such as that by U. Therefore, even the toxicity measured in conjunction with U used in the Th/U fuel cycle still was reduced by a factor of 3 compared to the other actinide. Th, besides its negligible radioactive character, high energy contend and superior magnetic, physical and chemical properties, is about 3 times as abundant in the earth's crust as U. Thus, Th is a more economically viable energy fuel than U. The radioactive waste problem, which is encountered when U is employed, would be eliminated via substitution of Th. Th is a promising nuclear fuel. The radioactive character of Th is negligible. Hence, Th appears to be the best nuclear energy fuel. In Table 3, world thorium resources, which are economically extractable, are listed.

Table 3. Thorium Reserves in the World (Tons)

COUNTRIES	EXTRACTABLE	DETERMINED*
U.S.A.	158 000	298 000
Australia	44 000	49 000
Brazil	16 000	18 000
Canada	100 000	100 000
India	292 000	300 000
Malaysia	4 000	4 000
Norway	166 000	183 000
South Africa	117 000	196 000
Turkey		380 000

Source: IAEA (International Atomic Energy Agency), News Brief, 2002.

On the other hand, there is a group, which argues that not only the radioactive character of Th and U would be problematic, but also the bioavailability of these elements through the food-chain and other factors would also irrecoverably damage the environment and the living things. [9-10] as discussed above, the main reason which underlies the decline in the production of nuclear energy cannot solely be the radiation that the nuclear plants emit. The main reason for the decline in endeavor for exploitation nuclear energy can be due to:
- The increased costs of monitoring and disposal of its fuel
- The real and potential costs related to compliance with the regulation for proper disposal and monitoring of the radioactivity of the fuel

Careful monitoring and quantitative determination of these elements is essential. However, due to their similar behavior, on-line monitoring and determination of Th and/or REE's is a problem in analytical chemistry and require employment of highly expensive and rarely found instrumentation (i.e., NAA, ICP-AES, ICP-MS, wavelength dispersive X-Ray Fluorescence Spectrometry) as these elements occur at very low concentrations (i.e.; parts per billion) in nature. [11-14] moreover, although strong claims are made for the specificity and sensitivity of these instruments some of the interferences cause problem using these methods. [12, 12,16] Cost-effective methods of detection entail lowering of detection limits of analysis. The most efficient mean for accomplishing this is preconcentration- increasing the concentration of the analyte prior to detection and thus lowering the detection limits. [17-30] However, the necessary sorbent materials and the techniques employed for producing specialty functional polymers, which would allow precise, accurate and rapid analysis via cost-effective and eco-friendly means is a great challenge. [31-48] the methods reported for the spectrophotometric determination of Th involve reactions with reagents, which form stable complexes with REE's and Th, or the "chelating dyes" as they are called. In preconcentration studies, which are the most efficient way of increasing the concentration of the analyte, these dyes are immobilized on conventional ion-exchange resins. The synthesis of these resins, which are also called chelating resins, can be achieved either through chemical or physical immobilization methods. The physical immobilization does not entail lengthy synthesis methods nor does it consume dangerous and carcinogenic reagents in great amounts. However, the chemical immobilization offers products with better stability than the

sorbent materials obtained via the latter method. However, the synthesis procedures employed so far were neither eco-friendly nor economic.

In this study, a new ecologically and economically friendly method of synthesis is developed for production of sorbent material which would allow detection of Th via UV-VIS Spectrophotometers in batch and on-line methods. This method provided the opportunity of combining the assets of covalent binding with the assets of adsorptive binding while eliminating the serious drawbacks of the former binding method. The sorbent materials, which were produced via chemical immobilization of the organo-analytical reagents on the supports, were successfully employed in detection of the analyte at trace levels. In a laboratory application of the sorbents produced via this method, the support material, which was chosen to be Amberlite XAD-4 resin, was functionalized with 2-(3,6-Disulfo-2-hydroxy-1-naphthylazo)benzenearsonic acid disodium salt, which is known with the common name Thorin. Thorin, despite its high specificity for Th, from which it has driven its name, has not been used with the purpose of preconcentration of thorium and the REE until recently. [11-12] the formation of a strong complex between Th and Thorin through the mechanism given in Figure 1 afforded the possibility of its employment as a preconcentration agent in the preparation of chelating material for spectrophotometric determination of thorium. [23, 47]
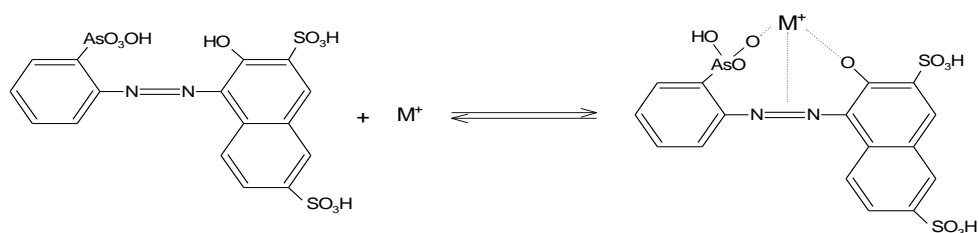
Figure 1. The mechanism of chelate formation between Thorin and the metal ion.

Experimental Studies

STAGE 1: PREPARATION OF THE SORBENT MATERIALS

In Figure 2 is presented the new synthesis mechanism of the sorbent material- Thorin immobilized Amberlite XAD-4.

Figure 2. Schematic Diagram of Preparation of Thorin Immobilized Amberlite XAD-4 resin.

STAGE 2. ANALYTICAL EVALUATION OF THE SUCCESS OF THE SYNTHESIS
METHOD
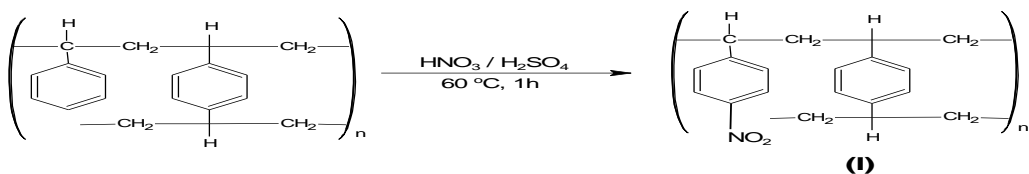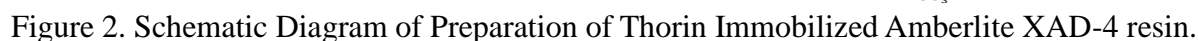
In the below figures the FT-IR spectra, the results of TGA analysis and the SEM photographs
of the products are presented.

Step 2.1. Results of FT-IR Analysis

In Fig. 3, 4 and 5 the FT-IR spectra of the unmodified, the amino and the Thorin
immobilized XAD resin is indicated, respectively.

Figure 3. FT-IR Spectrum of Unmodified Amberlite XAD-4 resin.
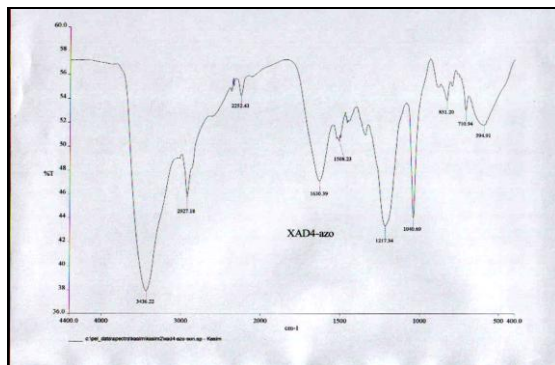
Figure 4. FT-IR Spectrum of amino XAD-4 resin.
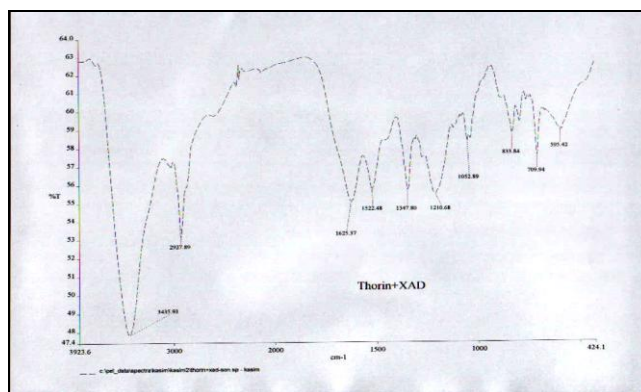
Figure 5. FT-IR Spectrum of Thorin immobilized XAD-4.

Step 2.2. Results of TGA Analysis
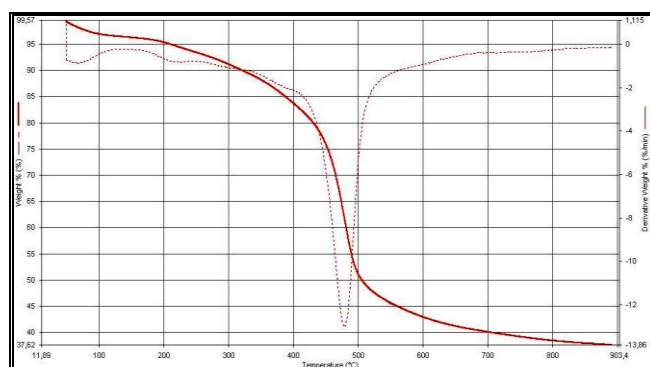
Figure 6. TGA Graph of Thorin Immobilized XAD-4.

Step 2.3. SEM Photographs

The SEM images of the unmodified Amberlite XAD-4 resin is presented in Fig.6, while the SEM image of Thorin immobilized resins are presented in Fig. 7, 8 and 9.
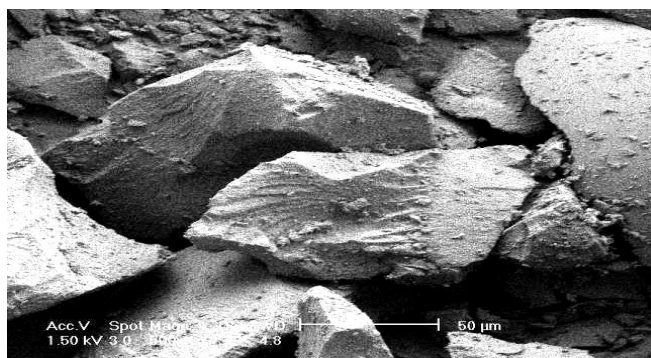
Figure 7. SEM image of unmodified XAD-4 resin.
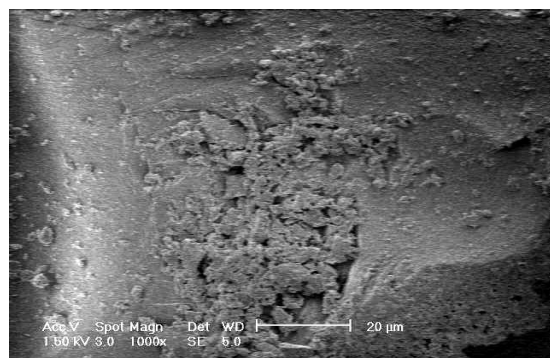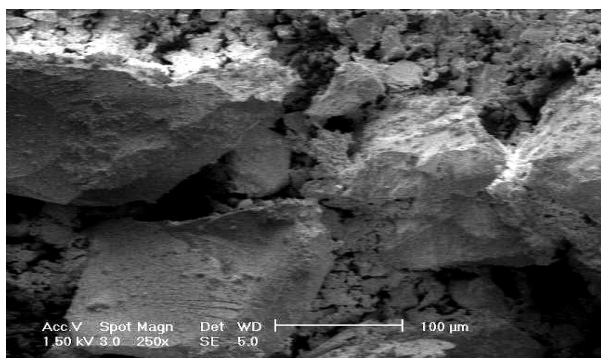
Figure 8. SEM image of Thorin immobilized XAD-4 resin.   Figure 9. SEM image of Thorin immobilized XAD-4 resin.

STAGE 3: PRECONCENTRATION OF THORIUM VIA THORIN IMMOBILIZED AMBERLITE XAD-4 RESIN

The sorbent material obtained in Stage 1 is employed in preconcentration of thorium both via batch and column techniques. Spectrophotometric determination of thorium as its thorium-Thorin complex was made according to the method proposed in the literature. [23, 47] The results are presented in Figures 10, 11 and 12.

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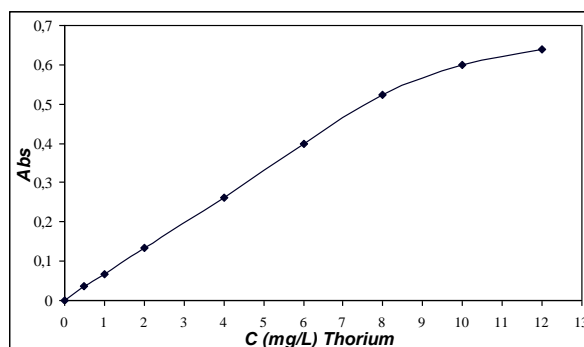
Figure 10. Calibration curve for thorium as its Thorin complex.
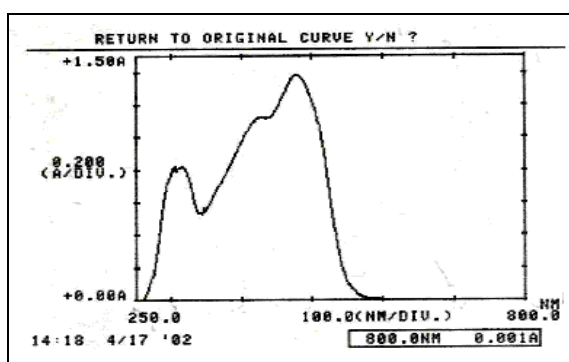
Figure 11. Spectrum of Thorin at pH 1.0. thorium-Thorin complex at pH 1.0.
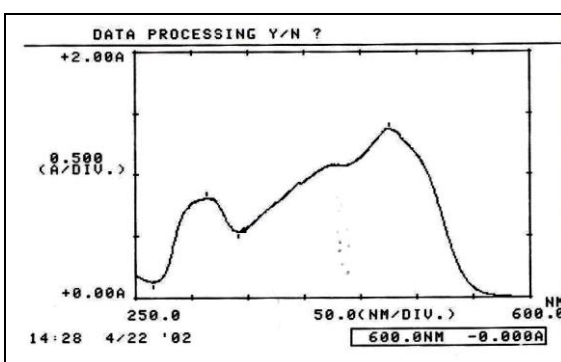
Figure 12. The spectrum of

Step 3.1. Sorption of Thorium by Amberlite Xad-4 Resin via Batch Technique

Step 3.2. Investigation of pH on sorption of Thorium

25 ml solutions containing 10 mg/L Th olutions, which were prepared in these solutions, were sorbed by 50 mg portions of the sorbent. The effect of pH on sorption efficiency is presented in Figure 13.

Figure 13. Effect of pH on percentage of sorption of thorium by Thorin immobilized XAD-4 resin.

Step 3.3. Investigation of effect of time on sorption of Thorium

9 ml 30 mg/L thorium solutions were sorbed by 50 mg sorbent portions. The effect of contact time on sorption efficiency is presented in Figure 14.

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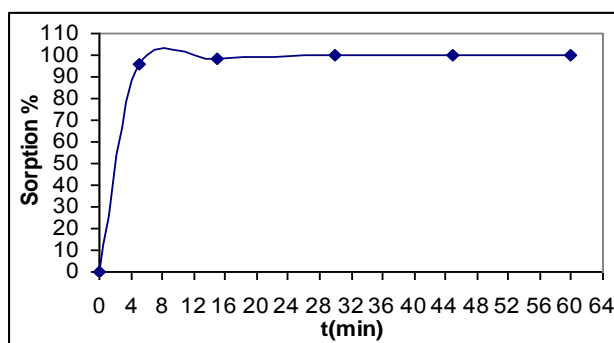
Figure 14. Effect of time on percentage of sorption of thorium by Thorin immobilized XAD-4 resin.

Although sorption of Th is completed in 45 min., considerably high sorption efficiency is achieved within 5 min.

Step 3.4. Investigation of the effect of concentration of Thorium on the efficiency of its sorption

Thorium solutions of various concentrations were reacted with sorbent material. The results are presented in Table 4.

Table 4. Effect of concentration on sorption of Th^{4+} by Amberlite XAD-4 resin.

Concentration of Th^{4+} (mg/L) in the sorption solution	Amount of Th^{4+} (μeqg) sorbed by 1 g sorbent	Sorption %
5	97.00	97,0
10	188.0	93,80
20	363.6	90,90
40	179.4	86,7

Step 3.5. Investigation of effect of amount of sorbent material on sorption of Thorium

Various amounts of sorbent material were reacted with Th solutions. The results are presented in Table 5.

Table 5. Effect of sorbent amount on sorption.

Amount of the Sorbent (mg)	Amount of Th^{+4} (μeqg) sorbed by 1g sorbent	Sorption %
20	89.65	13,2
40	54.35	51,4
60	48.73	75,4
80	32.91	83,7
100	33.99	97,4

Step 3.6. Determination of the exchange capacity of Thorin immobilized xad-4 for Th (IV)

25 ml Th (IV) solutions of different concentrations were prepared at the optimum pH and they were reacted with 50 mg portions of Thorin immobilized XAD-4 overnight. The amount of Th (IV) sorbed by 1 g sorbent was calculated from the difference between the concentration found in the solutions above the sorbents before and after sorption. 25 ml 252 mg/L Th^{4+} solution, which was prepared in water, was added onto 50 mg sorbent and it was found that 62.9 mg Th was sorbed by 1g sorbent.

Step 3.7. Determination of optimum eluent and elution conditions

8 ml 20 mg/L Th (IV) solutions were prepared in water and were reacted with 40 mg portions of sorbent. After sorption the sorbents were filtered and were washed with 10 ml pure water. After sorption Th (IV) was eluted by 12 ml HCl solutions of different concentrations and the sorbents were washed with water. The effect of concentration of HCl on the efficiency of elution is presented in Figure 15.
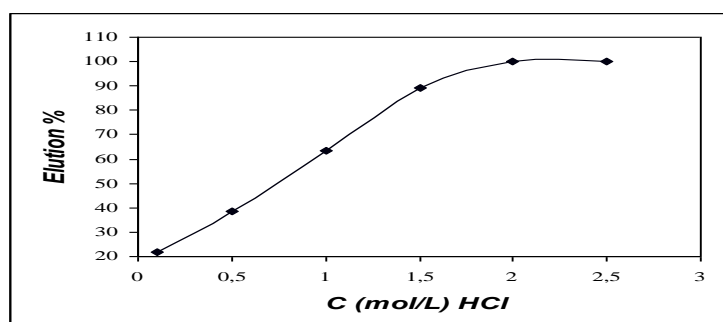
Figure 15. Effect of concentration of HCl on elution of Th^{4+} from Thorin immobilized Amberlite XAD-4.

Investigation of EDTA as Eluent
After sorption of 10 ml 5.5 mg/L Th^{4+} solutions, which were prepared in water, EDTA solutions of different concentrations prepared in different media were used as eluent.

Preparation of eluats for spectrometric Th (IV) determination requires formation of Th-Thorin complex. Therefore, following elution Th-EDTA complex should be decomposed first. Hence, the eluats were wet-ashed by 2 ml conc. $HClO_4$ + 5 ml conc. H_2SO_4 + 5 ml conc. HNO_3 mixture on hot-plate until wet colorless residues were obtained. Then upon cooling to room temperature, they were transferred to 25 ml volumetric flasks by washing with water. Followingly, they were prepared for spectrometric Th (IV) determination and the final volume was made to be 25 ml with water. In Table 6 the efficiency of elution made by EDTA is presented.

Table 6. Effect of concentration and acidity of EDTA solutions on elution of Th^{4+} from sorbent material.

EDTA SOLUTIONS		ELUTION STEP
C_{EDTA}	Prepared in	Elution %
0.10	water	89.0
0.01		74.1
0.10	0.01 M HCl	83.6
0.01		92.0
0.10	0.01 M KOH	88.6
0.01		98.7

Results
The newly developed method of synthesis of organo-analytical reagent immobilized polystyrene based resin was exemplified in the synthesis of Thorin immobilized Amberlite XAD-4 resin. The characterization studies of the functionalized resin revealed that the synthesis method was successful. The sorbent material thus obtained was employed in preconcentration of Th, which is the most promising nuclear energy fuel due to its negligible radioactive character and ecological and economical aspects.

The synthesis method, which entails chemical immobilization of the reagent on the support material, is time efficient and eco-friendly. The methods employed for physical binding do not yield products with adequate stability and the reagents immobilized leach quickly. This in turn, increases consumption of the reagents employed in the process and takes much longer time as the whole process should be repeated over and over again for preparation of each sorbent material. However, the chemical immobilization procedures, although entail lengthy synthesis in the preparation step, yield much more stable products. Thus, once the sorbent is prepared, it can be used without conditioning or further treatment for long time (app. 1 year). Nevertheless, the chemical immobilization methods, which have been employed so far required lengthy synthesis of about a few days. Moreover, the reagents employed were highly carcinogenic and they were consumed in great amounts.

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However, the newly developed method requires employment of much less dangerous reagents in very dilute concentrations and only in about two and a half hours a highly selective, sensitive and stable sorbent material is obtained from simple unmodified resin.

The characterization studies of the sorbent material were accomplished through FT-IR, SEM, TGA and elemental analysis. The results obtained revealed the success of the procedure.

Thorin immobilized XAD-4: $\{-CH\,(Ph\text{-}C_{16}H_{11}AsN_2O_{10}S_2\text{-}CH_2.CH_2\text{-}X)_n\text{-}CH_2.— \}$

- Results of the FT-IR Analysis:
  FTIR (KBr): 1195, 1053 ve 1038 $cm^{-1}(SO_3^-)$, 1626 cm^{-1} (-N=N-); 3461 cm^{-1} (ArOH);

- Results of Thermal Gravimetric Analysis :
  The weight loss of 4% up to 120^oC arises from 2 moles of water in the structure. Degradation starts after 180^oC, which is the temperature up to which the structure is stable.
- Scanning Electron Microscopy Images:
Thorin covers the surface homogeneously. The dark regions are caused by sorption of the reagent in greater amounts in the micro-pores within the macro-porous structure. In the images, existence of islands with different dimensions are caused by the grinding the resin to the dimension of 100-120 mesh prior to the immobilization process.
The proposed method of synthesis provided functionalized resins, which demonstrated all the features of a good sorbent material. Thus, Thorin immobilized XAD-4 was employed in preconcentration of thorium. It was observed that thorium could be sorbed with high efficiency from its aqueous solutions of at pH values between 4.5-5.5. It was observed that sorption was achieved with about 99% efficiency within 45 minutes. Elution could be accomplished both by 0.1 M EDTA solutions and 1.5 M HCl solutions prepared in water. Since both the sorption and elution efficiencies were high enough, the sorbent was employed in column processes. There was no need for conditioning of the column neither following nor prior to employment of the sorbent. However, high flow-rates were not appropriate for sorption. Therefore, although the sorbent material can be less successful when high flow-rates are demanded, in the batch applications the sorbent material offers successful recovery, enrichment, analytical monitoring and detection processes.
In this study, the developed sorbent synthesis method provided cost-effective, rapid, sensitive and selective determination of thorium instead of its monitoring and detection via relatively less common and high-cost instrumentation. Thorium was found to be a better alternative than uranium when they are evaluated upon taking the ecological and the economical aspects into consideration

Conclusions
The following conclusions can be drawn from the present study:
a)   Nuclear energy is receiving increased attention not just in Turkey but also in the world as the renewable energy sources such as solar, geothermal, wind and biomass, is not sufficient to meet the energy demand. Moreover, the depleting nature and the accelerated

demand of commercial energy forced planners and policy makers to look for alternative sources. Therefore, clean energy and environmentally benign sources should be sought.

b)   Because environmental problems stem from the use of fossil fuels and the renewable energy sources are not sufficient due to their comparatively low energy contents, nuclear energy can be considered as a possible source of energy both in Turkey and in the world. In this respect, thorium attracts much attention as it is the least radioactive element. Moreover, in the nuclear reactions while U causes emission of substances with high radioactivity, such as other actinides, Th does not have the same consequence. Thus, it can be employed as a combined fuel with uranium, which in turn would decrease the adverse effect of U as well.

c)   When trace amounts of Th are employed during production of materials such as ceramics, glasses, camera lenses and optical fibers, thorium confers better electrical, magnetic, mechanical, nuclear and optical properties to the products. Thus, industry would also benefit from the superior properties of Th.

d)   The first barrier preventing widespread employment of the REE's, which are also nuclear energy fuels, is the strict regulations and the lack of an economic, reliable and precise method of production, monitoring and detection of these elements. Enrichment of these elements, preferably via preconcentration technique, would provide an easier, selective, sensitive and more economic way both for their extraction from the natural sources and for their monitoring in the media in which they are present. This requires production of functionalized sorbent materials.

e)   The prerequisites, which the sorbent materials must meet, bring limitations to the materials, which can be employed as support materials, and to the functional groups, which can confer the sorbents produced the desired selectivity and sensitivity. The methods of production of sorbent materials can be grouped in two broad categories: the physical and the chemical immobilization of the functional group on the support material.

f) Each category offers distinct advantage and disadvantages. The chemical sorption provides products of better stability. However, the time necessary for the production in the conventional methods is long about 3-4 days and carcinogenic reagents are consumed in great amounts. Thus, a new method, which would minimize both the synthesis time and the consumption of such dangerous reagents, is essential. The adsorptive binding is relatively short, but the products produced are not stable against leaching.

g)   The sorbent materials would provide the analysis and monitoring of thorium and the REE's via relatively more economic and common detector, i.e., photometers and optical fiber chemical sensors, instead of the NAA, ICP-AES, X-Ray Fluorescence spectrometers. Thus, in-situ and in-vivo analysis and monitoring of these elements would also be made via economic and environmentally benign methods.

h)   The patented method, via which the sorbent material(s) that provide selective, sensitive and accurate analysis of Th, would provide economical, ecological and reliable monitoring of Th. This in turn may bring a solution to the great disputes regarding nuclear energy.

i) It was observed that Th, which is much more abundant and less radioactive than uranium, would be a better alternative. As the patented sorbent material production method is a cost-efficient and eco-friendly method, the strict restrictions on nuclear energy and its fuels would not cause economic consideration neither for the production nor for the monitoring of these elements.

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THE FIELD TRIP ABOUT SOLAR ENERGY AND APPLICATIONS OF THE EFFECTS OF STUDENTS'S ATTITUDES AND ACHIEVEMENTS

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Importance of the renewable energy is significantly increasing in the world. For this reason, the education about renewable energy and its usage must be given at the best situation. The aim of this research is determine the effects of student's attitudes and achievements which were done The Field Trip **about** The Solar Energy and Applications topic. Research was conducted with control group and experiment group. High school 2. Class students were divided into two groups which are control and experiment groups. While the topic of "Solar Energy and Applications" was being given to control group by traditional method, the topic was given by Field Trip method and The Solar Chimney has been taught with Learning Cycle Model to experiment group student. The Solar Energy and Applications Achievement Test (SEAAT) and The Solar Energy and Applications Attitude Scale (SEAS) were given both groups, as a pretest and posttest. Collected data were evaluated by using SPSS 11.0 program. While evaluating data t-test was used. At the end of the research, the student's who were in Field Trip Method and Learning Cycle Model, achievements are more than the student's who were in traditional method was determined. At the results of interviews with students and SEAS, the students have developed positive attitudes towards The Solar Energy and Applications topic.

Keywords: *Solar energy and applications, Field trip, learning cycle model, Attitude.*

INTRODUCTION

Renewable energy resources (solar, hydroelectric, biomass, wind, ocean and geothermal energy) are inexhaustible and offer many environmental benefits over conventional energy sources. Each type of renewable energy also has its own special advantages that make it uniquely suited to certain applications [1].

The outdoor field trip is defined as a teacher-led student excursion away from the physical classroom.   It is considered to be a valuable learning experience because the activities during the trip provide a hands-on experience to complement traditional classroom teaching [2]. Field trips are an important component, or teaching methodology, of an educational program. They are usually taken to provide students with opportunities that they do not or cannot receive in the classroom. Field trips may be taken to museums, cultural events, or to the outdoors. However, while their value is known, field trips are not used by all teachers [3].Outdoor field trips are used as a instructional strategy in the science classroom, and they link science education to environmental education because they are used as an instructional strategy for environmental education as well. Plenty of research justified the use of field trips as an additional and effective instructional strategy towards the improvement of science

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education [4, 3,5].The field trip has been long recognized as an educational teaching tool particularly in geological and biological sciences . However, the general agreement on the educational value o field trips has not been reflected in their use by schools [6]. The beliefs of teachers and their actions may contribute to their decision-making process to support outdoor field trips. Teacher beliefs are considered to be important because they were found to influence the nature of teacher roles, planning, and decision-making process, which influced the curriculum [7]. Bethel et al. [8] stated that science educators had a major responsibility to foster he acquisition of knowledge and positive attitudes toward environmental science education. Their study investigated the effects of an inservice science education program on teachers' philosophical views or attitudes toward science and environmental science education. They sought to determine whether a program that stressed inquiry activities, science seminars, demonstrations, special reading assignments, and field trips promoted positive attitudes toward environmental science and science education.Borun and Flexer, claimed that the outdoor field trip was benefical because it helped students develop a conservation ethic, enriched classroom learning, was hands on, improved science education, and enhanced academic curriculum. The Learning Cycle originated in the 1960s with the work of Robert Karplus and his colleagues [9, 10,11]. It was originally based on Piaget's ideas about learning [12], but it is also consistent with other theories of learning [13].

The foundational sequence of the Learning Cycle consists of three instructional phases: exploration, concept introduction, and concept application. In exploration, work with scientific data or materials to ask questions, gather data, and engage with scientific phenomena, ofte in contexts that are scientifically authentic.In concept introduction a cenral scientific concept is defined relative to the experiences and questions raised in the exploration phase.In concept application student apply the new defination or principle to a new or similar context or situation [14].The cognitive activity of concept application extends the understanding of the principle beyond a single problem context or situation.Learning Cycle is credited to Roger Bybee who developed the 5 E model [15].

Table1. The Stage of Learning Cycle Model

Engagement	Object, event or question used to engage students. Connections facilitated between what students know and can do.
Exploration	Objects and phenomena are explored. Hands-on activities, with guidance.
Explanation	Students explain their understanding of concepts and processes. New concepts and skills are introduced as conceptual clarity and cohesion are sought.
Elaboration	Activities allow students to apply concepts in contexts, and build on or extend understanding and skill.
Evaluation	Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

The solar chimney offers a method for the large scale generation of electricity from solar energy.
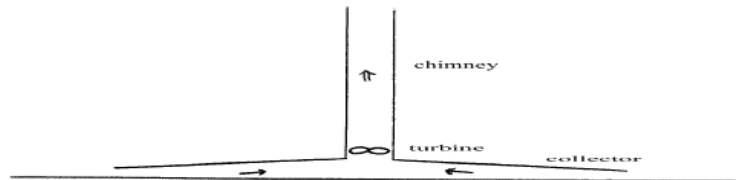
Figure1. The Solar Chimney

Ambient air is drawn into the glass collector. This is warmed by solar energy and rises up the chimney. The current of rising warm air drives a turbine. The capital cost is high but running costs are very low, the fuel is free and the power station has a long lifetime. The technology could become the cheapest method for the large scale generation of solar electricity [16].
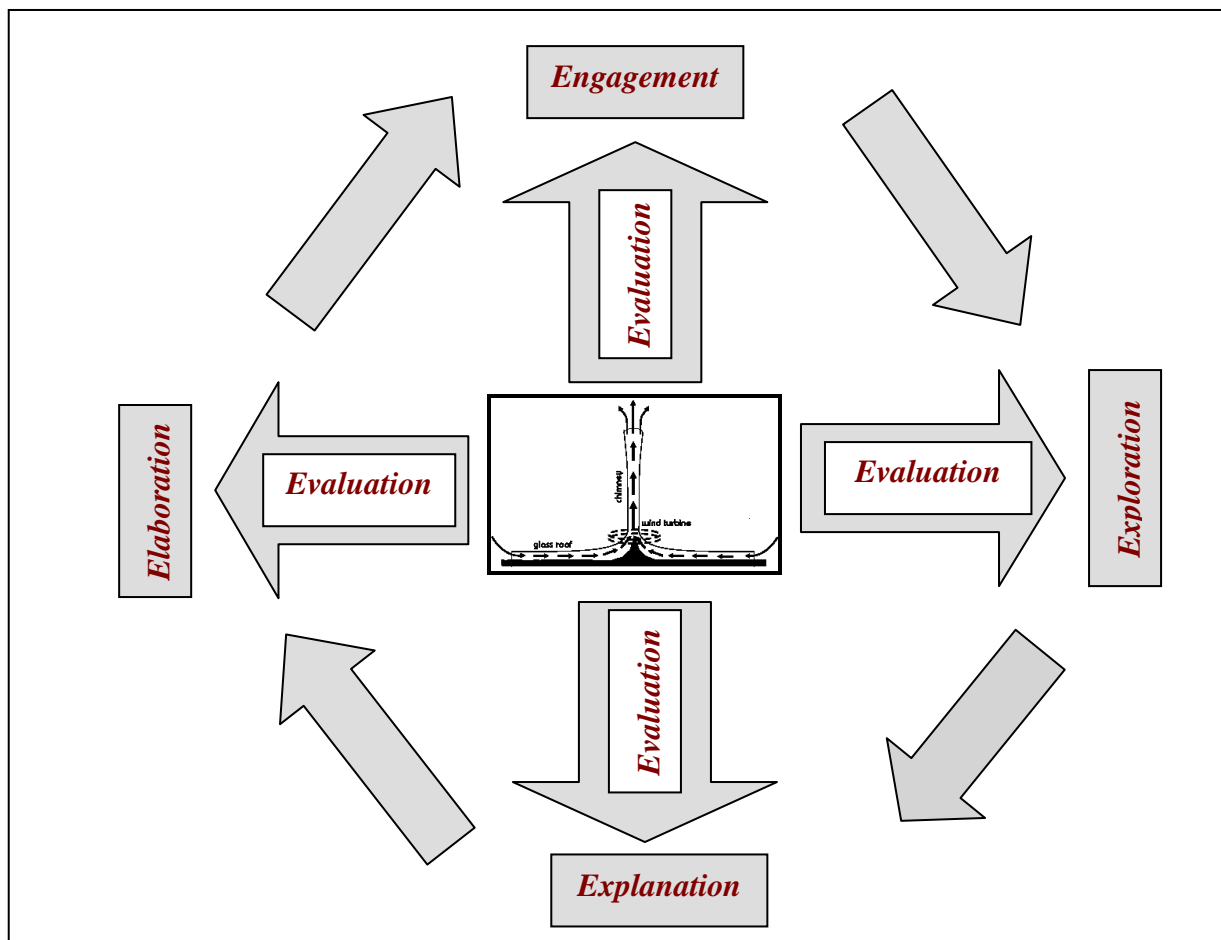
Figure2. The 5E Learning Cycle: The Teaching of The Solar Chimney

The aim of this study is to understand the importance of the renewable energy and to investigate the effect of using The Field Trip and Learning Cycle Model methods to students' attitudes and achievements in The Solar Energy Applications topic.

METHOD

The aim of this study is to determine whether there are any statistical differences in the level of achievement and in the attitudes when one group of students received traditional method and the other with The Field Trip and learning cycle model.The experimental /testing model was used in this study. The searching sample was selected from The Vocational High School second class students. The study was done in 2005-2006 educational term. In this study, for the determining students' achievements and attitudes test has been developed. The tests were applied as a pretest and posttest. The Renewable Energy Resources Center was selected at The University of The Suleyman Demirel. The Learning Cycle Model was applied to teach working principals of The Solar Chimney which is a type of Solar Energy and Applications. The experimental and control groups was formed for the teaching model of six person. In addition, The Solar Energy and Application Achievment Test (SEAAT) and The Solar Energy and Applications Attitudes Scale (SEAS) were developed for measuring the students' attitudes towards The Solar Energy and Applications topic.

Table1. The 5E Learning Cycle: The Teaching of The Solar Chimney

THE 5E LEARNİNG CYCLE: The Teaching of The Solar Chimney	
Stages	**Activities**
I. Engagement: The activities in this stage capture the student's attention, stimulate their thinking and help them access prior knowledge.	* The students collect the informations about Solar Chimney. * The students investigate the interviews of experts about the Solar Chimney at The Renewable Energy Resources Center.
II. Exploration: In this stage students are given time to think, plan, investigate, and organize collected information	* The students arrange the collected informations about The Solar Chimney. * The students investigate stage of the Solar Chimney. * The students draw the figures about the Solar Chimney.

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Table1 cont.

III. **Explanation:** Students are now involved in an analysis of their exploration. Their understanding is clarified and modified because of reflective activities.	* The students explain their information about The Solar Chimney. * The students draw the figure about the principal working of the Solar Chimney * The students ask the misunderstanding of the Solar Chimney. * The students discuss about the Solar Chimney and its Working principals.
IV.Elaboration: This stage gives students the opportunity to expand and solidify their understanding of the concept and/or apply it to a real world situation	* The students discuss on the best working conditions Of the Solar Chimney. * The students discuss how can applications be Developed further same the application. * The students envisage the best pratical application Model.
V. **Evaluation:** In this stage, students receive formal feedback from the teacher on the adequacy of their explanations. Students also evaluate their own understandings and determine what they have yet to figure out.	* The students solve the Solar Energy Exam which is Given by the teacher.

The Solar Energy and Applications Attitudes Scale (SEAS):
SEAS is applied for measuring the interest and attitudes of students toward The Solar Energy and Applications topic. SEAS were adapted from a master thesis [17]. Each item in scale did not include more than one idea. SEAS was included 24 item. This scale was applied to 30 students. Cronbach alfa reliability coefficient was 0.94. Finally SEAS was used as a pretest and posttest.

The Solar Energy and Application Achievment Test (SEAAT):
The purpose of this test was to measure the achievement of students about The Solar Energy and Applications topic. SEAAT included 32 questions. 31 questions was multiple-choice, one was open-ended question.

The Solar Chimney Exam (SCE):
The purpose of this exam was to measure the knowledge about The Solar Chimney and its working principals. This exam included 10 questions.

The data were analyzed using SPSS statistics program. Paired samples t-test was used to investigate significant differences between pre and post-test in the groups.

And then the semi-structured interview protocol was used for determining students' views about The Field Trip and The Solar Energy and Applications topic. The interviews results was evaluated .

RESULTS

Table2. SEAAT Pretest mean score results of experimental and control groups

	N	X	S	sd	t	p
Experimental Group	15	20.80	4.73	14	-,26	,799
Control Group	*15*	*21.13*	*2.87*			

$(t_{(14)}=-,26; p>,05)$

Pre-test results showed that in the beginning of the application the experimental group who was done the field trip scores from the control group which was subjected to traditional method X=20.80 and 21.13 respectively. T-test results indicated that the difference in the pretest mean score was not statically significant.

Table3. SEAAT Posttest mean score results of experimental and control groups

	N	X	S	sd	t	p
Experimental Group	15	52.13	9.61	14	8.72	,000
Control Group	*15*	*25.80*	*4.66*			

$(t_{(14)}=8,72; p<,05)$

As it is presented in table 2, posttest results showed that at the end of the Field Trip, students in the experimental group who were applied the field trip method scored higher than the students in the control group who participated traditional method X= 52.13 and 25.80 respectively. And t-test results indicated that the difference, in the posttest mean score was statically significant.

Table4. SEAS Pretest-Posttest means score results of T-test

	N	X	S	sd	t	p
Pre-test	15	51.80	4.51	14	-21.70	,000
Post-test	*15*	*85.13*	*2,93*			

$(t_{(14)}=-21,70; p<,05)$

It was determined that there was a considerable difference between the groups the applied the field trip method regarding the attitude towards the solar energy and applications topics.

Table5. SCE Pretest means score results of experimental and control groups

	N	X	S	sd	t	p
Experimental Group	6	21.33	7.14	10	-,308	,765
Control Group	*6*	*22.50*	*5.92*			

$(t_{(10)}=-,308; p>,05)$

Pretest results showed that in the beginning of the application the experimental group who was done the Learning Cycle Model scores from the control group which was subjected to traditional method X=21.33 and 22.50 respectively. T-test results indicated that the difference in the pretest mean score was not statically significant.

Table6. SCE Posttest means score results of experimental and control groups

	N	X	S	sd	t	p
Experimental Group	6	73.16	3.97	10	12.238	,000
Control Group	*6*	*28.83*	*7.93*			

$(t_{(10)}=12,238; p<,05)$

As it is presented in table 6, posttest results showed that at the end of the teaching The Solar Chimney and its working principals, students in the experimental group who were applied the Learning Cycle Model scored higher than the students in the control group who participated traditional method X= 73.16 and 28.83 respectively. And t-test results indicated that the difference, in the posttest mean score was statically significant.

The interview has been done with students about the Field Trip to the Renewable Energy Resources Center. The data was determined which results of interviews as follows:

Question and answers '' what are your ideas about the Field Trip ''
A: I have learned different things about Solar Energy and Applications.I have enjoyed in this trip. I believe that; it will be useful for my future educational life. I was very pleased.

Answers of the question '' what are things which was concerned at the trip ''
B: The trip was very useful. The Vacuum Tube Solar Collector was concerned to me particularly.The Solar Chimney was very interested to me. I have learned very good ıts working principals.

Answers of the question: '' What are the effects of the trip on your future ideas''
C: the field trip made my ideas to change and, Solar Energy and Application was begun in my future ideas.I want to study on the field of Solar Energy and Applications at the future.

CONCLUSION

In this study, students' achievement and attitudes toward The Solar Energy and Applications topic depending on Field Trip and Learning Cycle Model and traditional teaching methods compared. The more significant and positive changes were found on students' attitudes toward The Solar Energy and Applications topic in method Field Trip and Learning Cycle Model than traditional teaching method.

The results of SEAAT test presented students who were taught by Field Trip and Learning Cycle Model were more successful than the students who were taught by tradiational method. Students' interest and attention can easily attract with The Solar Energy and Applications in The Field Trip. In addition, knowledge is not forgotten because number of using sense organs is increased in learning process. It can be concluded that The Field Trip method and The Learning Cycle Model with education is more effective than traditional methods on students' attitude towards The Solar Energy and Applications.

The similar results from different studies were cited; Gennaro and McKenzie [18, 19] found that most students who have been prepared for field trips by their teachers concentrate beter

and learn more from the experience. Beiers and McRobbie [20] gave students a structured interviews and a concept map exercise prior to the visit and this sequence was repeated after the visit.The results indicated the importance of prior learning.Students who participated in a marine ecology field trip showed a more positive attitude toward the subject mattle following the field experience [21].Storksdreck and Falk [22] have found evidence that pre- and post-visit activities support not only the field trip itself, but also subsequent learning experiences that provide evidence for long-term impact of a science museum visit. Using learning cycle approach in classroom has more positive attitudes toward science and science instruction other approaches [23].

Physics teachers should be used the Field Trip and the Learning Cycle Model for the teaching renewable energy. It is further suggested that more research should be carried out on applications of these methods in various areas of physics.

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BRAZILIAN BIOMASS GASIFICATION TECHNOLOGY FOR RURAL ELECTRIFICATION AT AMAZON STATE – GASEIBRAS PROJECT

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This paper will present the project "GASEIBRAS - Nationalization of the Technology of Biomass Gasification and Formation of Human Resources in the North Region", approved for the National Advice of Scientific and Technological Development and for the Ministry of Mines and Energy.

The gasification systems already developed in Brazil are not adjusted to the electricity production at isolated communities, because this models that supply a gas with satisfactory properties to this end, are projected to operate with coal and not with biomass *in natura*, what implies in the biomass transformation in coal with all the environmental impacts and loss of thermodynamic income associates to this practical.

These problems had been surpassed with the GASEIFAMAZ Project development, realized by CENBIO in a partnership with Biomass Users Network of Brazil and the Technological Research Institute in the last two years. The project aimed to make possible the electricity supply expansion in communities without energy access in Brazil's north region, consisted of the importation of two gasification systems from the Indian Institute of Science, tests accomplishment and its transference to an isolated community at Amazon region. Thus, the GASEIBRAS Project proposal it is to use the previously acquired experience to develop and construct a 20 kW gasification system with entire national technology, of easy operation and maintenance, to be fed with local available biomass residues *in natura*.

In this scope, it considers the biomass use as a solution to the energy supply, while sustainable source capable to stimulate local economic activities, as well as the reduction of the fossil fuels use and dependence. Also to serve as instrument for the local agroindustry development, guaranteeing an agricultural production to improve the communities population quality of life, beyond to supply the residues to be used in the gasification system.

Key-words*: Biomass Gasification; Renewable Sources; Human Resources; Amazon Region.*

1. INTRODUCTION

The solid fuel gasification is a sufficiently old process and is carried through with the objective to produce a gaseous fuel with better transport characteristics, better combustion efficiency and also that it can be used as raw material for other processes.

There are some gasification systems that had been developed in Brazil until the moment that had not adjusted to the electric energy production in isolated communities. The models that supply a gas with satisfactory properties to this end are projected to operate with coal and not with biomass *in natura*, what implies in the biomass transformation in coal with all the environment impacts and loss of thermodynamic income associates to this practical.

However, there are already institutions working with biomass gasification in the country, but there are gaps that prevent its commercialisation, mainly at gas cleaning procedure in order to feed the engine and simplified operation and maintenance procedures.

These problems had been surpassed with the GASEIFAMAZ project development; accord FINEP/CT-ENERG 23.01.0695.00, realized by the National Reference Center Biomass – CENBIO, in a partnership with Biomass Users Network of Brazil - BUN, Technological Research Institute - IPT and the University of Amazon, between the years of 2002 and 2005. The GASEIFAMAZ project aimed to make possible the electricity supply expansion in communities without energy access, in the north of the country.

Ahead of this, the GASEIBRAS Project proposal is to use the experience acquired during the GASEIFAMAZ Project accomplishment to develop and to construct in the country, a 20 kW gasification system with national technology and also to propose the system's large scale manufacture, to the national industry.

2. GASEIFAMAZ PROJECT

The GASEIFAMAZ project, accord FINEP/CT-ENERG 23.01.0695.00, was a partnership between CENBIO - The Brazilian Reference Center on Biomass, BUN - Biomass Users Network of Brazil, IPT - Technology Research Institute of São Paulo State and and UFAM - Amazon Federal University.

This project aimed to test the Indian biomass small-scale fixed bed gasification technology, imported from the Indian Institute of Science – IISc and lead this to Aquidabam village in Amazon, providing electric energy in a sustainable way to isolated communities, offering an alternative to replace fossil fuel CENBIO, [1] which was them way of energy provide.

The project intended to evaluate the operation conditions of the gasification system like gas cleaning, electric energy generation also allowing the capacity building in the Amazon region and to replicate the system in other villages.

There are already institutions working with biomass gasification in the country. However there are gaps that prevent its commercialisation, mainly at gas cleaning procedure in order to feed the engine and simplified operation and maintenance procedures. Considering that India

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already makes use of this equipment over ten years running at isolated communities, similar to those in Brazil, this project will allow to enjoy the outcome of the Indian experience to improve the technology for energy generation in the Amazon's isolated communities.

Thus, a 20 kW biomass gasification system was imported from the Indian Institute of Science

– IISc, Mukunda et al. [2].

Below we present the 20 kw gasifier during the tests phase at IPT, in figure 1.

Figure 1. 20 kw Gasification system being tested at IPT/USP CENBIO, [3].

Figure 2. Diesel Engine adapted to the gasifier system CENBIO, [3].

2. 1 Gasification System

2.1.1 Gasifier description

The gasifier imported from IISc is downdraft stratified, or either the solid fuel outflow flows in same direction as the gas. Both the biomass stream and the air stream get in on the top of the gasifier that is open top and goes to the base, as indicated on Fig. 3. The gasifier operates in depression, with inside pressure lightly lower than the atmospheric pressure, enough to guarantee the gases outflow through the biomass load.
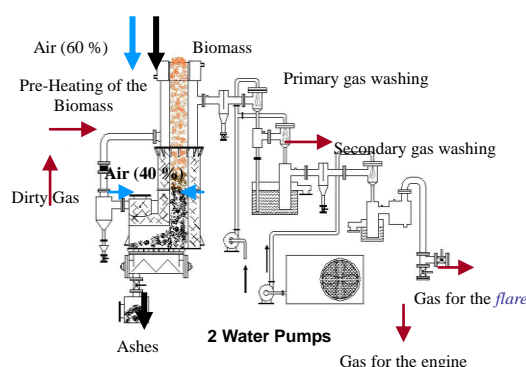
Figure 3. Working Flow, Ushima [4].

2.1.2 Description of installed instruments in the gasifier

To evaluate the gasification system fulfilment a set of instruments were installed in the gasifier body, like: four temperature measures, three pressure measures and one flow measurer, the latter to determine the gas generated outflow. The instruments location is showed in Fig. 4.
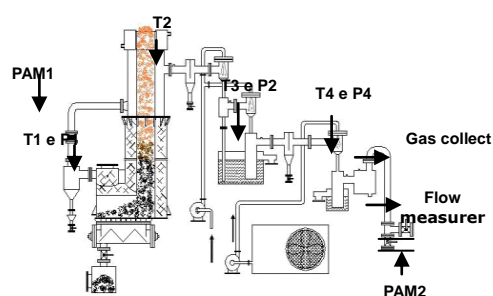
Figure 4. Set up of the instruments in the gasifier, Ushima [4].

The thermometers were installed along the gas circuit to measure the gas temperatures: in the gasifier exit (T1), before the cyclone; in heat exchanger exit (T2), after the primary cleaning system (T3), and the last one after the secondary cleaning system (T4). It were installed three pressure measures in order to measure and monitor the pressure along the gasifier: in the gasifier exit (P1), in the primary cleaning system exit (P2), and the last one in the secondary cleaning system exit

TRANSBORDER COOPERATION IN THE POWER GENERATION AMONG SOUTH ASIAN COUNTRIES: OPPORTUNITIES AND THREATS

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Electricity is universally acknowledged as one of the most important inputs for economic growth and human development. The growth of a nation, encompassing all quarters of the economy and all segments of society, is conditional on meeting its energy necessities satisfactorily.

As the world shrinks its national barriers and transforms into a global village, it becomes an issue of immediate importance to look into all areas in which countries can cooperate for mutual benefit. It is in this context that we attempt to examine India's electricity requirements, its existing electricity trade with neighbouring countries such as Nepal and Bhutan, explore the avenues of regional power trading between India and Pakistan and creating regional power pools for benefit of SAARC nations.

According the latest statistics released by the Power Ministry of India, the total power availability in the country is as follows (as on December 31,2005)[1] :

Sector	MW	PERCENTAGE
State Sector	70,772	57.0
Central Sector	39,909	32.2
Private Sector	13,420	10.8
Total	**1,24,101**	

Further, if the power sector in India is broken down on the lines of fuel, then the entire statistics of power generation is as follows (as on December 31,2005) [2]:

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Fuel	MW	%age
Total Thermal	**82,298**	**66.4**
Coal	68,433	55.2
Gas	12,663	10.2
Oil	1,202	1.0
Hydro	32,335	26.0
Nuclear	3,310	2.7
Renewable	6,158	4.9
Total	**1,24,101**	

Share of electric power consumption throughout India was as follows[3]:

- Industry   39%
- Agriculture   33%
- Transport   2.5%
- Residential   20%
- Others   5.5%

Inspite of these statistics, India suffers from power deficiency, as it can gauged from the following:

Power Situation: (April 2005-February 2006) [4]

	Demand	Met	Surplus/ Deficit
Energy	575,384 MU	527,539 MU	-8.3 %
Peak Demand	92,968 MW	81,370 MW	-12.5 %

To add to these figures, is the dominant optimism under the programme "Power for all" by the Government of India. The programme aims at total electrification of India by 2012. This means a further capacity edition of more than 2 lakh megawatts by this period.

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The main impetus for this optimism about capacity addition has been the Indian Power Sector Reforms starting with the consensus of all Chief Minister at their meet in Delhi, 1996. The resolution thus passed included:

- ✓ Finalisation of National Energy Policy
- ✓ Establishment of Central Electricity Regulatory Commission.
- ✓ Establishment of State Electricity Regulatory Commissions.
- ✓ Rationalisation of Tariffs.
- ✓ Gradual Private Participation in Generation, Transmission and Distribution.
- ✓ Compulsory Metering
- ✓ Compulsory Energy Audit of all customers .
- ✓ Encouragement of Cogeneration and Captive Generation
- ✓ Evolve National Policy on Hydropower development.
- ✓ Policy on Mega Power Projects[5].

Under the Reforms Programme, the following formed the key players of Indian Power Sector Reforms:

- ➢ Ministry of Power, Govt. of India.
- ➢ Central Electricity Regulatory Commission
- ➢ Power Trading Corporation.
- ➢ Power Finance Corporation.
- ➢ State-level Power Ministries.
- ➢ State Electricity Regulatory Commission
- ➢ State Electricity Boards / Succeeding Entities.
- ➢ Independent Power Producers -- IPPs.

However, the sluggish pace of accumulation to electricity generating competency; deficiency in noticeable progress in the governance, management and level of service to consumers; the failure of efforts to introduce the private sector into distribution on large scale; the lack of ability to find an answer to the problem of subsidized provision of electricity to agriculturists; the disorganized condition of Low Transmission distribution with the level of Transmission and Distribution losses remaining uncertain and the annual loss decrease in the system being very slow; the rationalization or rebalancing of tariffs becoming a extensively uphill task because the average cost of supply augments quicker than the probable charges of any increase in tariffs; and the shortfalls built up over the years striking an intolerable interest burden on power sector in India.[6]

The same fact is highlighted by Dr. Manmohan Singh, Prime Minister of India at the 78th Annual General Meeting of the Federation of Indian Chambers of Commerce and Industry (Ficci). The Prime Minister expressed his concern over the anticipated slippage on 12,000 MWs of new power generation capacity in the country and stressed upon improving distribution systems and cutting thefts and losses. There should be competitive supply and better revenue collection mechanisms in the power sector, he said. [7]

Position of Some Power Reform Implementing Indian States:

Andhra Pradesh: Located in the south, it represents the story of success of Power Sector Reforms in the region. It stood first in the country during 2004-05 in the power generation besides securing a record 89.7 per cent Plant Load Factor.[8]

Punjab: The Indian state of Punjab falls short in terms of Power Generation. To overcome the 2,300 mw power shortage in Punjab, the state government has come up with five projects, including a gas-based project. These projects include 500 mw thermal plants at Goindwal, 166 mw hydel projects at Shahpur Kandi, 500 mw thermal plants at Lehra Mohabbat and 84 mw hydel projects at Mukerian. The 1,000 mw gas-based power project will be set up jointly by GAIL (India) Ltd and the Punjab government at Doraha, Ludhiana district. However, there are chances that till the installation of the gas pipeline, the source for this particular power project will be coal. Punjab is also expecting 1,500 mw power shares from 4,000 mw NTPC Super Thermal Plant at Chhattisgarh. For the Chhattisgarh plant the Centre has given in principle approval. The state government is also ready to go in for partnership in the nuclear plant, provided it is set up in the desert where it was comparatively less hazardous. [9] Thus Punjab still has a long way to go if it is to succeed in economic reforms.

Power as a Tradable Commodity in South Asia.
Case I: India and Bhutan
India and Bhutan have well established ties. This is reflected in the bilateral where among other things, power forms a core area. A record of current Bhutanese Hydel Projects catering to India's Power Requirements is as follows:

Chukha (1998)	336 MW
Kurichhu (2002)	45 MW
Basochu Upper Stage (2002)	24 MW
Lower Stage or phase II ('05)	40 MW

Total Generation	445 MW[10]

The rich benefits which Bhutan accrued on account of these projects are as follows:
• Hydroelectricity export has become the single most important source of revenue for Bhutan
• It contributes to 45 % of the Bhutanese Revenue.
• The Bhutanese economy saw an estimated GDP growth of 6.8 percent in 2003-04 in which the power sector grew by 9.5 % and its share in the GDP increased to 12.3 %
• Total electricity export to India increased to Rs. 2.6 billion in the year 2003-04.[11]

Some of the ongoing power projects between India and Bhutan are as follows:

• Punatsangchu hydroelectric power project.
• Sunkosh Multipurpose Project .
• Mangdue Chu Project.
• Tala Project

The ambitious approach of the Bhutanese Power Projects can be noticed from the fact that Delhi is likely to get Bhutanese Power by 2007. The Delhi Transco Limited (DTL) has begun the groundwork for constructing a 400/220 KV grid station opposite Maharani Bagh, on the low-lying area near the Sarai Kale Khan crematorium. The power for this will come from the excess supply that will be made available in the northern region from the upcoming 1,000-MW Tala power project in Bhutan. "A transmission line from the plant will come to the northern region via the eastern region. This will lead to more power in the system and by displacement feed the upcoming grid station, which should be complete in about 26 months," Transco director (operations) S.R. Sethi said. At present, the land, which is close to the riverbed, is being filled up to a height of three metres. The plot was involved in several court cases. Transco will also construct part of the 220 KVA station here.There's more good news on the power front. On Friday, Transco finally identified a plot where a 220 KV sub-station will be constructed for south Delhi. Nearly four years ago, the DDA allotted it a site near the Siri Fort wall but due to ASI's objections, no work could begin here. So, Transco recently asked DDA to give it some place where work could begin fast. "This plot is opposite the Savitri cinema and was selected when DDA and our team went looking for an alternate site," Sethi said. Being built by DTL at a cost of about Rs 25 crore, it would feed south Delhi areas like Greater Kailash, Masjid Moth, South extension, Defence Colony, Ayurvigyan Nagar and AIIMS once complete in about two years. This substation would get power from the upcoming Maharani Bagh grid station. At present, south Delhi is fed by grid stations in Mehrauli, Vasant Kunj, Okhla and Lodhi Road. Once this one is complete, it would allow the government to meet south Delhi's ever-growing load requirement with fewer breakdowns. [12]

Case II: Power Cooperation between India and Nepal:

Power exchange between India and Nepal has been underway since the last three decades based on an agreement between the Governments of Nepal and India for exchanging power up to 50 MW, as and when required by the border towns. Interconnection is between Bihar State Electricity Board, Uttar Pradesh Power Corporation (formerly known as Uttar Pradesh State Electricity Board) and now also with the newly created State of Uttaranchal. Despite the tariff being very nominal, the revenue generated by Nepal through trade of power to India has recorded approximately six-fold increase during the preceding eight years [13]:

Exchange of power between India and nepal

	1993	1994	1995	1996	1997	1998	1999	2000	2001
Bulk energy sale to India (GWH)	46.1	50.5	39.5	87.0	100.2	67.4	64.2	95.0	126.0
Bulk energy purchase from India (GWH)	82.2	102.8	113.8	73.0	154	210.3	232.4	232.2	226.5
Revenue from bulk sale to India (Rs million)	75.5	91.4	97.6	206.7	249.3	199.9	198.1	327.8	441.0

Source:source:NEA, A year in Review, 2000/01, kathmandu, August 2001

West Seti Project:

SMEC (Snowy Mountains Engineering Corporation of Australia) has signed a Memorandum of Understanding in India opening the way for the purchase of electricity from the proposed West Seti hydropower plant in the Far Western Region of Nepal.

The Memorandum was signed between SMEC West Seti Hydro-electric Corporation Limited (wholly owned by the SMEC Group) and the Power Trading Corporation of India Limited, the Indian Government agency responsible for the co-ordination of the electricity market and the purchase of energy from private suppliers. It commits the parties to the negotiation of a Power Purchase Agreement in accordance with broad technical and commercial parameters already discussed.

The site for the 750 MW West Set hydropower plant is in one of the poorest and most remote parts of Nepal close to the Indian border. The hydrological and topographical conditions are especially favourable for hydropower generation. During the past few years SMEC has signed a series of agreements with the Government of Nepal giving the company exclusive rights to develop the project with private funding. It was always planned that the energy from the plant would be sold to northern India.

SMEC has been engaged in analysis and design related to this project for some years and the statement by the Power Trading Corporation of its intention to purchase the energy brings the project closer to implementation. The West Seti project will be the largest single foreign investment in Nepal and will generate foreign exchange for the country through sale of the energy. It consolidates Australia's longstanding commercial relationship with both Nepal and India.

During the coming few months SMEC and the Power Trading Corporation of India will negotiate the details of power supplies and tariffs. These will be incorporated in a Power Purchase Agreement which will form the basis for the finalisation of arrangements for equity and loan finance and commencement of construction. [14]

Case III: Prospects of Power Trade with Pakistan:
Fundamental Difference between Power Utilities in India and Pakistan

- Power Generation, Transmission and Distribution in India is mostly managed by the State Electricity Boards or their succeeding entities.
- Power Supply in Pakistan is managed by two entities - Water and Power Development Authority ("WAPDA") and the Karachi Electric Supply Corporation ("KESC"). WAPDA supplies power to all of Pakistan, except the metropolitan city of Karachi and some of its surrounding areas which are supplied by KESC.
- The Clearance and establishment of Private Power Projects are easier in Pakistan than in India.

Power Generation in Pakistan statistics are as follows:
- Total Installed Capacity is about 19478 MW.
- Share of the Public Sector: 70%
- Share of the Private Sector: 30%
- Presently, the total electricity generation capacity available in the public and private sector is sufficient to meet
- the current power demand in met up to 2005 but after 2005 the gap between demand and supply of electricity start growing rapidly.

[**Source**: Preliminary Information Memorandum, Private Power & Infrastructure Board (PPIB)] [15]

Main Players of Pakistan Power Sector
- Ministry of Water & Power
- Private Power & Infrastructure Board (PPIB)
- National Electric Power Regulatory Authority (NEPRA)
- Water & Power Development Authority (WAPDA)
- National Transmission & Despatch Company (NTDC)
- Distribution Companies (DISCOs)
- Karachi Electric Supply Corporation (KESC)
- Pakistan Atomic Energy Commission (PAEC)
- Independent Power Producers (IPPs)
- Pakistan Electric Power Company (PEPCO)
- Provincial Private Power Cells
- Sindh Coal Authority
- Fuel Suppliers (SNGPL, SSGC, OGDCL, PSO)

Independent Power Producers in Pakistan
- Private Power Policy was announced by the Government of Pakistan in 1994.
- There are 16 IPPs in the country
- **Mode of Operation**: BOO (Build Own Operate) basis
- Scope for further expansion. [16]

Strategy to Meet the Rapidly Growing Energy Requirements of Pakistan, based on the approved 25 Year Energy Security Plan announced by by Dr. M. Akram Sheikh, Deputy Chairman, Planning Commission, Government of Pakistan at International Ministerial Conference on Nuclear Power for the 21st Century, Paris, 21-22 March 2005 is summarised as follows:

- For electricity generation, Pakistan will continue to rely heavily on natural gas and hydro. Their combined contribution will be around two-third of the total electricity generation, with natural gas (45%) remaining the largest contributor among all energy sources.
- The increasing gap in indigenous sources of 208 MTOE (57.4% of demand) is to be met through imports of gas and oil
- Use of coal from the Thar field is to be increased from 3.3 million TOE in 2004 to 69

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million TOE in 2030, mainly for electricity generation, raising its share to 19%
•   The share of nuclear energy in electricity generation is planned to be increased from 0.8% in 2004 to at least 7% by the year 2030 (adding 8,400 MW).
•   In 2030, 2.5% of the total commercial energy supply will be met through renewables.
•   As furnace oil is the most expensive option for base load electricity generation, it will be used only to fill up the gap between demand and supply and its share will decrease to 5% by the year 2030 from the present 16%.
• Nuclear Power : The current vision envisages a minimum of 10 nuclear plants totaling 8800 MW by 2030 (8% share of electricity), with least burden on the public exchequer through self financing and other schemes. [17]

Prospects of Power Trade between India and Pakistan

Talks began between India and Pakistan during 1998-99 on the issue of the sale of power to India. However, a number of stumbling blocks surfaced. These were as follows:

   a) **Cost of Power:** The major hurdle in the power talks has been the sale price of power per unit. As Pakistan was planning to sell its surplus power from the IPPs, it is expecting to sell the power at Rs. 3. 60 per unit plus a profit margin.
   b) **Technical aspects of transmission**: It has been decided that transmission lines on both the sides would be constructed within six months from the date of the commercial agreement between the two governments. The respective countries will bear the cost of laying the lines on their sides. Besides, a 65 km interconnecting line is to be set up from Dinagar to Amritsar.
   c) **SAARC Power Grid**: India has made a proposal for a SAARC power grid to connect the national power grids of all the countries in the subcontinent as obtains in Europe. Surplus power available in any SAARC country would automatically flow to any other country which has the need. Detailed discussions on the SAARC grid are still due.
   d) **Seasonal Variations**: In India, consumption of power by states vary from season to season, place to place, and during each day. This inconsistency in demand prevents India from assuring Pakistan that it would purchase a fixed amount of power all the time.
   e) **Dual Basis of Power Purchase**: India has forwarded another proposal in which has offered Pakistan a smaller component of assured purchase (200 MW) on 'take or pay' basis, and a larger component of non-assured purchase (500 MW) on a 'take and pay' basis. India is willing to pay a higher price for the 'take and pay' part of the agreement. This ensures that both sides can safely invest in the initial laying of lines. However no agreement was reached on this issue.
   f) **Technical Problems**: The cost of power, synchronisation of the power grids, and transmission inefficiencies are some of the technical problems facing the power deal. However, these problems should be taken care of by both sides.

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g) **Confidence Building on Both Sides**: Both countries should realise that the power deal will benefit them equally. For India the deal will enable it to overcome its power shortage. For Pakistan this deal, besides helping it to reduce its adverse balance of trade with India, will also help to strengthen WAPDA's (Water and Power Development Authority) financial position. Besides, the deal will enable the IPPs in Pakistan to generate more power, ultimately reducing the cost of power inside Pakistan. [18]

An Example of India-Pakistan Cooperation -- India-Pakistan-Iran Gas Pipeline
This project was shelved from past several years because of stumbling blocks between India and Pakistan. But thanks to the initiatives taken by the prudent leadership of both the countries, this project seems to be a reality in the days to come.

Main Areas in which India, Pakistan and other South Asian Countries can develop bilateral trade in Power Sector:
i) Bilateral power trade.
ii) Pool based power trade which not just includes India and Pakistan but also other SAARC nations on the lines of South African Power Pool (SAAP) and other Regional Power Pools.

Feasibility of Bilateral Power Trade
i) Pakistan already has a 500 KV primary transmission system extending from Jamshoro in the south to Tarbela and Peshawar in the north.
ii) The proposal of laying a 50 km high voltage double circuit (HVDC) transmission line to take power from the Dinanagar sub-station near Lahore to the Patti sub-station in the Indian Punjab is technically quite feasible and will be a boon for bilateral trade.

Prospects of a regional power pool in South Asia in accordance with other pools around the world:
   • South African Power Pool (SAPP) was created in 1995 encompassing among others South Africa, Lesotho, Mozambique, Namibia, Malawi, Zimbabwe and Zambia under the regional cooperation organisation viz., Southern African Development Community (SADC).
   • SAPP countries have a diverse mix of hydro and thermal generation plants serving a population of over two hundred million people.
   • Other regional pools around the world[19]:

Regional Arrangement	Member Countries
Union for the coordination Transmission of electricity(UTCE)	Spain,Portugal,France,Belgium,Italy,Netherlands,Luxemburg,Austria, Germany,Switzerland and now extended to Poland,Czech Republic,Slovak Republic,Hungary,Slovenia and Croatia
Nord Pool	Norway,Sweden,Finland and Denmark
North American Electric reliability council (NERC)	United States and Canada
Southern African power Pool(SAPP)	South Africa,Lesotho,Mozambique,Namibia,Malawi,Zimbabwe and Zambia
The commession of Regional Power Integration(CIER)	Jordan,Bahrain,Tunisia,Algeria,Saudia Arabia,Syria,Libya,Egypt,Morocco,Mauritania,Yemen,Iraq,Lebanon,Palestine,Dubai and Qatar
South America power trading	Argentina,Paraguay and Uruguay,Central America

Conclusion: the SAARC nations – India, Bhutan and Nepal already have bilateral trade in electricity. India-Pakistan talks on the Bilateral Trade in Power did make some progress during 1998-99 and this progress can be further renegotiated for not just bilateral trade but also towards building a regional pool on the lines of the South African Power Pool (SAPP) with a diverse mix of hydro and thermal generation plants serving a population of lakhs of people living in the SAARC region.

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A NUCLEAR PLANTS DEATH AND BIRTH: ENERGY INFRASTRUCTURE COMMEMORATED INTO CULTURAL HERITAGE

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Debates about the future of the now closed-down nuclear power plant Barsebäck in the south of Sweden are on-going; while the cultural heritage sector sees the plant as speaking to a particular set of historical experiences of high modernism; local residents wish the plant to be removed and the land to be returned to the local communities. As a site representing a particular set of historical experiences, the Barsebäck case provides a good opportunity to study how understandings of place are shaped by different actors over time. By researching the place-meanings held by local residents and the cultural heritage sector, this study focuses on the differentiated and conflicting understandings of place and landscape. It is within this context that 'public involvement' unfolds. As a place created for, and oriented toward energy production, the Barsebäck nuclear power plant offers a good opportunity to study the turns of industrialism and modernity against a background of a landscape with visual remains of the past. The focus, thus, is on how planned visions of the future—and underlying assumptions and meanings of space and place—are translated into planning practices.

Introduction

Negotiations regarding cultural heritage unfold within highly complex settings. As have been suggested within the field of Social Impact Assessments (SIA), the social and cultural impacts of centrally planned interventions must be recognised in order for them to be sustainable (Freudenburg 1986; Goldman 2000) . Not only to achieve a successful implementation, these interventions must be taken seriously since despite being backed by legislation, they touch on issues of democracy, fundamental human rights and sustainable development. There is a growing agreement that in order for such interventions to be sustainable, not only must the initiatives and projects be broadened to include local and marginalised experiences and perspectives, but measures must be taken to increase possibilities for public involvement in decision-making (Aarhus 1998). Increased participation has thus been launched as a solution on the social conflicts that may rise when project owners introduces policies that might have an affect upon peoples' lives. This latter subordinate clause responds to the fact that politicians, decision-makers and practitioners are involved in activities that may have social and cultural consequences, globally as well as locally, that will affect the feasibility and outcome of decided-upon projects and policies. As a result, increasing attention has been paid to the social and cultural impacts of centrally planned interventions (Barrow 2002; Cloke, Milbourne, and Thomas 1996; Fraga 2005; Goldman 2000; Skogen 2003).

Debates about the future of the now closed-down nuclear power plant Barsebäck in the south of Sweden are on-going; while the cultural heritage sector sees the plant as speaking to a particular set of historical experiences of high modernism (see Giddens 1991), local residents wish the plant to be removed and the land to be returned to the local communities. Although not loud, this contestation regarding a relatively recent past takes place within a landscape saturated with remnants of previous eras. As a site representing a particular set of historical experiences, the Barsebäck case provides a good opportunity to study how understandings of place are shaped by different actors over time.

By researching the place-meanings held by local residents and the cultural heritage sector, this study focuses on the differentiated and conflicting understandings of place and landscape. It is within this context that 'public involvement' unfolds. As a place created for, and oriented toward energy production, the Barsebäck nuclear power plant offers a good opportunity to study the turns of industrialism and modernity against a background of a landscape with visual remains of the past. The focus, thus, is on how planned visions of the future—and underlying assumptions and meanings of space and place—are translated into planning practices. We addresses how nationally agreed upon objectives are incorporated into processes that entail a physical transformation.

When the Swedish Parliament decided to close the power plant, the question whether the nuclear plant could be understood as a cultural heritage, entered the scene. The preliminary results of this study suggest that the local residents show less interest in giving the plant meaning as a cultural heritage. As long as ambiguity prevailed regarding whether the power plant to be closed down or not, local actors took action in favour of prolonged energy production.

Theoretical inspiration

Place and landscape

The key theoretical concern of the proposed research project rests with the different ways local communities of place and communities of interest perceive and conceptualise the establishment and implementation of specific conservation initiatives. The theoretical orientation is therefore broad. Theories on place and landscape (e.g. Ingold 1993; Tsing 2001), new institutional theory, sociology of translation (Czarniawska and Sevón 1996; Latour 1987; Latour and Woolgar 1986), and theories on participation and citizenship, have especially served inspiration (Arnstein 1969; Habermas 1987; Putnam 1993).

Theories on the meaning of place and landscape suggest that the local environment—landscape, buildings, 'nature', landmarks—is important for the building of collective identification (see among others Halbwachs 1992 (1952); Schama 1995; Sjölander-Lindqvist 2004b; Stoffle, Halmo, and Austin 1997; Stoffle, Traugott, Harshbarger, Jensen, Evans, and Drury 1988). Attention has also been focused on how the landscape is produced through practice. The view that landscapes are produced, modified and contested by people who engage with them, emphasises the role of process and thus also the aspect of time and temporality. Informed by cultural value frames that have developed during times and years of 'dwelling', to apply the vocabulary of anthropologist Tim Ingold (Ingold 1993), local

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residents can be said to find themselves in a "configurative complex of things" (Casey 1996, p. 25). Besides relating to the natural and social worlds in ways that reproduce collective memories (Schama 1995) and the meanings the traditions of the landscape bring to its practitioners, people's understandings and experiences of the contemporary world is also informed by other actor's endeavours imposing other sets of values (cf. Löfgren 1997; cf. Scott 1998; cf. Sjölander-Lindqvist 2004a). The landscape then, with all its various signs and features, conveys messages of history and turns of societal change and development.

Participation

Processes to achieve consensus-based decisions and approaches involve manifold actors—government agencies, scientists, media, NGOs, companies and local residents. The integrity of the project in question may be threatened when it proves difficult, due to a range of structural and cultural aspects, to address and integrate the perspectives and clashing interests of the concerned parties. The establishment of such decision-making processes are socially and culturally laded (Bohlin 2006 (fortchcoming)).

Such processes, commonly referred to as 'public involvement', 'public participation', 'public consultation' and 'deliberation', can be said to derive from the standpoint that a mutual exchange of arguments and reflections regarding a particular environmental issue or problem, will be of the benefit for the solution of the issue at stake (Pateman 1970; Renn 2006; World Commission on Environment and Development 1997; Väntänen and Marttunen 2005).

Democracy studies focusing on participation put forth that citizen involvement and influence in decision-making processes can increase local acceptance and compliance of the implementation of certain policies but also for the reasons behind (Olsen 1990). The Swedish Commission on Democracy, mandated by the Swedish Government in 1997, points out that an involvement of the public should result in real influence if to be experienced as meaningful to citizens (SOU 2000:1).

Method

The study of perspectives and opinions on the Barsebäck nuclear power plant employed an ethnographic approach. Such methods have found to be applicable to research situations when it is of crucial importance for the outcome of the research carried out to establish trustworthy relationships with the informants (Boholm 1983). The use of ethnographic research methods enabled the researchers in the project to collect a wide range of narratives about different matters regarding the future prospects of the power plant and its location. By employing qualitative methods, the project aimed at gaining insight into the meaning-building processes of the actors involved and how they made sense of a place that was turned into a locality of energy production.

The Death and Birth of the Barsebäck nuclear power plant

The Barsebäck nuclear power plant is located between the cities of Malmö and Helsingborg in the south of Sweden and just across its neighbouring country Denmark. Due to political decisions taken by the Swedish Parliament (the Riksdag) its two nuclear reactors have been closed down—Reactor 1 was closed down in November 1991 and Reactor 2 in May 2005. It had then been running for 30 years and had during its thirty year of running produced 201,5 TWh electricity.

Barsebäck was put into service a few years prior to the Harrisburg accident in 1979. As a result of the accident, opposition towards the use of nuclear power grew in Sweden, resulting in political turmoil. The political parties of the Riksdag agreed on taking a referendum regarding the future of nuclear power in Sweden. After the taking of popular vote in 1980, the Riksdag decided that all nuclear reactors should have been phased-out in year 2010. These plans were later given up.

Local understandings

Coal power rejected—nuclear power supported

When the owner of the plant—a national state-owned company—introduced their plans to build a coal plant the local inhabitants reacted very strongly on these plans since they felt that the landscape should not be even more destroyed by the company. The launching of the plans to build a coal power plant involved the building of four additional buildings side by side the nuclear plant.

Afraid that transportation to and from the area would increase resulted in the forming of a local action group in the early 1980s consisting of a core group of residents from the three adjacent villages of the *Barsebäck Village, Vikhög Village* and the *Barsebäck Harbour Village.* Intensive opposition work was carried out by the core group. The writing of petitions and the mobilizing of other villagers were some of its main activities together with the holding of information meetings on a continual basis, until the proposing company, finally, withdrew its plans to build a coal power plant next to the nuclear power plant.

In accordance with Swedish environmental regulation, public consultations have to be carried out before technological facility siting may commence. At these consultations, people strongly objected the plans on the siting of a coal power plant. Not only heavy local objections to the plans seem to have contributed to the withdrawal of the plans. As one of the informants say:

"The company was not well prepared. Our lawyer seems to have been more competent than the company's. They even said that we won the first round."

According to one of the informants, the local municipality had up to this time right of veto regarding the area. Besides the listing of signatures, the action group also tried to influence the local politicians as much as possible since they feared that the municipality would not object the plans on a coal plant as it would generate openings. The committee claimed that the community would be destroyed if the coal plant was built. In the end the politicians voted against the building of a coal power plant next to the Barsebäck nuclear power station and the plans on coal power produced energy was abandoned definitively.

Local opposition towards the power plant appears to have been rather weak. If recognized at all, the plant is referred to as ugly. Despite it being regarded as a landscape blemish, local consent on its presence appears. Local opposition rose when the decision on the nuclear phase-out of Reactor 2 was to be taken. Both the municipality and local residents tried to influence both politicians and national authorities to work for a continuous energy production. While the local municipality saw job openings, residents feared that their lives were going to be put at risk during phase-out. One of the informants said that the loss of competent staff during phase-out had increased insecurity.

Local unfaithfulness—national restoration

During a meeting on industrial cultural heritage in 2003, arranged by a network of museums and authorities dealing with cultural heritage, it was suggested that the Barsebäck nuclear power plant should be discussed, and eventually declared, as a cultural heritage. As a symbol for the interweaving of environmental issues, political dynamics and advanced technology, the proponents argued that Barsebäck would well be applicable. Within the cultural heritage sector (museums, authorities), disunity prevailed regarding whether to direct attention to such a process. According to one of the major proponents, a county custodian of antiquities, the idea was contested.

Researchers and representatives of the heritage sector attended the meeting, titled "Big, ugly and dangerous", and which took place at the plant. Local politicians were invited to attend the meeting but did not show up. The meeting resulted in a project that aimed to make a documentation of the ways of working at the power plant. Besides this, a report on the meeting was written, published just prior to the taking of the decision to commence nuclear phase-out.

The closing-down of the plant, naturally, attracted much media attention. So did a statement by the county custodian of antiquities when interviewed by local media; saying that the Barsebäck nuclear power plant should be preserved at its present location. The statement was quoted in many news papers—locally, regionally and even nationally. In response to the statement, some local residents called her up saying that they did not want the plant to be preserved as a cultural heritage. The area should, instead, be available for private houses.

Fuelled by the governmental decision on the Barsebäck phase-out, the meeting "Big, ugly and dangerous" became the starting-point for a discussion on how to preserve large industrial facilities. As a result, we see a process in which both the cultural heritage sector and researchers have begun to focus on how to deal with, and preserve, larger industrial facilities.

One of our interviewee argues that the nuclear power produced at Barsebäck is clean energy. It is needed in a time when society consumes a lot of energy and the alternatives are not good enough to cover the demand. The interviewees make comparisons to coal power that produces a lot of grime and also take peoples lives. Protests have mainly been conducted of citizens that are not local.

Locally, people say that if there is no energy production, the plant should be dismantled and the area restored and given back to the municipality and the local communities found in its vicinity. Instead of declaring the plant as a cultural heritage, and preserving it in its location, they believe that the contact between land and see should be re-established—according to agreement when the decision on the siting of a nuclear power plant in the area was taken.

The landscape is by the informants described as very beautiful and a good place to grow up in. Nearness to the large cities of Copenhagen and Malmö (the third largest city in Sweden) with a variety of spare time activities to take part of and enjoy contributes, together with many employment opportunities, to the area's allurement.

Discussion

Facility siting research[1] have indicated that acceptance and compliance are dependent on a number of factors, for example, local benefits in combination with decision-making processes that promote dialogue, deliberation and respect (Grimes 2005; Quah and Tan 2002; Shindler and Aldred Cheek 1999). The results from this study render us to suggest that yet other dimensions need to be added to the list. While the cultural heritage sector sees the buildings as a conveyor of a historically laded past that should be preserved for future generations, local residents perceive the power plant as not to be used for other purposes than 'clean' energy production. A binary opposition is created when assigning nuclear-produced electricity as a necessary means for 'clean' energy. Local opposition to the siting of a coal power plant in the area in the 1980s can thus be said to have contributed to the rise of consent with the production of nuclear power in the area. The understanding that the landscape was lent to the state for a limited period of time also suggests that people locally agreed, in a silent way, on the lending out of the landscape. In exchange of their lending-out, people received unpolluted air. Gone with its function to produce is the reasons to the buildings being kept in the landscape. The cultural heritage sector seeks to address the function of the power plant—that the producing of energy may bring about contestations that are globally rooted. Locally, the plant is understood in the context of clean energy production—nationally (the cultural heritage sector) put forward that the buildings has yet other dimensions—as characteristic for society's ideas of progress and the 'common good', which includes beliefs in the capacity of science and technology to make way for a modern society. We see that a journey of association' is taking place when perceptions of place and space are interwoven into the cultural complexity of visions about a particular location or establishment (Löfgren 1997; cf. Martin 2005; Scott 1998; cf. Zukin 1991). In processes of change, planners and decision-

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[1] For an overview and discussion on the subject of 'facility siting', see Boholm, Åsa and Ragnar Löfstedt. 2004. "Facility Siting: Risk, Power and Identity in Land-use Planning." London: Earthscan Reader.

makers take part in and contribute to a rewriting of the symbolism of places and landscapes (Martin 2005). When national authorities in year 2005 decided the Barsebäck nuclear power plant to be phased-out, the question whether to preserve it as a cultural heritage or to be completely removed entered the scene. Our study show that local actors were involved in the debate as long as the nuclear power plant were supposed to be producing power, and in counteract of plans to site a coal power facility next to it, but did show less interest in giving the plant meaning as a cultural heritage.

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WIND POWER PLANTS UPDATED SITUATION IN TURKEY AS RENEWABLE ENERGY

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Wind the motion of air relative to the earth's surface affects a wide variety of human activities and can be both beneficial and harmful. One benefit, for example, has come with the evolution of wind-turbine technology, which has begun to make wind a viable energy source with the potential to contribute perhaps 10 percent of the nation's energy needs. The wind power plants are chosen as Alacati, Gokceada, Datca, Bozcaada and Intepe Regions of Turkey. The advantages of the wind power plants are that they have renewable energy sources , and the wind energy plants can be established in a very short time which is a clean energy In Turkey, at Marmara Region and Aegean region the wind velocity measurements were taken and as a result, the best places for establishing source. This kind of energy is independent when comparing with the fossil energy sources.

Keywords: wind energy, power plants, renewable energy

Introduction

Near-surface winds are the most variable of all meteorological elements, making their prediction and the control of their impacts all the more challenging. In the United States, the mean annual wind speed (for the continuous 48 states) is 8 to 12 mph (4 to 6 m/ s), but wind speeds of 50 mph (22 m/ s) occur frequently throughout the country, and nearly every area occasionally experiences winds of 70 mph (31 m/ s) or greater. In coastal areas of the East and Gulf coasts, tropical storms may bring wind speeds of well over 100 mph (45 m/ s) [1].

Today, the sciences of meteorology and wind engineering are central to predicting and managing wind forces and their effects. Continued improvements in the ability to forecast severe weather have led to longer lead times for responding to the disaster threat. The application of wind-engineering principles to accommodate wind loads has become an important aspect of modern construction practice. Research using modern boundary-layer wind tunnels and sophisticated computer modeling has greatly enhanced the designer's ability to ensure the safety and comfort of structures for the least cost. Design provisions based more directly on wind-engineering research than on traditional, empirical guidelines are also gradually finding their way into local building codes. Turkey needs the political will to develop long-term goals and objectives to deal effectively with wind energy issues.

Used or renewable energy per time will be described as power and the dimension is Joule/ s. Power's dimension is Watt and 1 Watt is equal to Joule/s. Energy is deposited in wind, and this energy is the kinetic energy of wind, itself. The moving air particles in wind is equal to the half of the mass of air times its velocity square where m (mass) dimension is kilogram and velocity's dimension is m/s. The kinetic energy of wind can be calculated as below: It is

assumed that the wind can pass through a cylinder which has 10 m. length with a cross sectional area A = 100 m^2. It means that the air must pass a volume in every second 100 x 10 = 1000 m^3. The air density at the sea-level is equal 1.2256 kg/m^3 must multiplied with this volume which gives the mass of air or the discharge rate of air which passes through the cylinder in every second.

The wind air mass (m) per second = air density x the volume of the wind air which passes through the cylinder in every second.

= wind air density x cross-sectional area x the cylinder length in which the wind air passes through in every second.

= the wind air density x area x velocity

$$m = \rho . A. V \rightarrow [\text{Kinetic energy /s}] = (1/2) \rho . A. V^3 \quad \text{(Joule/sn)} \tag{1}$$

The Kinetic energy in unit time gives at the same time the Power, it equals:

$$P = (1/2) \rho . A. V^3 \quad \text{(Watt)} \tag{2}$$

According to the Equation (2) the power of wind is the direct function of the cross sectional area in which the air passes and also the direct function of velocity exponent three. But while changing the power of wind into the useful energy the calculated above wind power is not the value of produced power which can be produced by the wind turbine.

The Calculation of Wind Power

For calculation of wind power the basic assumption is the formulation of the kinetic energy. The difference between the incoming wind energy and outgoing wind energy gives the total produced wind energy:

$$W_w = V_a \frac{\rho}{2} \left(V_1^2 - V_2^2 \right) \tag{3}$$

Where ρ is the density of the unit volume of air,
V_1 is incoming wind velocity to the turbine,
V_2 is outgoing wind velocity from the turbine,
V_A is the element of air volume inside the turbine.

The power of the wind turbine can be expressed as:

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$$P_w = \frac{dW_w}{dt} = d\left[\frac{V_a \frac{\rho}{2}\left(V_1^2 - V_3^2\right)}{dt}\right] \tag{4}$$

The air volume which passes through the rotor of the turbine is given as

$$\frac{dV_a}{dt} = A_R V_2 \tag{5}$$

where AR is the cross sectional area of the rotor of the turbine. The quasi-equilibrium power is given as

$$P_w = A_R \frac{\rho}{2}\left(V_1^2 - V_3^2\right)V_2 \tag{6}$$

The effective area A_R is the function of power absorption and the operation conditions of the turbine is determined by the wind velocity and above parameter's variation. Maximum power which can be taken from the wind turbine is given as

$$P_{wMAX} = \frac{16}{27} A_R \frac{\rho}{2} V_1^3 \tag{7}$$

The mean air velocity which passes through the rotor is equal to the mean of the difference between the incoming wind velocity and outgoing wind velocity. According to this assumption the air mass which passes through the rotor is given as

$$m = \rho A \frac{\left(V_1 - V_3\right)}{2} \tag{8}$$

According to Newton's second law the power which is yielded by the wind through rotor is given as

$$P = \frac{1}{2} m \left(V_1^2 - V_3^2\right) \tag{9}$$

Substituting "m" in the Equation (9) yields

$$P = \frac{\rho}{4}\left(V_1^2 - V_3^2\right)\left(V_1 - V_3\right)A \tag{10}$$

According to the assumption that the rotor does not prevent the wind the air power which passes through the same cross sectional area is given as

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$$P_0 = \frac{\rho}{2} V_1^3 A \tag{11}$$

The ratio between P and P_0 is called as the coefficient of efficiency

$$c_p = \frac{P}{P_o} = \frac{\frac{\rho}{4}(V_1^2 - V_3^2)(V_1 - V_3)A}{\frac{\rho}{2} V_1^3 A} \tag{12} \ (13)$$

$$c_p = \frac{1}{2}\left[1 - \left(\frac{V_3}{V_1}\right)^2\right]\left[1 + \left(\frac{V_3}{V_1}\right)^2\right]$$

The function (V_3/V_1) of c_p has maximum value of 1/3. The total net power of the wind is (16/27) of the total wind power or 0.593 of the total wind power. It means that the coefficient of efficiency at wind turbine can have the value between 0.10 and 0.45.

The effect of the Propeller number in the wind turbine

The turning velocity of a wind turbine can be given as turning number/minute or radian/s. The unit of turning velocity can be given in turning number/minute as [n] and tangential velocity can be given in ω.

1 turning number/minute = 2 * π/60 [rad/s]

$$= 0.10472 \ [rad/s] \tag{14}$$

Another dimension by measuring the wind turbine velocity is the "straight line velocity" or circumference velocity, or the velocity at the top of the propellers. The straight line velocity can be given in "V" and the tangential velocity is expressed as "ω" times the maximum radius of turbine propeller

$$V = 2 \pi R \ n / 60 \tag{15}$$

If the straight line velocity V is divided into V_0 another ratio can be yielded which is called as "the typical velocity ratio" or shortly "λ". This ratio can be used by comparison of different kind of the turbine characteristics. Optimum velocity ratio of the turbine is the function of the number of propeller and the length of propeller.

Refined Wind Energy Formulation

The conventional potential is calculated by considering only the wind velocity based on the

assumption that the atmosphere has standard composition. Unfortunately, such simplifying assumptions cause overestimations in the final energy budget calculations because it does not take into consideration timely variations of meteorological variables that represent the atmosphere such as the humidity, temperature and pressure.

In order to have unified decisions in meteorological sciences some of the atmospheric parameters are standardized for comparison purposes and "standard atmosphere" is one of such concepts. Conventional wind energy calculation suffers from this definition in that it does not account for timely variations in other atmospheric parameters except the wind velocity. In such an approach the pressure is considered on the average as equal to the sea level value as 1013.25 hpa; average temperature on the sea level as 15° C; and finally, the density of atmosphere as 1.225 kg/m^3. However, depending on the topographic conditions of the surrounding area the meteorological parameters will vary continuously. In classical wind energy estimations the density of air is assumed constant. However, the standard air density has been questioned by Elliot (1977). According to Reed (1979) constant density assumption causes to over-estimation by nearly 30%.The Purpose is also to develop a formula for taking into consideration humidity, pressure and temperature parameters in wind energy calculations.

In general, classically the wind energy, E, per unit time per unit area is related to air density, ρ, and wind velocity, V, as

$$E = \frac{1}{2}\rho V^3 \tag{16}$$

On the other hand, consideration of ideal gas law p= ρ R T with p air pressure, R universal gas constant equal to 2.87 for dry air when p in mill bars , T in ^{o}K and ρ in kg/cm^3. Furthermore, as given by Wiesner (1970) the following expression relates some of the aforementioned parameters to relative moisture content, e, as

$$\rho = \frac{3p - 5e}{8RT} \tag{17}$$

Where p air pressure, R universal gas constant equal to 2.87 for dry air when p in mill bars , T in ^{o}K and ρ in kg/cm^3.

The substitution of this expression into Equation (16) together with the consideration of ideal gas law leads to

$$E = \frac{(p - 5e)}{16RT}V^3 \tag{18}$$

The density of moist air is lesser than dry air (Eq. 17) and consequently the generation of wind energy with moist air will be lesser than the classical formulation. This formulation gives over-estimations in wind energy calculations. For realistic wind energy calculations one should prefer to employ Equation (3) with confidence. The implementation of the

methodology proposed in this section is made for meteorological variables measured at Canakkale station which lies along the Dardanelles straight separating the Asian and European continents in the north western part of Turkey. This area is one of the most promising wind energy generation locations within Turkey and there are intense researches on the design of turbines for this area (Aslan, et al, 1994; Akgün and Öz, 1994; Sener, 1994). Longitude and latitude of the station are 25^0 27' E and 45^0 39' N. The site is under the influence of Mediterranean type of climate with dry summers and cool and rainy winter periods. Dominant wind is along NNE direction and there are many cases that have average wind velocity exceeding 4.4 m/sec. Among the major reasons of wind velocity in this site are the interactions of land and sea as well as the topography of the Canakkale straight which guides air currents from the Black Sea in the north towards the Aegean Sea in the SW. There is not very significant change in the wind intensity from month to month. The elevation of the station above mean sea level is 3 meters. Available monthly data for the use of the methodology cover years from 1968-1971, inclusive (Sahin and Sen, 1995).

In order to measure the relative difference between the dry, and standardized atmosphere formulation in Equation (16) and wet atmosphere in Equation (18), the relative error definition has been used. For the study site the change of relative error with months is calculated. As the result, it is seen that always there is a difference between the two wind energy formulations and dry air concept over-estimations reach up to 6% during the summer months. This study points out that in wind energy studies the moisture content of the air should be taken into consideration in order to avoid overestimation which is the major drawback of classical wind energy formulation. The amount of overestimation might reach up to 6% especially during summer months. The proposed formulation takes into account also the other effects of meteorological parameters such as pressure and temperature.

The Wind Power in Turkey

The resource of wind power in Turkey can be used theoretically for the whole electrical energy demand. But the infrastructure for using of wind power is absent. That's why the wind power infrastructure must be designed in Turkey. EIKT gives the wind power potential in European Union. Turkey has the biggest chance for using the energy power in European Union. Technical wind power of Turkey has a value of 83.000 MW. This value is the wind power value, which must be used by Turkey at the first choice. In Turkey, at two districts (Asian Part and European Part) 20 meteorological measurement stations are installed for Turkey's wind power distribution atlas. In recent three years at Turkey, the Association of Wind Power User saw the potential of wind power of Turkey and they have one meeting in Iber Hotel Sari Germe Park in Ortaca. As the new and renewable energie sources and the research project preparation about this technology, 3 international wind power key studies were represented to have an idea of future development of wind power in Turkey. In 1997 there was a fair about the wind power plant's equipments in Istanbul and there was a show about the wind power turbines which were developed in last years.

Table. 1 The wind power potential distribution in different geographical regions of Turkey (Kızıltug, 2002)

Regions Name	Mean Wind Power density (W/m²)	Mean Wind Velocity (m/s)
Mediterranean	21.36	2.45
Inner Anatolia	20.14	2.46
Aegean	23.47	2.65
Black Sea	21.31	2.38
East Anatolia	13.19	2.12
South East Anatolia	29.33	2.69
Marmara	51.91	3.29

Table. 2 The richest regions in scope of wind power potential (Kızıltug, 2002)

Name of Station	Mean Wind Power density (W/m²)	Mean Wind Velocity (m/s)
Bandirma	152.6	5.1
Antakya	108.9	4.5
Kumköy	82	4.1
Mardin	81.4	4.1
Sinop	77.9	4.1
Gökçeada	74.5	4
Çorlu	72.3	4
Çanakkale	71.2	3.9

Table.3 Wind Power Plants updated situation in Turkey (Kızıltug, 2002)

Working Wind Power Plant		
Name of Project	Region	Power(MW)
Çeşme Alaçati Wind Power Plant	Izmir	7.2
Waiting Administration		
Kocadağ Wind Power Plant	Izmir Çeşme Konaği	50.4
Çanakkale Wind Power Plant	Çanakkale	30
Bozcaada Wind Power Plant	Çanakkale	10.2
Waiting for contract		
Mazidaği Wind Power Plant	İzmir Çeşme Alaçati	39
Waiting for Feasibility Report		
Datça Wind Power Plant	Muğla Datça	28.8
Datça Wind Power Plant (II)	Muğla Datça	12.5
Yalikavak Wind Power Plant	Muğla Datça	7.92
Intepe Wind Power Plant	Çanakkale Intepe	30

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Intepe Wind Power Plant (II)	Çanakkale Intepe	13.2
Akhisar Wind Power Plant	Manisa Akhisar	12
Akhisar Wind Power Plant	Manisa Akhisar	30
Bandirma Wind Power Plant	Balikesir Bandirma	15
Beyoba Wind Power Plant	Manisa Akhisar	7.92
Çeşme Wind Power Plant	Izmir Çeşme	12
Karaburun Wind Power Plant	Izmir Karaburun	22.5
Gökçeada Wind Power Plant	Çanakkale Gökçeada	1.62
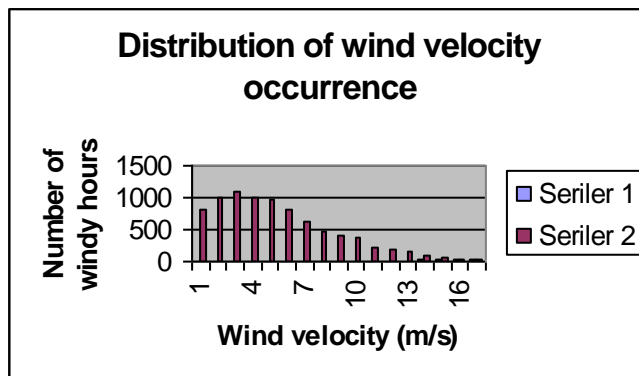
Figure. 1 The distribution of wind velocity occurrence (Weibull-Probability Distribution)
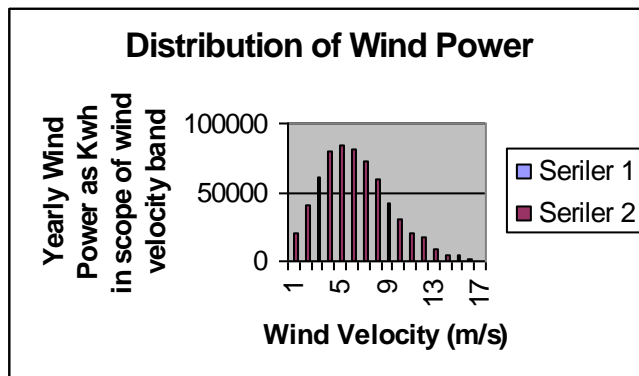
Figure. 2 The Distribution of wind power (Kızıltug, 2002)

Turkish Wind Power Association has evaluated different 39 Wind Farm Projects. These projects have as the total capacity between 1370 MW and 1440 MW. Among these 39 projects, 8 were finished with the evaluation, which has the capacity of 215 MW. The new installation of below wind power plants are planned in Turkey by different companies as

Table. 4 The new Wind Power Plants in Turkey as in installation phase (Kızıltug, 2002)
The Name of the Project the Location The Power

Cesme Alacati	Izmir – Cesme Alacati	7.2	MW
Kocadag	Izmir- Cesme Kocadag	50.4	MW
Canakkale	Canakkale	30	MW
Bozcaada	Canakkale - Bozcaada	10.2	MW
Mazidagi	Izmir – Cesme Alacati	39	MW
Intepe	Canakkale - Intepe	30	MW
Datca	Datca - Muğla	28.8	MW
Datca	Mugla - Datca	12.54	MW
Yalikavak	Mugla Bodrum - Yalikavak	7.92	MW
Cesme	Izmir - Cesme	12	MW
Akhisar	Manisa - Akhisar	12	MW
Akhisar	Manisa - Akhisar	30	MW
Beyoba	Manisa – Akhisar (Beyoba)	7.92	MW
Karaburun	Izmir - Karaburun	22.5	MW
Haciomerli	Izmir - Haciomerli	45	MW
Kocadag	Izmir – Cesme KOCADAG	26.25	MW
Gokceada	Canakkale - Gokceada	5	MW
Yaylakoy	Izmir - Karaburun	15	MW
Lapseki	Canakkale - Lapseki	15	MW
Senkoy	Hatay – Senkoy	12	MW
Belen	Belen - Hatay	20 – 30	MW
Kumkale	Canakkale - Kumkale	12. 6	MW
Mazidagi - 2	Izmir – Cesme	90	MW
Mazidagi - 3	Izmir – Cesme	39.6	MW
Kapidagi	Erdek - Balikesir	20 – 35	MW
Karabiga	Karabiga - Canakkale	15 – 50	MW
Yenice Belen	Yenice – Belen Karaburun	70 – 100	MW
Zeytinbağ	Bursa - Zeytinbag	30 – 60	MW
Cesme	Cesme	18 – 25.5	MW
Tastepe	Tastepe - Bandirma		37.8 MW
Kocaali	Tekirdag – Sarkoy		31.2 MW
Topdag	Sinop	33	MW
Pasalimani	Kapidagi - Marmara	9	MW
Seyitali	Aliaga	51	MW
Guzelyer	Cesme		50.4 MW
Yenisakran	Aliaga - Bahcedere	54	MW
Ekinli	Karacabey - Bandirma		39.6 MW

At the 9th September 1999 there was a competition of YID Model Wind Power Projects which had the number of 55 in Turkey. With installation of these projects, in Turkey wind power capacity will be more than 1700 MW. The wind power electricity has no pollution emission which means that the environmental effects are positive, and the below given targets will be reached in the future:

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Table. 5 The possible targets of Turkey in Wind Power Projects (According to YEKAB)

Year	Installation Capacity	
2000	400 MW	
2003	1400 MW	
2005	5000 MW	
2010	10. 000 MW	
2020	20. 000 MW	

The towers of the wind energy installation can be built in nowadays in Turkey in Turkish Companies. The operation number capacity in this district will be reached as

Table. 6 The number of working groups by Wind energy industry

Year	Installation Power	YEKAB-TARGETS
2000	8000 MW	--
2003	1400 MW	28 000
2005	5000 MW	100 000
2010	10000 MW	200 000
2020	20000 MW	400 000

Table. 7 Comparing the wind energy proportion with the installation capacity of different power plants in Turkey for the future

Year	Installed Capacity	Wind energy proportion in the total installed capacity
2000	30 000 (MW)	% 1.33
2010	65 000 (MW)	% 15.38
2020	110 000 (MW)	% 18.18

Investigation of Wind Velocities Distribution

Observations yielding numerical values of a random variable x, the number of outcomes occurring during a given time interval or in a specified region, are often called Poisson Experiments. The given time interval may be of any length, such as a year. Hence a Poisson experiment   might generate observations for the random variable x representing the number of windy days in one year. The specified region could be an area.

A Poisson experiment is one that possesses the following properties:
1. The number of outcomes occurring in one time interval or specified region is independent of the number that occurs in any other disjoint time interval or region of space.
2. The probability that a single outcome will occur during a very short time interval or in a small region is proportional to the length of time interval or the size of the region and does not depend on the number of outcomes occurring outside this time interval or region.
3. The probability that more than one outcome will occur in such a short time interval or fall in such a small region is negligible.

The number x of outcomes occurring in a Poisson experiment is called a Poisson random variable and its probability distribution is called the Poisson distribution.

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Since its probabilities depend only on μ, the average number of outcomes occurring in the given time interval or specified region we shall denote them by the symbol p (x, μ). The derivation of the formula for p (x, μ), based on the properties for a Poisson experiment will result in the following definition:

Poisson distribution: The probability distribution of the Poisson random variable X, representing the number of outcomes occurring in a given time interval or specified region, is

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} \qquad x = 0,1,2,...... \qquad (19)$$

where μ is the average number of outcomes occurring in the given time interval or specified region. According to the Table.1 the average wind velocity at **Mediterranean Region** during one year in a station is 2.5 m/s. Using the Poisson distribution the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated from the Table Poisson Probability Sums (Walpole and Myers, 1985) as

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-2.5}2.5^{5}}{5!}$$

$$p(5,2.5) = \sum_{x=0}^{5} p(x,2.5) - \sum_{x=0}^{4} p(x,2.5) = 0.9580 - 08912 = 0.0668$$

According to the Table.1 at the **Inner Anatolia** the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated as

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-2.46}2.46^{5}}{5!}$$

$$p(5,2.46) = \sum_{x=0}^{5} p(x,2.46) - \sum_{x=0}^{4} p(x,2.46) = 0.06573$$

According to the Table.1 at the **Aegean District** the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated from the Table Poisson Probability Sums (Walpole and Myers, 1985) as

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-2.65}2.65^{5}}{5!}$$

$$p(5,2.65) = \sum_{x=0}^{5} p(x,2.65) - \sum_{x=0}^{4} p(x,2.65) = 0.07023$$

According to the Table.1 at the **Black Sea District** the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated as

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$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-2.38}2.38^{5}}{5!}$$

$$p(5,2.38) = \sum_{x=0}^{5} p(x,2.38) - \sum_{x=0}^{4} p(x,2.38) = 0.06359$$

According to the Table.1 at the **East Anatolia District** the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated as

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-2.12}2.12^{5}}{5!}$$

$$p(5,2.12) = \sum_{x=0}^{5} p(x,2.12) - \sum_{x=0}^{4} p(x,2.12) = 0.9834 - 0.9473 = 0.0361$$

According to the Table.1 at the **South East Anatolia District** the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated as

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-2.69}2.69^{5}}{5!}$$

$$p(5,2.69) = \sum_{x=0}^{5} p(x,2.69) - \sum_{x=0}^{4} p(x,2.69) = 0.07187$$

According to the Table.1 at the **Marmara Region** the probability of x = 5 m/s wind velocity can be seen at the station during one year is calculated as

$$p(x,\mu) = \frac{e^{-\mu}\mu^{x}}{x!} = \frac{e^{-3.29}3.29^{5}}{5!}$$

$$p(5,3.29) = \sum_{x=0}^{5} p(x,3.29) - \sum_{x=0}^{4} p(x,3.29) = 0.1008$$

As seen from the above calculations the biggest probability of wind occurrence at x= 5 m/s is in Marmara Region by comparing the probabilities with the other regions.

The Comparison of Wind power use in Turkey with the world's wind power potential
The need and the importance to the wind power were after 1973 petroleum crisis. After this crisis the need and the research to the alternative energy consumptions were at the highest level. At the world between 50^{0} parallels and between the Southern Hemisphere and the Northern Hemisphere the wind power potential is nearly 26.00 TWh/year. On the world surface which is nearly 3 x 10^{7} km^{2} as a value of the total wind energy potential % 27 of it there is wind velocity bigger than 5 m/s and the %4 of this area can be used effectively. In the last 20 years the wind turbine technology has a biggest development and today's world wind power plants have total power of 6177 MW which are installed mostly in U.S.A. and in European Countries.

Today's wind energy field has a power between 500 and 700 kW. The construction costs of wind power plants are now lower. Also the unit cost of wind power electricity depends on the district wind power potential.

Turkey is in good situation in scope of renewable energy sources. According to the research program of the year 1961, in different 9 cities, 41 wind power plants and 718 wind turbines were installed for water transmission from the underground aquifers. In Turkey the total wind power potential is between 40 000 and 80 000 MW. The Government Meteorological Measurement Division gave the result of the measurement stations for the time period 1970-1980: The mean yearly wind velocity in Turkey has a value of 2.54 m/s above the surface at 10 meters and has a wind power density nearly 24 W/m^2. In Turkey if we compare the wind energy potential with the different regions, The Marmara Region and the Southeast Anatolian region have bigger wind power density than the other regions of Turkey. The Marmara Region, the Aegean and Mediterranean Coasts of Turkey include 30% of the whole world wind power potential. In Aegean Region one wind turbine which has 55 kW power capacities was installed in a tourist coastal establishment which has a power consumption giving 5% of the whole electrical energy demand.

The trade aiming first wind power plant was installed at Aegean Coast of Turkey in Germiyan town of Alaçati and this wind power plant has the status of self producer which has
1.75 MW power as a power plant which is used 5 000 people in this district and produces 5 000 000 KWh power yearly. Also another wind power plant which has 7.2 MW power capacities begun to produce energy since the year of 1998.

The Bodrum Region and the district of Intepe in Canakkale have planned to produce their energy consumption by wind power plants. As the research results the whole electrical consumption of Bodrum Peninsula were provided by 100 wind turbines since the year of 1998. Nowadays, many companies have the feasibility research for using the wind turbines while connecting the electrical power to the interconnection system of Turkey's regions where the wind power velocity is higher.

In the feasibility work in Turkey, the Marmara Region and the Aegean region energy conversion systems are appropriate for using of wind power. The electricity costs are higher in the Marmara Region and in the Aegean Region that is the reason why the wind energy conversation systems will be used because nowadays the lost through the electrical conversion are also decreased. Also there are some laws for the private companies which will install some wind energy power plants.

Many governments supervised the use of the wind power programmes and they begin to use this clean energy according to 5 year's programmes. Also in some countries the other fossil energy sources comes nearly to an end, so the alternative energy source as wind energy will be used widespread.

RESULTS

Today in our world the uses of renewable energies increase day by day. The use of wind power in Turkey is also increased. The research about this topic is common in Turkey. The advantage of the use of wind power can be given as:

1) Wind energy is clean and renewable energy resource. There will be no environmental pollution.
2) The installation time of wind power plants are very short by comparing by the other power plant installation times (meanly 4.5 months).
3) There is no need to the raw material by using wind power plants.

There will be also some disadvantages by developing some technologies about this energy source:

1) There will be noise pollution by operating wind propeller generators.
2) The use of the amount of fertile land use for the installation location of wind power plant.
3) Wind energy is no stationary energy source.

But when we compare these disadvantages with the advantages, the advantages are over weighted. During the operation and the maintenances of the wind power plants we must work in scope of above disadvantages. By using the wind power plants the wind energy is an alternative energy source, that's why there must be energy connection to the National Enter connection of the Turkey's electricity network. In Turkey there is some need of research about this infrastructure. The wind energy generators what we use in Turkey are synchrony generators and asynchrony generators. The most widely used generator is the asynchrony generator in Turkey. For designing these generators, there must be design of the most effective and the minimum loss of energy generators. For the designing there must be the connection to the electricity network with the most equilibrium harmonies and minimum output phase differences. For Turkey wind power installation it must be prepared a 30 year wind power installation program.

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THE DESIGN OF SOLAR COOKER AND PRODUCE OF ITS PROTOTYPE

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Solar energy has been used for many years by businesses and industry, such as generation of electric, heating and cooling. The solar energy has been used effectively only for heating water in Turkey. Hot water has been provided with the help of solar energy collectors. The solar cooker will be a new area for using solar energy.

A box-type solar cooker was designed and constructed. The cooker was tested in summer conditions of Tarsus in southern Turkey. It's summer season is very long and hot. Experiments were performed during June 2006 without load for one week. Both sides of solar cooker was covered with wood and fiberglass. Isolation materials were used to prevent losing heat. The inside of the solar cooker was covered with aluminum foils to transfer the rays to absorber plate. The temperature of the solar cooker is evaluated with digital thermocouple.

The experimental results show that the box type solar cooker may be assumed suitable in some cooking process for the climatic conditions of the most region of Turkey.

Key words: Solar energy, design of the solar cooker, heat efficiency, heat storage

1. Introduction

Solar energy provided from sunlight is clean and renewable energy for world. Solar energy which is not a new or novel idea, using of it has been studied by many researchers for improvement of efficiency.

Many researches have been studying solar energy for a long time. There are several types developed and field-tested and "eld-tested, including those with concentrating or flat plate collector (Murthy and Norasolah, 1985; Khalifa et al., 1987; Pande and Thanvi, 1987; Bernard, 1990; Rao et al., 1990; Nahar and Grupta, 1991) and the box-type solar cookers (Mullick et al., 1987; Yadov and Tiwari, 1987; Channiwala and Doshi, 1989; Nahar, 1990; Grupp et al., 1991; Stibravy, 1992)(18).

Solar cookers have been developed in many countries. One of them is solar cookers which collect the incoming solar radiation and convert it into heat energy. They are designed to use solar energy in process of cooking (2). Various types of solar cookers have been used, such as box type, concentrated type and oven type around the globe. Solar cookers can replace the use of firewood for cooking in the remote and rural areas where solar radiation is available at large scale and there is a lack of other energy forms (3).

Efficiency of solar cookers depends on several factors that include angle of solar radiation, the number of covers, materials for covers, absorber plate, etc (4). The addition of plane reflector increases the performance of solar cooker, particularly at low sun angle (1). Solar cookers are heat exchangers designed to use solar energy in the process of cooking (2). Solar energy have attracted the attention of many researchers. In this study, the performance of box type solar cookers was investigated as experimentally and theoretically.

2. Material and methods
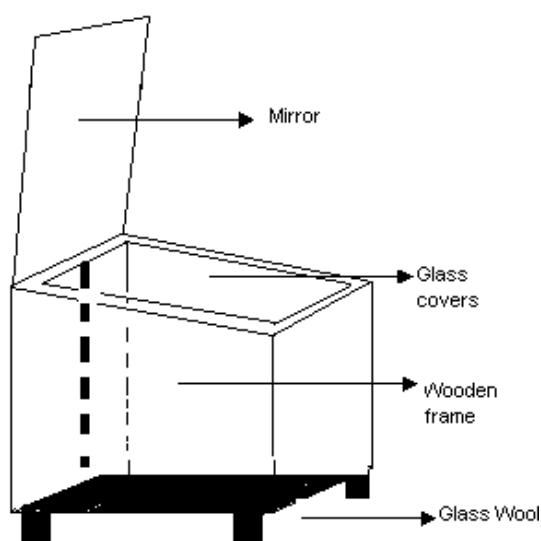
Figure 1. Schematic diagram of the constructed box type solar cooker

The constructed box type solar cooker is shown in Figure 1. It is consists of wooden, mirror, glass wools and glass covers. The inside surfaces of the box are covered with aluminum foils. Shape of the solar cooker is rectangular prism. The inner dimensions of the box are 0.78 mX0.42 mX0,63 mX0,53 m. The top of the solar cooker was covered with double glass separated by 0.02m. The double glass covers minimizing the rate of heat lost through the top of the cooker (17). Mirror reflector was used to reflect the solar radiation onto the cooker cover for increasing of efficiency. Dimensions of the mirror 0.70 m and 0.78 m. A steel platform was used for the absorbing surface for the incoming solar radiation in bottom of the solar cooker. Thickness and dimension of the platform are 0.001 m and 0.55X0.75 m^2, respectively. The temperatures were measured for two angles of cooker which are 16º and 26º. Radiation of sun is vertical for 26º according to the surface of the cooker.

The experiments were conducted on 21-25 June 2006. Temperatures were measured between 10 AM and 16 PM. with an interval of 1 hour.

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4. Results

Temperature distribution for the box type cooker without load is shown in Fig. 2. The cooker was kept under the sun until the temperatures of the cooker to obtain their maximum values. From the results of Fig. 2, it is clear that the temperatures of the cooker increase with the time of the day until they achieved their maximum values at 2.00 PM.

Experiment was started at 10.00 AM on 21 June 2006. The sun angle of the cooker was adjusted to 16º. The results were found to be 36, 45, 58, 69,80, 82, and 79 ºC, respectively (D1). When the sun angle of the cooker was altered to 26º, the temperatures were measured to be 37, 65, 82, 102, 119, 126 and 123 ºC (D2) on 22 June 2006; 45, 81, 119, 127, 131, 128 and 130 ºC (D3) on 23 June 2006; 45, 85, 121, 130, 135, 128, and 126ºC (D4) on 24 June 2006; 36, 51, 62, 70, 84, 91 and 92 ºC (D5) on 25 June 2006, respectively. The weather was clear and sunny on the 21-24 June 2006 but it was cloudy on the 25 June 2006. As seen from figure 2 the lower temperatures were obtained on the 25 June 2006 (D5).
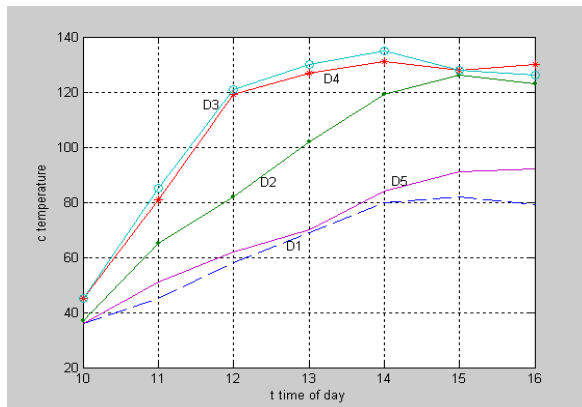
Figure 2. The relationship between time of day and temperature for the cooker without load The graphs were attained by using matlab program. The matlab program was given:

```
t=[10 11 12 13 14 15 16];
c=[36 45 58 69 80 82 79];
c1=[37 65 82 102 119 126 123];
c2=[45 81 119 127 131 128 130];
c3=[45 85 121 130 135 128 126];
c4=[36 51 62 70 84 91 92];
step(t,c)
step(t,c1)
step(t,c2)
step(t,c3)
step(t,c4)
plot(t,c,'--',t,c1,'.-',t,c2,'-*',t,c3,'o-',t,c4)
xlabel('t time of day')
ylabel('c temperature')
grid
```

5. Conclusions

- The designed cooker is inexpensive and easy to manufacture and use.
- Boling temperature of water was reached. Thus, some cooking process may be performed with the box type cooker and may be realized in the short time at Tarsus's climatic conditions.
- Thermal performances and cooking abilities may be improved by adapting some modifications in non-tropical regions.

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ENERGY SAVING BY USING HEAT RECOVERY DEVICES AT DIFFERENT CLIMATIC REGIONS IN TURKEY

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In modern world, people spend most of their time indoors. Therefore, improving the quality of the indoor climate, heating, cooling and ventilating have gained great importance. These processes increase energy consumption, resulting large costs. During ventilation, a certain amount of indoor air is exhausted and fresh air is adjusted to required temperature and humidity levels. Energy consumption can be reduced by using heat recovery equipment. Turkey, being located between 36° - 42° North Latitudes and 26°- 45° East Longitudes, consists of four different climatic regions.

In this paper, monthly energy consumption cost of a heat recovery device is analyzed using computer software in cases of the device being used in a hotel in four different climatic regions. The results show that the heat recovery device yields highest economy in the coldest region of Turkey, which is the fourth climate region.

Using heat recovery equipment reduces the energy consumption. That means reduced fuel consumption, therefore reduced pollutant emission.

Keywords: *Heat recovery, energy efficiency, economic analysis, air conditioning*

NOMENCLATURE

DBT   dry bulb temperature [ºC]
RH   relative humidity
WBT   wet bulb temperature [ºC]
Q   Total heating capacity (kW)
q   Air flow rate (m^3/h)
Cp   Specific heat (kJ/kg^{o}C)
ρ_1 Air density at pre-heater outlet (kg/m^3)
ρ_2 Air density at heater outlet (kg/m^3)
DBT_p Air temperature at pre-heater outlet
DBT_o Air temperature at pre-heater inlet
DBT_{hs} Air temperature at humidifier outlet
DBT_i Room temperature
$DBTa$ Environmental temperature
DBT_s Matrices Temperature
ΔDBT Temperature increases at heat recovery system matrices. (˚C)

ε Efficiency of heat recovery system (%)

YT   Fuel saving (m^3/month)

t   Working period of heat recovery (h /month)
H_u Lower heating value of natural gas
         (34.485 kJ/m^3)
ηk Combustor efficiency (85%)
BY   unit price of natural gas (TL/m^3)
PT   saved money (TL/month)
h_a environmental enthalpy (kJ/kg)
h_i room enthalpy (kJ/kg)
h_s enthalpy at matrices outlet (kJ/kg)

1. Introduction

In modern times, approximately more than 90% of a person's time is spent indoors, and therefore it is important to maintain the indoor environment within comfortable conditions for the occupants [1]. This is usually accomplished by cooling, heating and ventilating the indoor space so that it stays within a comfortable range. Heating, cooling and ventilating increase energy consumption, resulting large operating cost. Heat recovery device is effective on the outer air temperature. Heat recovery is re-use of outlet air from a building or process. To satisfy this point, fresh air should be used as much as necessary. By using the energy efficiently, without compromising the fresh air, it is possible to reduce cooling or heating loads occurring from fresh air. Using a heat recovery device, energy in the exhaust air can be used as pre-heater or pre-cooler and this can reduce fresh air loads by 20 to 60%. Energy saved using heat recovery devices not only reduces costs but also helps protecting ecological balance and environment. Using heat recovery systems in air conditioning systems reduces heating, humidifying loads in winter and cooling, de-humidifying loads in summer. Therefore, heating and cooling systems with reduced capacity and dimensions can be established [2].

Several types of air-to-air exchanger recovery devices are available for recovering energy from ventilation. The heat exchanger may transfer sensible heat only or both sensible and latent heat. Over many decades, plate type, regenerative wheels, and heat pipe exchangers were developed and used to transfer heat for a variety of air-to-air applications. Typical heat and enthalpy exchange efficiencies range from 55 to 80% [3].
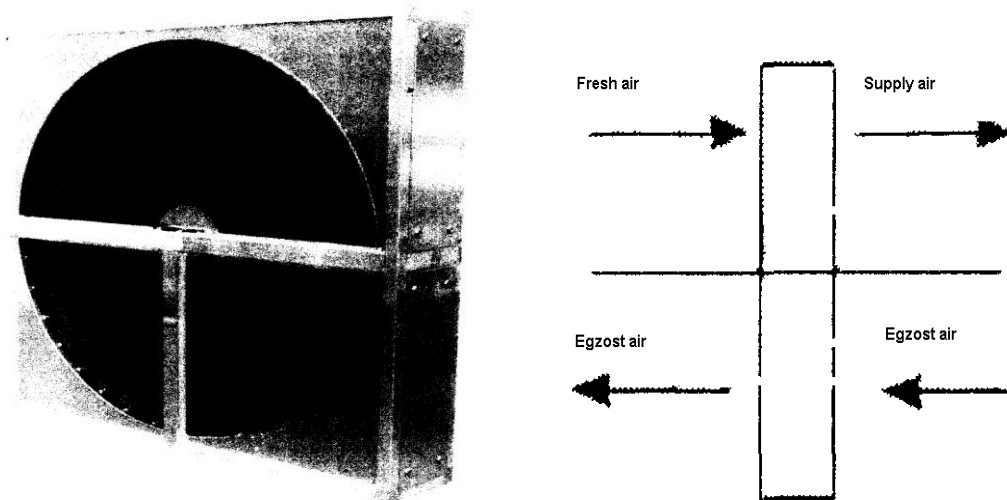
Fig.1. System scheme of heat recovery

In this study, on a hotel project, with a system in which a rotary type heat recovery device is used, the energy saving rates are analyzed using computer software in cases of the device being used in a hotel in four different climatic regions. The results show that the heat recovery device yields highest economy in the coldest region of Turkey, which is the fourth climate zone.

2. Thermodynamics Analysis of Heat Recovery System

This study is based on the air conditioning unit which provides fresh air, which is cooled and heated with a fan-coil, to 162 rooms on the first floor of a hotel. This unit operates with 100% fresh air with a flow rate of 13000 m^3/h. In order to provide necessary conditions in winter time, a pre-heater, moistening and post-heater units are added to the main unit. In summer time, a cooling unit used to maintain desired room conditions.

Table 1: Monthly average temperature on climatic region [4]

Months	1. Climatic region	2. Climatic region	3. Climatic region	4. Climatic region
January	8,0	3,3	1,3	-5,2
February	9,3	4,5	2,0	-4,1
March	11,5	7,2	5,0	-1,3
April	15,7	12,6	9,8	5,1

May	20,6	[7,8	14,1	10,1
June	25,4	21,9	18,1	13,5
July	28,0	24,4	21,1	17,2
August	27,2	23,8	20,6	17,2
September	23,3	19,6	16,5	13,2
October	18,1	14,1	11,3	6,9
November	13,3	9,1	6,5	1,3
December	9,4	4,9	2,6	-3,0
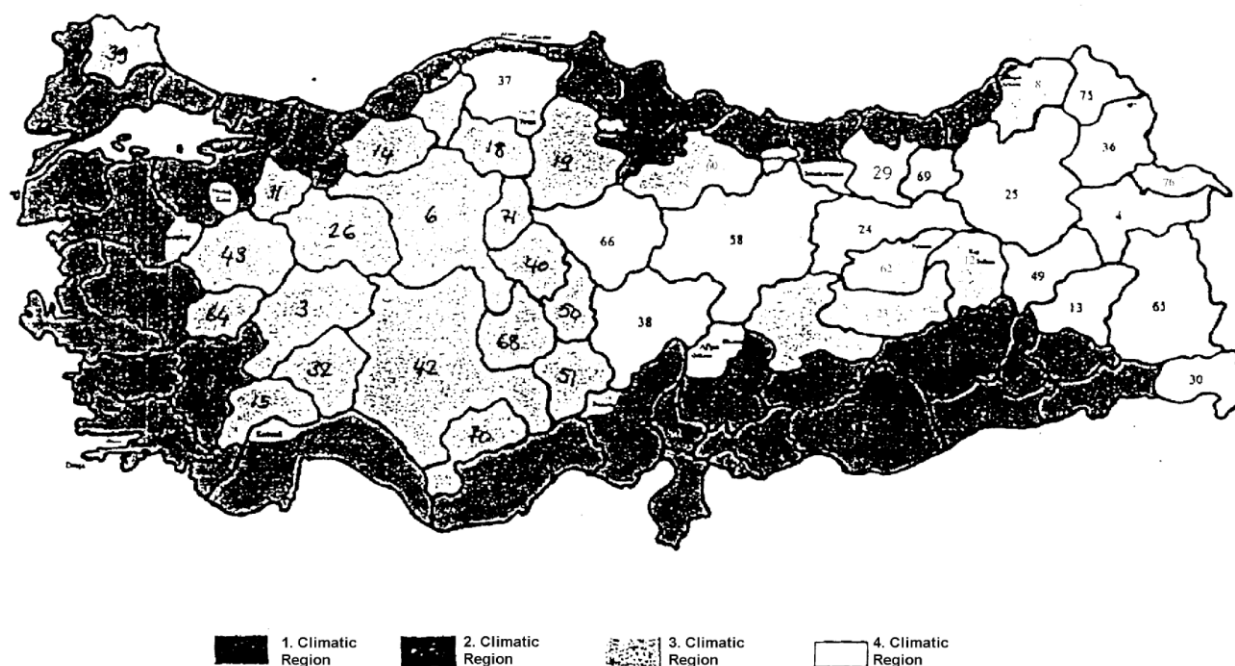
Fig 2. Degree – day regions of Turkey [5]

Winter Season:

For winter season, in air conditioning system without heat recovery, the air processes are preheating, humidifying and heating respectively. [6]

Total heating capacity:

$$Q_{1w} = q \cdot C_p \cdot [\rho_1(DBT_p - DBT_o) + \rho_2(DBT_i - DBT_{hs})] \cdot (1/3600)$$

For air conditioning system with heat recovery, the air processes are heating and humidifying respectively.
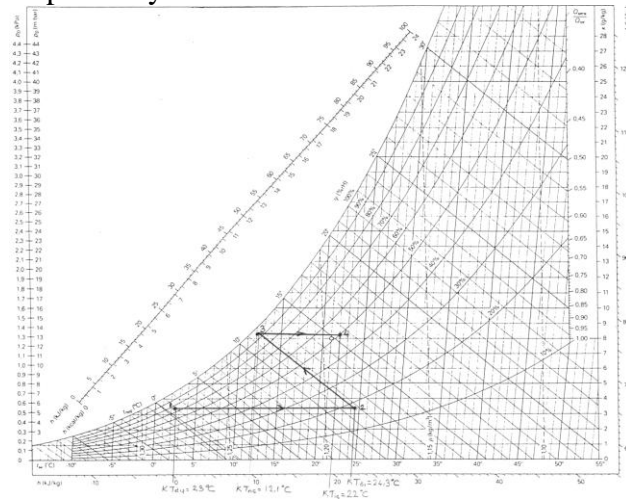
Fig. 3. Air conditioning process without heat recovery
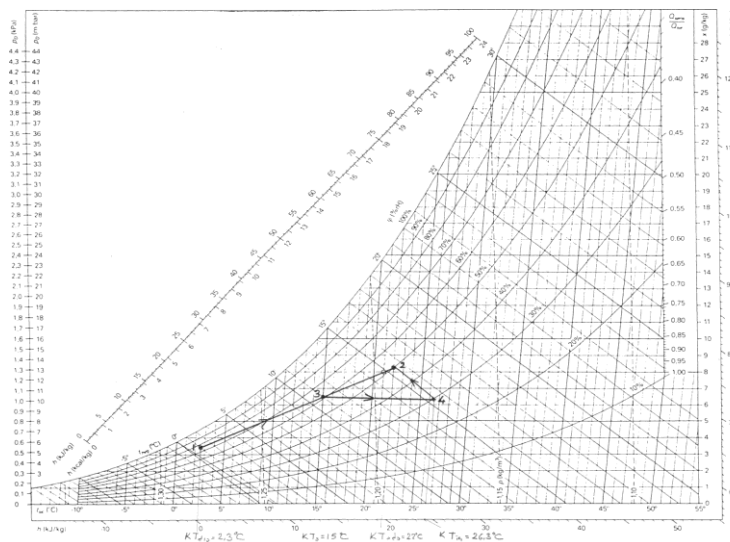
Fig. 4. Air conditioning process with heat recovery for winter season (February)

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Total heating capacity with heat recovery (Q_{2W}):

$$\Delta DBT = (DBT_i - DBT_a).\varepsilon$$

$$DBT_s = = \Delta DBT + DBT_a$$

$Q_{2W} = $ q. cp. ρ_2. (DBTi - DBTs). (1/3600)

Saved Energy :

$Q_{netw} = Q_{1W} - Q_{2W}$ (kW)

Saved Fuel :

$$YT = \frac{Q_{net} * t * 3600}{Hu.\eta_k}$$

Saved money
PT=YT x BYF

BYF = unit price of natural gas (0.0002 €/m^3 in August 2006)

Summer Season:

Capacity of cooling coil for air conditioning at summer season without heat recovery:

$$Q_{1S} = q. \rho. (h_a - h_i). (1/3600)$$

Energy saving at capacity of cooling coil for air conditioning in summer season with heat recovery:

Saved energy :
$Q_{netS} = $ q. ρ. ($h_a - h_s$).ε (1/3600)

Saved electricity:
$$Te = \frac{Q_{netS} * t}{COP} \quad , C.O.P = 2.8$$

Saved money:
Pt = Te. EP
EP = Price of electricity: 0.07 € / kWh

As seen in Figure 3, using the heat recovery device, has a great effect on fresh air temperatures.
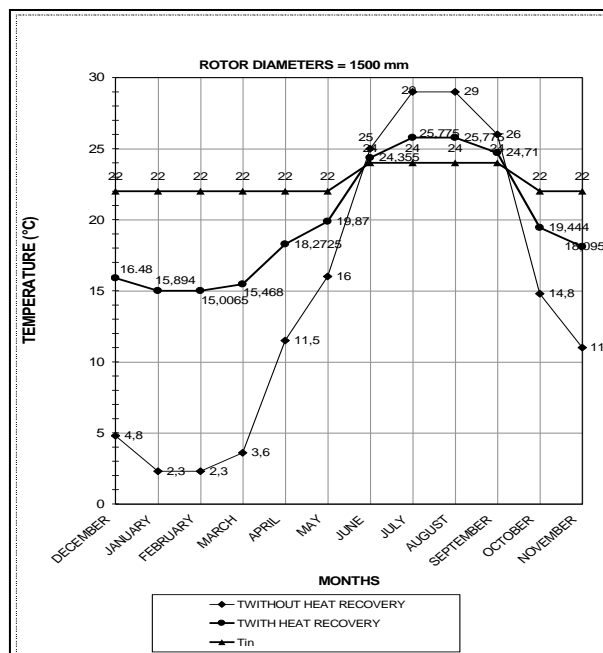
Fig. 3. Fresh air temperatures in heating and cooling seasons with and without a heat recovery device (Based on the values for Istanbul, in the 2nd climate region) [7]

A program was written with Mat lab software for this project. With this program, differences in the heating and cooling loads and the amount of recovered energy connected with th heat recovery equipment usage can be calculated for different projects at different climate zones. Thus the investor can realize the amount of recovered energy and money saving at the beginning by means of the heat recovery equipment usage. Monthly energy saving values based on the hotel project which is defined above, according to heat recovery equipment usage for the four different climate zones of Turkey are shown on the below diagram. As seen in Figure 4,5,6,7 using heat recovery device reduces cooling coil capacity in summer, and heating coil capacity in winter. Thus, heating and cooling coil's investment costs are reduced, energy is saved.
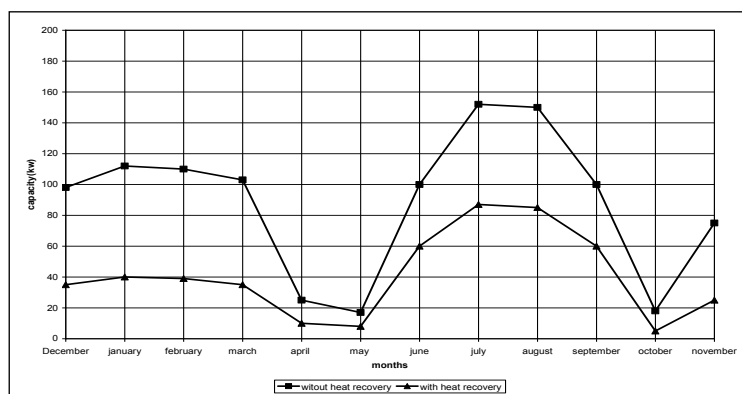
Fig. 4. Monthly heating and cooling coil capacity changes for the 1st climate zone

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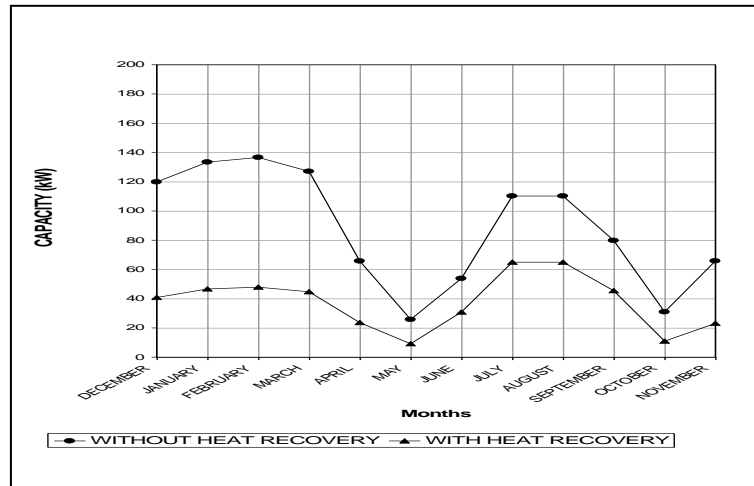
Fig. 5. Monthly heating and cooling coil capacity changes for the 2nd climate zone
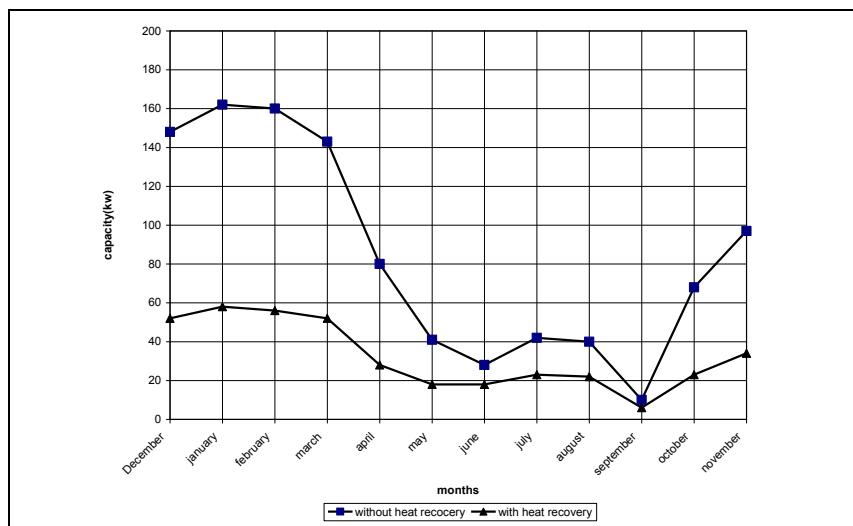
Fig. 6. Monthly heating and cooling coil capacity changes for the 3rd climate zone
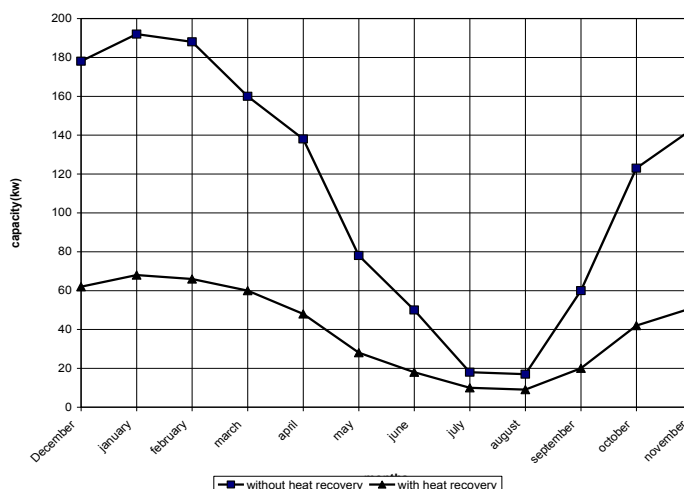
Fig. 7. Monthly heating and cooling coil capacity changes for the 4th climate zone

When Fig 4,5,6,7 are examined and compared each other, it is seen that the maximum cooling load is in 1st region, and the maximum heating load is in 4th region, as the 1st region is the warmest and the 4th is the coldest region.

3. Economical Analysis of the Heat Recovery Device

In the applications that heat recovery devices are used, some criteria such as; efficiency of the device, mixing ability of exhaust air with fresh air, unit cost of energy etc. must be taken into consideration. Higher energy costs support energy recovery systems feasibility. Recovery of waste energy with higher enthalpy is more economical compared to the one with lower enthalpy [7]. Using energy recovery devices reduces boiler and chiller dimensions, reduces pipe dimensions and also reduces electrical supply needs., Total pressure loss at ductwork increases with using heat recovery systems. To compensate the increased pressure loss, more powerful fan and fan motor are needed. Heat recovery devices also enable vapor transfer. Thus, in the case of cold fresh air is used, humidifying costs decrease, and in the case of warm fresh air is used, de-humidifying loads decrease. Economical analysis of heat recovery devices should be considered together with establishment costs and operating costs.

3.1. Factors That Effect Establisment Costs

Cost of the heat recovery device, mounting costs, additional duct costs, additional automatic control units' (capacity and velocity control) costs, fan, filter costs, pre-heater and automatical frost control unit -whereas frost possibility is present- costs are factors that increase establishment costs. With heat recovery device usage, due to reduced heating loads, boiler and heating equipment savings, piping and pump savings, due to reduced cooling loads, cooling equipment savings, reduced humidifying costs are the factors that reduce establishment costs.

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Establishment costs	EURO
Hygroscopic rotary type heat recovery device	11086
Additional panel filter cost	98,53
Increase of air conditioner unit dimensions due to the additional heat recovery cell	1181
Establishment costs saving amount	6169,84
Additional fan and motor costs due to air side additional serpentine resistance	283,27
Total establishment cost	6478,96

3.2. Factors That Effect Operating Costs

Using heat recovery devices, provides economy in annual heating and cooling costs. Heat recovery device, additional fans and automatic control devices cause increase in operating costs.

	I. Climatic Region	II. Climatic Region	III. Climatic Region	IV. Climatic Region
Annual Operating Costs Economy	€ / Year	€ / Year	€ / Year	€ / Year
Annual heating and cooling energy saving	9542,35	9838,66	8962,51	11355,15
Additional annual electricity cost due to air side additional serpentine resistance	109,69	109,69	109,69	109,69
Average annual maintenance cost	500	500	500	500
Total annual operating economy	8932,66	9228,97	8352,82	10745,46

Annual operational cost saving for Turkey's four different climate zones by adding heat recovery equipment to the reference hotel project is shown on Figure 8. As seen on the figure, using these equipments bring large amount of recovered energy in every climate regions of Turkey. However, the annual operating cost saving is maximum for the 4th climate region where the heating loads in cold winter are maximum.

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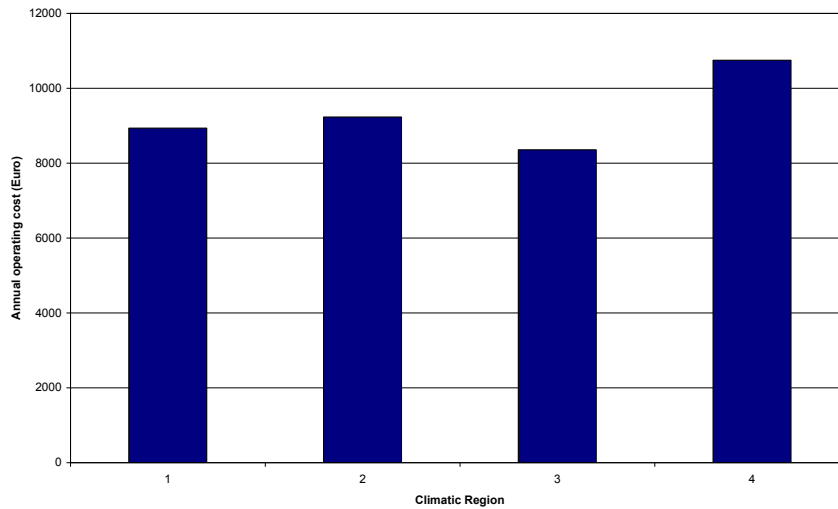
Fig.8: Energy savings gained by using heat recovery equipment at four different climate regions.

By using this prepared software, energy saving obtained by the heat recovery equipment can be evaluated on the project design phase.

4. Conclusion

This study is based on the air conditioning unit which provides fresh air, that is cooled and heated with a fan-coil, to 162 rooms on the first floor of a hotel. A program was written with Mat lab software for this project to calculate differences in the heating and cooling loads and the amount of recovered energy connected with the heat recovery equipment usage for different projects at different climate zones in Turkey. Results are shown graphically according to regions. Amount of the recovered energy and money saving by means of the heat recovery equipment usage can be evaluated at the beginning with this program. Using heat recovery equipments for the four different climate zones in Turkey considerably reduces the heating and the cooling loads. As we examine the graphics, greatest decrease in the heating load is in the 4th region which is the coldest part of Turkey and the greatest decrease in the cooling load is seen in 1st region which is the warmest part of Turkey. Energy saving achieved by using the heat recovery equipment will also reduce the harmful emissions to the environment

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ENERGY DISSIPATION AND HYDRAULIC JUMP CHARACTERISTICS IN THE FLOWS OVER THE STEPPED CHANNELS

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The Roller Compacted Concrete (RCC) dam construction technique allows the stepped chute to be integrated to the downstream face of the dam body and the body itself could directly be used as the spillway. The steps of the stepped channels, acting as high roughness features, in the meantime, force the outer edge of the boundary layer to reach the free surface and to initiate the natural free surface aeration. The mixture of air and water contributes to the increase in the dissolved oxygen content of the flow. In order to examine the flow regimes, to measure the energy dissipation along stepped channels and to determine the hydraulic jump characteristics such as the length of the jump and conjugate depths in the stilling basin, a 10 cm wide stepped channel having steps 12 cm high and 10 cm long is constructed within DEÜ Civil Engineering Department Hydraulics Laboratory. These parameters are obtained for nappe, transition and skimming flow regimes in quasi-uniform and non-uniform flow conditions and the results are compared with those obtained from the empirical formulae given in literature.

Key words: Stepped channel, flow regimes, energy dissipation, hydraulic jump length

1. INTRODUCTION

The hydroelectric power plants have numerous advantages such as renewable energy source, high life time, and low operating expenses, non-polluting and reliable technology. The spillway of a dam, which is designed to evacuate the flood wave from reservoir without damaging the structure and the environment, is one of the vital components.

The Roller Compacted Concrete (RCC) dam construction technique allows the stepped chute to be integrated to the downstream face of the dam body and the body itself could directly be used as the spillway. Considering the advantages, the two earthfill dam projects previously designed with conventional type of spillways, Çine and Çaltıkoru Dams, were decided to be converted into stepped spillway RCC dams by State Hydraulic Works (DSİ) and now are under construction. Stepped spillways, which are more appropriate for the small dams will presumably be used more in the near future both in Turkey and in World.

The excessive energy at the spillway toe should be dissipated to prevent the scour at the river bed. During the design of the stilling basin, one should consider the residual energy at the downstream of the spillway. Different from the conventional spillways, the stepped spillway corresponds to a distributed energy dissipater along the channel. The steps acting as high roughness features, in the meantime, force the outer edge of the boundary layer to reach the

free surface and to initiate the natural free surface aeration. In the un-aerated spillway zone which is potentially prone to cavitation damage, a layer containing a mixture of air and water contributes to the increase in the dissolved oxygen content of the flow.

Stepped waterways are also used as river training, debris dam structures, storm water systems and aeration cascades. Aeration enhancement by macro-roughness is well known in water treatment, and the aeration cascade is one of the methods.

2. CONSTRUCTION OF THE STEPPED CHANNEL

The model is made up of a stilling basin, a channel for the ogee crest, a channel for the steps, an outflow channel at the toe of the model, a triangular weir to measure the flow rate by reading the head over the weir by a piezometer tube. The components and the dimensions of the stepped channel is given in Fig. 1. The curvature of the ogee crest was given to the plexiglas sheet in Water State Works of Technical Research and Quality Control Department workshops. The side walls and the steps are made of transparent plexiglass in order to observe the flow visually.
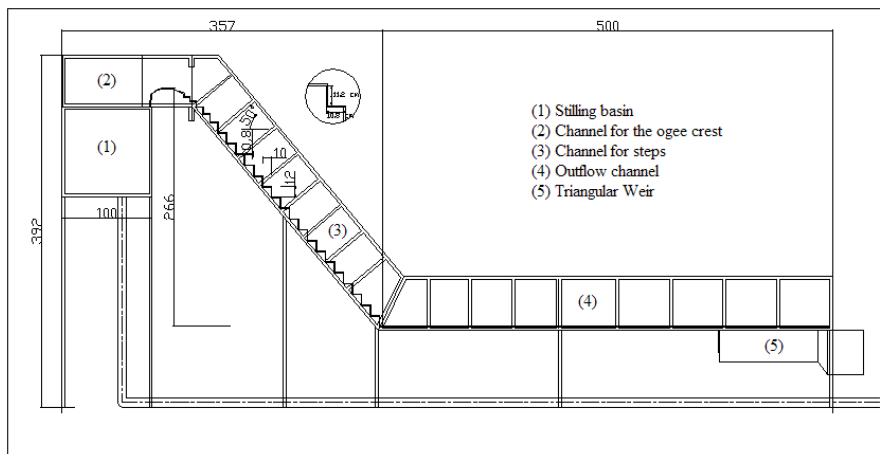
Figure 1: The dimensions of the stepped channel (units are in cm)

The geometrical detail of a step is given in Fig. 2. The channel has 5 transition steps and 19 steps with uniform dimensions. In the following Eqs. 1 and 2, the l_s is the distance between step edges or roughness spacing and the k_s is the roughness height perpendicular to pseudo-bottom.

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$$l_s = \sqrt{s^2 + l^2} = s/\sin\Phi = l/\cos\Phi$$

(1)

$$k_s = s*l/\sqrt{s^2 + l^2} = s*\cos\Phi = l*\sin\Phi$$

(2)

Where Φ: is the chute angle with horizontal, s: is the step height, l: step length.
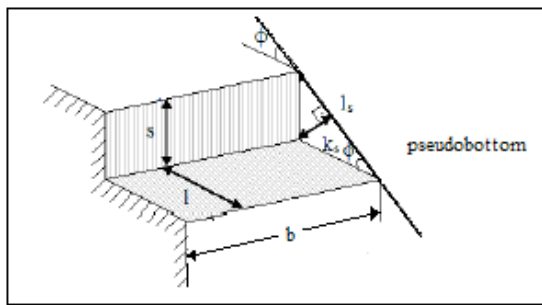
Figure 2: Geometry of the steps

The stepped channel in the laboratory has the following values, s=12 cm, l=10 cm, Φ=50,2°, l_s=15,6 cm, k_s=7,7 cm. The vertical distance from stepped channel crest to the toe of the channel is z_{crest}=266 cm and the channel width is b=10 cm.

3. FLOW REGIMES ON THE STEPPED CHANNELS

Two distinct regimes are defined for flow over stepped channels, so-called nappe flow and skimming flow. Between these two flow regimes a transition regime occurs, as depicted in Fig.3.

In nappe flow the steps act as a series of overfalls with the water plunging from one step to another [Boes, Minor, 2000]. After the water jet hits the step, a partial or full hydraulic jump occurs. Nappe flow occurs at low discharges with long steps and the stepped chutes with small slopes (Fig. 3.a). A transition regime occurs between nappe flow and skimming flow. During this transition regime, flow looses the nape regime characteristics whereas the skimming flow characteristics are not developed yet. At the inner side of the steps air pockets appear while at the inner edges water pools without vortices exist (Fig. 3.b). In skimming flow the steps act as a coherent stream over the pseudo-bottom formed by the step corners. For small steps and large discharges, the water skims over the step corners, and recirculating zones develop in the triangular niches formed by the step faces and pseudo-bottom [Boes, Minor, 2000]. Skimming flow is observed in steep channels and/or high discharges (Fig. 3.c).

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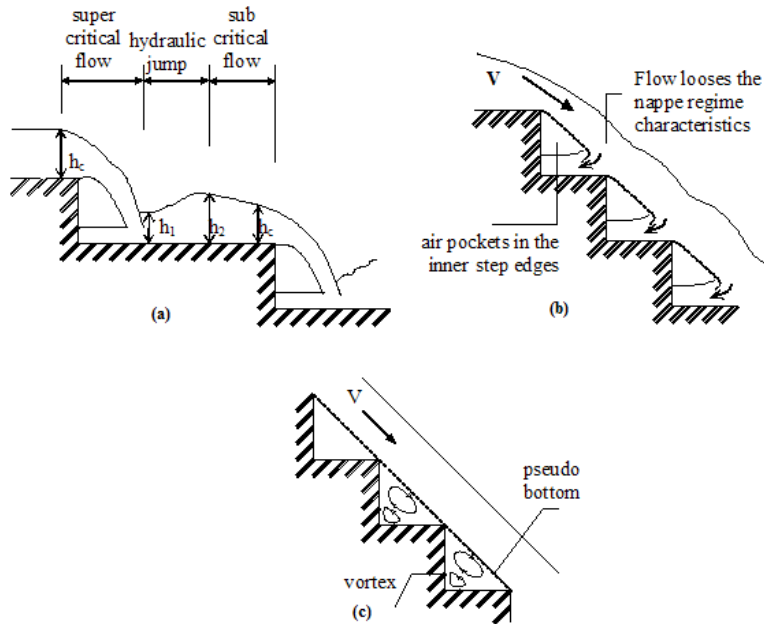
Figure 3: (a) nappe flow, **(b)** transition flow regime, **(c)** skimming flow

Chanson defined the onset of skimming flow by "the disappearance of the cavity beneath the free-falling nappes, the waters flowing as a quasi-homogeneous stream". The -30% from the Eqn. 3 defines the end of nappe flow, and + 30% is for the onset of skimming flow. The equation is valid when $0,2 < s/l < 1,25$ (or $11° < \Phi < 52°$) [Chanson, 2000].

$$h_{cr}/s = 1,1 - 0,4\, s/l$$

(3)

With the stepped channel values s = 0,12 m and l = 0,10 m, the h_{cr}/s ratio is found as 0,62 and the critical flow depth is found as h_{cr} = 7,44 cm. The common equation $h_{cr} = \sqrt[3]{q^2/g}$ is used to obtain the flow rates. The nappe regime ends when; h_{cr}/s ratio is 0,44 (=70% of 0,62), and this corresponds to h_{cr} = 5,208 cm, q = 0,0372 m^3/s/m, and Q is 3,7 l/s. The onset of skimming flow is when h_{cr}/s ratio is 0,81 (=130% of 0,62), giving h_{cr} = 9,672 cm, q = 0,0942 m^3/s/m, and Q is 9,4 l/s. The transition regime is in the range of 3,7 l/s – 9,4 l/s .

Ohtsu & Yasuda proposed Eqn. 4 for the end of nappe flow and Eqn. 5 for the onset of skimming flow according to Chanson's definition [Ohtsu & Yasuda, 1997].

$$h_{cr}/s = (1,4)*[1,4-(s/l)]^{0,26}$$

(4)

$$h_{cr}/s = 0,862*[l/l]^{-0,165}$$

(5)

The nappe regime ends when h_{cr} is 5,640 cm corresponding to q=0,0420 m^3/s/m, and Q= 4,2 l/s. The onset of skimming flow is when h_{cr} is 10,037 cm giving q = 0,0996 m^3/s/m, and Q is 10,0 l/s

Experimentally it was observed that the nappe flow ends when Q is 2,5 l/s and the skimming flow begins when Q is 9,4 l/s. The transition regime is in the range of 2,5 l/s − 9,4 l/s [Bombar, Güney, 2005]. The experimental results are outlined in Tab.1. The observed flows are presented in Fig. 4.

Table 1: The upper and lower boundary values for the transition regime

	End of nappe flow regime			Onset of skimming flow regime		
	h$_{cr}$ (cm)	q (m^3/s/m)	Q (lt/s)	h$_{cr}$ (cm)	q (m^3/s/m)	Q (lt/s)
Chanson(2000)	5,208	0,0372	3,7	9,672	0,0942	9,4
Ohtsu, Yasuda (1997)	5,640	0,0420	4,2	10,037	0,0996	10,0
Bombar, Güney (2005)	4,0	0,025	2,5	9,7	0,094	9,4

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4. ENERGY DISSIPATON FOR THE FLOWS OVER THE STEPPED CHANNELS

4.1 Energy Dissipation in Nappe Flow Regime

In nappe flow regime, at every single step a hydraulic jump occurs and therefore energy dissipation is distributed along the stepped channel. The energy dissipation formula for this type of flow is given in Eqn. 6. [Chanson, 1994]

$$\frac{\Delta H}{H_{max}} = 1 - \frac{0,54 * \left(h_{cr}/s\right)^{0,275} + 1,715 * \left(h_{cr}/s\right)^{0,55}}{3/2 + z_{crest}/h_{cr}}$$

(6)

where ΔH: total energy loss height, H_{max} and z_{crest} are the water level elevation at the basin and spillway crest elevation having the downstream channel elevation as datum, respectively. H_{max} can be expressed as in Eqn. 7.

(7)

$$H_{max} = z_{crest} + 1,5 * h_{cr}$$

4.2 Energy Dissipation in Skimming Flow Regime

After entering the stepped channel, flow starts to feel the roughness of the steps in the skimming flow regime. As it is shown in Fig. 5, when the outer edge of the boundary layer ($\square$) reaches the free surface, the turbulence level next to the free surface is large enough for free-surface aeration. After the inception point of air entrainment, the flow becomes a two-phased flow i.e. white waters having air bubbles in water. The non-aerated flow length from the spillway crest to the point of inception depends on the shape of the steps and flow rate. Downstream of the inception point, a layer containing a mixture of both air and water extends gradually through the fluid. Far downstream the flow will become uniform. This region is defined as the quasi-uniform equilibrium flow region [Boes, Hager, 2003].
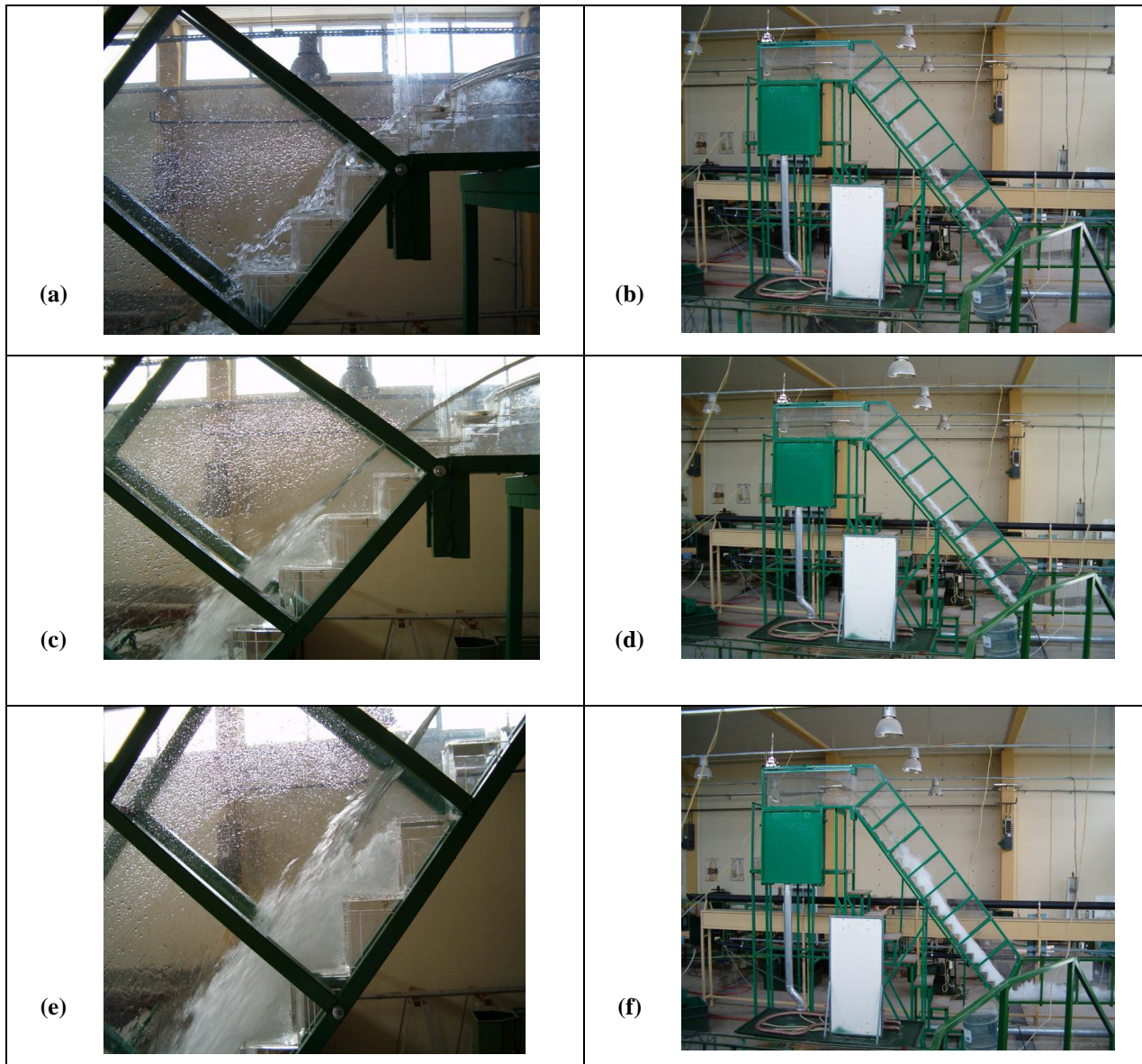
Figure 4: (a)&(b) nappe flow regime, **(c)&(d)** transition regime, **(e)&(f)** skimming flow regime

Chanson proposed the following equation for the energy dissipation □ H in the case of skimming flows regardless of the quasi-uniform flow attainment [Chanson, 1994].

$$\frac{\Delta H}{H_{max}} = 1 - \frac{F}{3/2 + z_{crest}/h_{cr}} \qquad \text{with}$$

(8)

$$F = \left(\frac{f_b}{8*\sin\Phi}\right)^{1/3} * \cos\Phi + \frac{\alpha}{2} * \left(\frac{f_b}{8*\sin\Phi}\right)^{-2/3} \qquad (9)$$

where f_b is the friction factor of botom roughness, α energy correction coefficient. Chanson claims that the friction factor is in the range of 0,5 and 4, with an applicable mean value of f_b=1,3. The energy correction coefficient α is taken as 1,0. [Chanson, 1994].
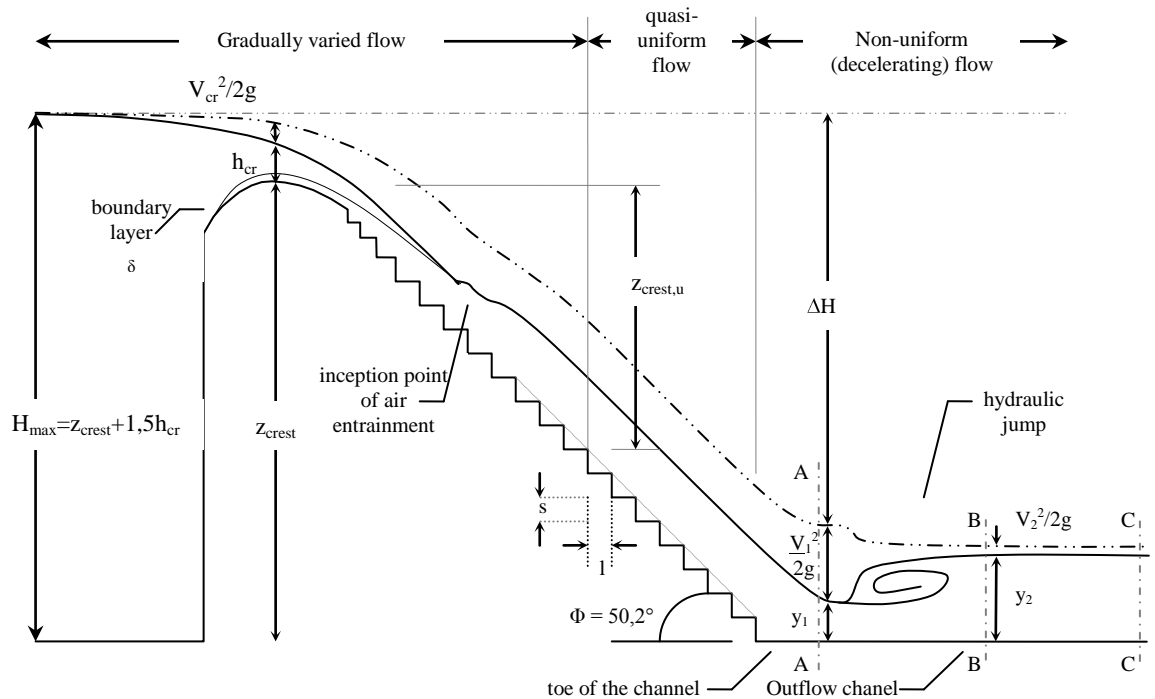
Figure 5: The energy grade line and hydraulic jump at the stepped channels

Eqn. 10 and Eqn. 12 are proposed by Boes and Hager [Boes, Hager, 2003].

$$\frac{\Delta H}{H_{max}} = 1 - \exp\left[\left(-0,045\left(\frac{k_s}{D_{h,w,u}}\right)^{0,1}(\sin\Phi)^{-0,8}\right)\frac{z_{crest}}{h_{cr}}\right] \qquad \text{for } z_{crest}/h_{cr} < 15\text{-}20$$

(10)

Where $D_{h,w,u}$ is the hydraulic diameter and calculated by Eqn. 11.

$$D_{h,w,u} = 4b\, h_{cr}\, x\, 0,215(\sin\Phi)^{-1/3} / (b + 2\, h_{cr}\, x\, 0,215(\sin\Phi)^{-1/3})$$

(11)

$$\frac{\Delta H}{H_{max}} = \frac{z_{crest}/h_{cr}}{F + z_{crest}/h_{cr}} \qquad\qquad \text{for} \quad z_{crest}/h_{cr} > 15\text{-}20$$

(12)

In this case, the F parameter in Eqn. 12 can be calculated from Eqn. 9 using the energy correction coefficient $\alpha \approx 1,1$. The bottom roughness coefficient f_b in Eqn. 9 can be calculated from Eqn. 13.

$$\frac{1}{\sqrt{f_b}} = \frac{1}{\sqrt{0,5 - 0,42\sin\Phi}}\left[1,0 - 0,25\log\frac{k_s}{D_{h,w}}\right] \qquad\qquad (13)$$

Christodoulou (1993) proposed Eqn. 14 for the energy dissipation. The parameter y_{cr} can be calculated from Eqn. 15, where N is the number of steps [Vischer, Hager, 1998].

$$\frac{\Delta H}{H_{max}} = \exp\left(30 * y_{cr}^2\right)$$

(14)

$$y_{cr} = h_{cr}/N * s \qquad\qquad (15)$$

Kaş and Yıldız examined the energy dissipation on stepped channels with different step heights and slopes. Within their research, the two sets of measurement are taken in order to make a comparison. All the experiments belong to skimming flow regime [Kaş, Yıldız, 2000].

In order to measure the water depth in two-phase flows, special electronic instruments are generally used. They obtain the air concentration in the flow, which is the ratio of the amount of air to the water. Since this kind of an instrument is not available in our laboratory, the flow depth in two phase flow could not be safely measured. Therefore, it is intended to form a hydraulic jump at the toe of the stepped channel and measure the clear water depth at the downstream section, y_2. Then, the velocity V_2 and the Froude number Fr_2 are calculated. Using the "Belanger conjugent depth equation" given in Eqn. 16, the water depth at the upstream part y_1 is calculated. Simultaneously, by Eqn. 17 the total energy at this section, H_1 and the dissipated energy over the stepped spillway ($\Delta H = H_{max} - H_1$) could be calculated.

$$\frac{y_1}{y_2} = \frac{1}{2}\left[\sqrt{1 + 8Fr_2^2} - 1\right] \qquad\qquad (16)$$

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$$H_1 = z_1 + y_1 + \frac{V_1^2}{2g} \qquad \text{(here } z_1 = 0) \qquad (17)$$

Prior to this study, Bombar and Güney studied the energy dissipation experimentally and observed that for skimming flow regimes the hydraulic jump formed is of submerged type and causing an underestimated amount of energy dissipation, as seen from Fig. 6 [Bombar, Güney, 2005]. The outflow channel where the hydraulic jump takes place is elongated from 2 m to 5 m to have a free jump and not a submerged one.

The various equations given above are used for h_{cr}/z_{crest} values corresponding to our experimental values. The flow depths at the downstream part of the hydraulic jumps for various flow regimes, are measured. The ratios of the amount of dissipated energy to the total energy head are given in Tab. 2. These values are plotted in Fig. 6.

Table 2: The amount of energy dissipation

Exp no	Q (l/s)	Flow regime	h_{cr}/z_{crest}	y_2 (cm)
13/2	0,14	nappe	0,002	2,5
13/3	0,48	nappe	0,005	3,7
13/1	1,38	nappe	0,010	5,5
13/4	1,69	nappe	0,012	5,7
13/5	2,65	trans.	0,016	6,6
13/6	5,30	trans.	0,025	11,0

Table2 cont.

12/ 1	6,10	trans.	0,027	12,0
12/ 2	9,10	trans.	0,036	16,5
13/ 8	10,78	skim.	0,040	17,0
12/ 3	14,19	skim.	0,048	22,5
12/ 4	16,62	skim.	0,053	26,5
12/ 5	17,92	skim.	0,056	27,5

	ΔH /	H_{max}	(%)		
Present study, (2007)	Chanson (1994), (6) nfr-tr	Chanson (1994), (8) tr-sfr	Boes& Hager (2003) (10)	Boes& Hager (2003) (11)	Christodoulou (1993) (14)
97,8	97,9			97,7	100,0
99,1	97,0			95,0	99,9
98,6	95,8			90,2	99,7
97,7	95,5			88,9	99,7
96,9	94,7	97,3		85,6	99,4
94,6	93,2	95,7		78,8	98,4
94,2	92,8	95,3		77,2	98,1
91,8	91,7	94,0		72,2	96,8
92,1		93,3		69,9	96,0
88,8		92,0		65,8	94,3
86,0		91,2	61,4		93,0
85,7		90,8	59,6		92,3

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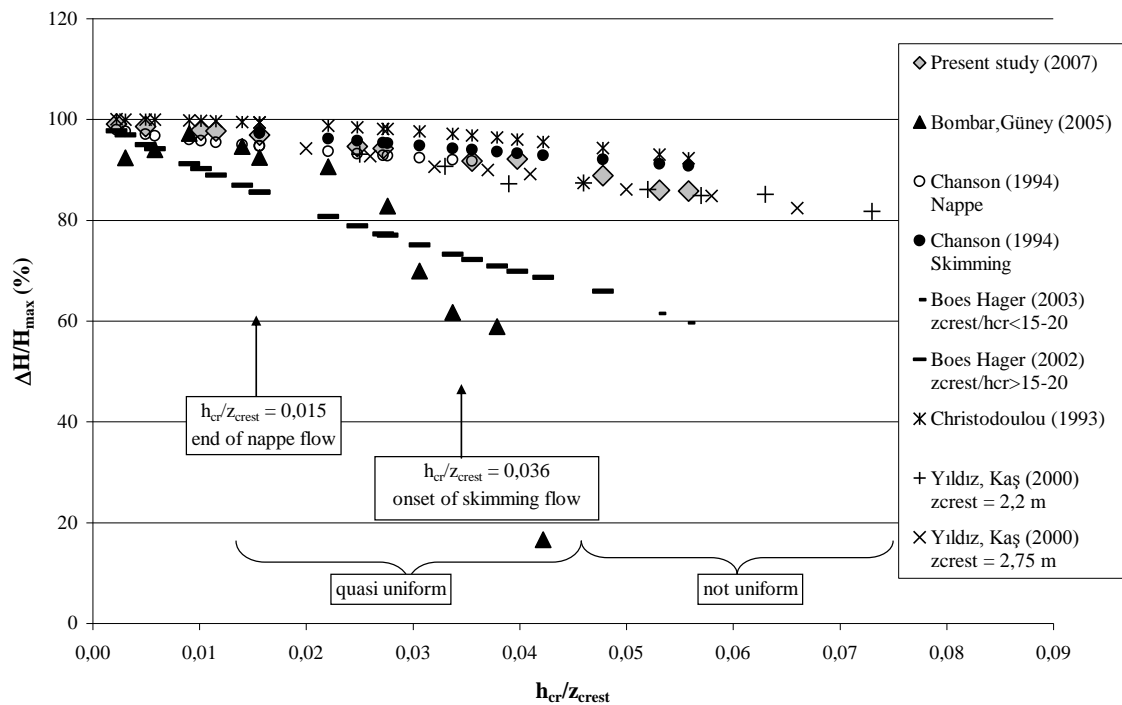
Figure 6: Energy dissipation along the stepped channels

5. LENGTH OF THE HYDRAULIC JUMP IN THE STILLING BASIN

The supercritical flow coming from the upstream spillways, should be safely conducted to the channel where subcritical flow conditions prevail. A hydraulic jump takes place in stilling basins, as a part of the energy dissipater system at the downstream of the spillways. The length L of the hydraulic jump is one of the important parameters in designing and determining the size of the stilling basin. The relation between L/y_2 and Fr_1 is given by the graph presented in Fig. 7 which is developed by U.S. Bureau of Reclamation [USBR, 1955].
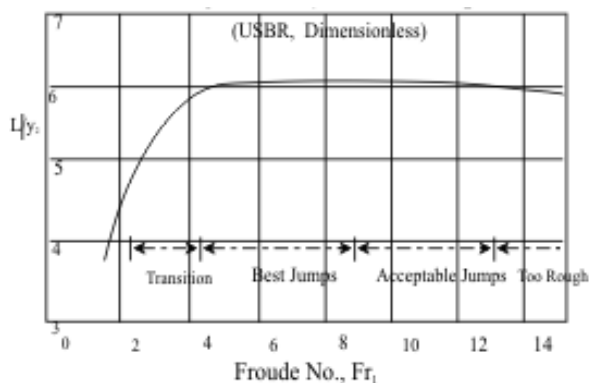
Figure 7: Lengths of Hydraulic Jumps

Yıldız and Kaş measured the hydraulic jump lengths for stepped channels of different slopes and step heights [Yıldız, Kaş 2000].

The hydraulic jump lengths at the toe of the stepped channel are measured for different flow rates ranging from 2,6 l/s to 17,9 l/s, with Froude numbers, Fr_1 ranging from 5,1 to 10,5. The relevant photographs are given in Fig. 8. The measured hydraulic jump lengths are given in Tab. 3, together with those proposed by USBR. The relationship between the dimensionless parameters h_{cr}/z_{crest} and L/z_{crest} is depicted in Fig. 9.

Figure 8: (a) Q=2,6 l/s Fr_1=5,1; **(b)** Q=5,3/s Fr_1=6,28; **(c)&(d)** Q=10,8 l/s Fr_1=5,36

Table 3: The hydraulic jump length at the toe of the stepped channels, the values measured in this study and those calculated by the empirical equation given by the literature

Exp no	Q (l/s)	y_2 (cm)	Fr_1	y_1 / h_{cr}	Type of the jump	h_{cr}/z_{crest}	Measured L / z_{crest}	USBR graph L / z_{crest}
13/5	2,6	6,6	5,10	0,58	steady	0,016	0,248	0,152
13/6	5,3	11,0	6,28	0,54	steady	0,026	0,271	0,298
12/1	6,1	12,0	6,10	0,55	steady	0,027	0,256	0,280
12/2	9,1	16,5	7,61	0,51	steady	0,036	0,323	0,391
13/8	10,8	17,0	5,36	0,57	steady	0,040	0,387	0,352
12/3	14,2	22,5	8,09	0,50	steady	0,048	0,474	0,533
12/4	16,6	26,5	10,49	0,46	strong	0,053	0,534	0,618
12/5	17,9	27,5	9,89	0,47	strong	0,056	0,620	0,641

The hydraulic jump lengths determined in this study are in good agreement with the values obtained from Fig. 7 and with those given by Yıldız and Kaş [Yıldız, Kaş, 2000].

6. CONCLUSION

The flow regimes are analyzed according to Chanson's definition and the results are compared with other literature data. The end of the nappe flow is at q=0,025 m^3/s/m and the onset of skimming flow regime is at q=0,094 m^3/s/m . The experimental findings are in accord with the values calculated by using the empirical equations given in literature.
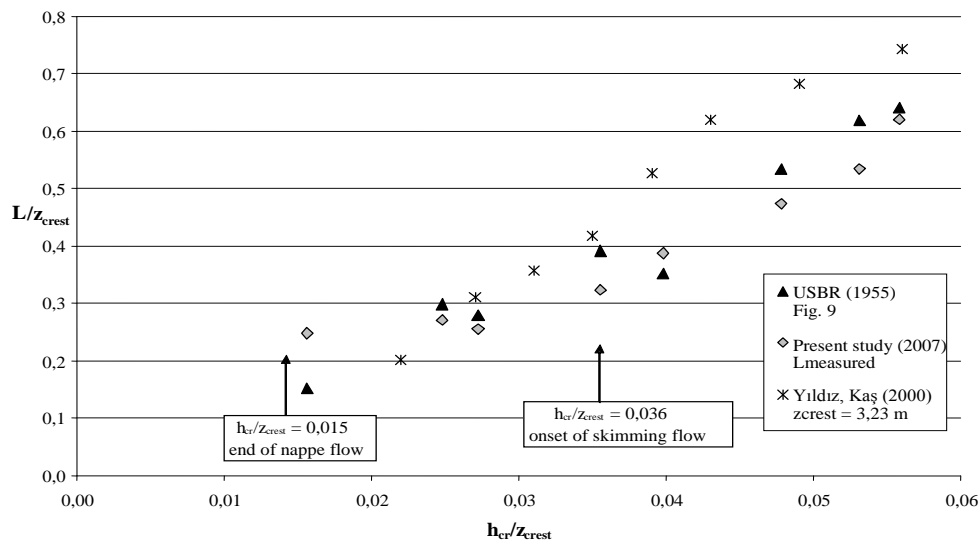
Figure 9: The hydraulic jump lengths

The equations for the calculation of the energy dissipation proposed by Chanson (1994), Boes & Hager (2003) and Christodoulou (1993), the experimental results of Yıldız and Kaş (2000) and our experimental results are compared. Except the equations proposed by Boes & Hager, our experimental results are in accord with those obtained from empirical equations given in the literature, especially with the measured values obtained by Yıldız and Kaş.

The hydraulic jump lengths determined in this study also are in good agreement with the values given by USBR and with those given by Yıldız and Kaş (2000).

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AN ALTERNATIVE ENERGY SOURCE: BIOFUEL AND IT'S POSITION IN TURKEY

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In this study, major agricultural products that come to the fore in the production of biofuels (biodiesel and bioethanol), some of alternative energy sources, have been determined for Turkey. Besides, developments in biomass use in the world and European Union have been evaluated. For these purposes, using the statistical data about production regions, production amounts, yields and support status of the agricultural products that are actually used or will be used in the future, opportunities and threats in the future of biofuel production have been discussed, and some suggestions have been made.

Key Words: Alternative energy sources, Biofuel, Biomass Energy.

INTRODUCTION

One of the criteria that indicate the development level of a country is its energy use. Basic factors that increase energy consumption are industrialization rate, population growth rate and development of trade. Despite the increasing need for energy, fossil fuels such as oil, natural gas and coal which presently meet the energy demand of the world are being used up. As of 2004, it was reported that the world has coal supply enough for 186 years, oil for 41 years and natural gas for 60 years [1].

Emissions from burning of fossil fuels cause very serious environmental problems. Climate changes, desertification and deterioration of ecosystems encountered today are all attributed to fossil based fuels. Besides, often experienced petrol crises result in drastic increases in energy costs. These increases are aggravated because of the wars.

Therefore, depletion signals of fossil fuels, sensitivity for the environmental problems caused by them and constant increases in oil prices force countries to seek alternative energy resources. Turkey meets her oil demands to a large extent via imports. Dependence upon oil and its ever-increasing price seriously affect basic economical parameters in Turkey.

As in developed and developing countries, Turkey has to try alternative energy sources such as geothermal, solar, wind, sea current, hydrogen and biomass energies, which are renewable and can be produced using domestic resources.

Use of alternative energy resources is a necessity for Turkey. Dependence of the country on external sources for her energy needs should be alleviated. One of the items that need to comply with the European requirements during Turkey's membership process to EU is about energy.

The European Union, through Biofuel Use Regulation of 2003, established the need for mixing biofuels with liquid fuel used for commercial and transporting purposes in member countries. By this regulation, it has been projected that mixing rate of 2 % in 2005 will have been elevated to 10 % by 2010. Therefore, Turkey has to try alternative energy sources that can be produced using internal resources to meet her energy need.

For Turkey, alternative energy resource with the highest technical potential is biomass energy. Biomass energy is defined as energy produced from plant and animal based materials whose main constituents are carbohydrate compounds. In order to use biomass as energy, various technologies are used to produce liquid, solid and gaseous fuels. The most common types of these so-called biofuels are biodiesel and bioethanol [2]. Biodiesel is a type of fuel used as mixtures with oil-based fuels. Its main raw material is oil seeds such as canola, sunflower, soybean, safflower and cottonseed. In addition, biodiesel is also produced from recycled vegetable oils and animal based fats. Biodiesel produced from organic oils are equivalent of oil-based diesel in terms of function.

Bioethanol is a fuel alcohol produced by fermentation and distillation of agricultural products rich in starch, sugar and cellulose. It is used as mixtures with gasoline in internal-combustion engines. Its main raw material is sugar beet, corn, wheat, sugar cane, potatoes, vegetative wastes and cellulose-rich wastes.

In this study, available potential of alternative energy resources such as biodiesel and bioethanol have been studied, and opportunities and problems in the production of these energy sources have been discussed. Data used in the study was obtained from UN Food and Agriculture Organization (FAO). Besides, previously conducted relevant studies and papers were also used.

BIODIESEL AND BIOETHANOL PRODUCTION IN THE WORLD AND EUROPE

World biodiesel production is on a constant increase. It was 11 million liter in 1991, and this amount increased by 34,200 % in 2005 and reached to 3,762 million liter. Germany is in the lead for biodiesel production and is followed by the US.

Bioethanol production is also on a constant increase. World production of 16,348 million liter increased by 274.5 % and reached to 44,875 million liter in 2005. The US leads the world for bioethanol production and is followed by Brazil and China.

Biodiesel and bioethanol production figures in the world during 1991-2005 periods are given in Table 1.

Table 1. Biodiesel and Bioetanol Production in the World [3-4]

Years	Production (million lt)		Index (1991=100)	
	Bioetanol	Biodiesel	Bioetanol	Biodiesel
1991	16348	11	100,0	100,0
1992	15581	88	95,3	800,0
1993	15839	143	96,9	1300,0
1994	16802	283	102,8	2572,7
1995	17971	408	109,9	3709,1
1996	18688	546	114,3	4963,6
1997	20452	570	125,1	5181,8
1998	19147	587	117,1	5336,4
1999	18671	719	114,2	6536,4
2000	17315	893	105,9	8118,2
2001	18676	1068	114,2	9709,1
2002	21715	1488	132,8	13527,3
2003	27331	1832	167,2	16654,5
2004	30632	2196	187,4	19963,6
2005	44875	3762	274,5	34200,0

Major biodiesel and bioethanol producing countries of the world and their production status are given in Table 2.

Table 2. Biodiesel and bioethanol production in major countries in the world (2005) [4]

BIODIESEL		BIOETANOL	
Country	Production (million lt)	Country	Production (million lt)
Germany	1,921	United States	16,214
France	557	Brazil	16,067
United States	284	China	3,8
Italy	227	India	1,7
Czech Republic	136	France	910
United Kingdom	74	Russia	750
Brazil	70	Germany	350

For the purposes of improving rural development and employment within the context of Lisbon Agenda of EU and of lowering CO_2 emissions and dependence on external sources for energy within the context of Kyoto Protocol, EU has required that production and use of biofuels should be promoted in the union. This concept has been accepted by all EU countries. Therefore, in European Council of March 23-24, 2006, leaders of the countries have openly expressed their ideas in favor of supporting the renewable energy resources and biofuels [1].

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Status of biodiesel and bioethanol in some EU countries are given in Table 3.

Table 3. Biodiesel and bioethanol productions of some EU countries [4-5]

Country	Biodiesel (million lt)				Bioethanol (million lt)			
	2002	2003	2004	2005*	2002	2003	2004	2005*
Germany	634	1008	1458	1921	0	0	31	350
France	513	504	490	557	135	121	153	910
Italy	297	382	450	227	0	0	0	150
Spain	0	9	18	84	265	238	292	376
Denmark	13	58	99	80	0	0	0	-
Czech Republic	99	99	85	136	9	0	0	-
Austria	36	45	81	85	0	0	0	-
United Kingdom	4	13	13	74	0	0	0	290
Poland	0	0	0	80	99	90	54	220

As can be seen in Table 3, Germany is in the lead in EU for biodiesel production followed by France and Italy in 2005. When it comes to bioethanol production, France is in the lead and is followed by Spain and Germany. Both biodiesel and bioethanol production is on the increase in all member countries. EU aims to increase the use and production of biofuels through tax incentives and regulations for internal production and import from other countries. When a 5.75 % mixture rate is reached, a percentage mentioned in the directive issued by EU commission in May 2003, EU ethanol consumption in 2010 is estimated to be about 10.5 million tons. In order to reach this goal, fifty new facilities should be established each year, each with a capacity of 200,000 tons/year [1]. Presence of agricultural production potential in EU countries makes the biofuel sector attractive.

BIODIESEL AND BIOETHANOL PRODUCTION IN TURKEY

Although the exact figures are not known, biodiesel production in Turkey has increased in recent years. As of 2005, yearly production capacity of Turkey is 450,000 tons according to ALBİYOBİR, 878,000 according to capacity reports by Union of Chambers and Commodity Exchanges of Turkey and 978,436 according to General Directorate of Electrical Power Resources Survey and Development Administration. However, it is reported that capacity use ratio of enterprises is only 10 % and actual biodiesel production is 90,000 tons [6-7].

Bioethanol production in Turkey is realized by a single company named Turkish Agricultural Chemicals (Tarkim) in cooperation with Petrol Ofisi, leading oil refining and retailing corporation in Turkey [8]. On the other hand, it is reported that a bioethanol factory with the highest capacity of all in Turkey has started to be build in Konya sugar factory by Pankobirlik [2].

As of 2005, 90 companies in 27 provinces of Turkey operate in biodiesel production. Distribution of companies over provinces and their employment figures are given in Table 4.

Table 4. Distribution of biodiesel producing companies over the provinces in Turkey and their employment figures [6-7]

Province	Number of company	Number of people employed	Province	Number of company	Number of people mployed
Gaziantep	16	89	Kilis	1	14
Ankara	11	47	Antakya	1	4
Adana	7	67	Osmaniye	1	20
Bursa	7	62	K.Maraş	1	10
İzmit	7	70	Aksaray	1	14
İzmir	6	86	Antalya	1	15
Kocaeli	6	86	Konya	1	4
Batman	3	25	Denizli	1	6
Şanlıurfa	3	15	Afyon	1	4
Mersin	3	25	Samsun	1	6
Diyarbakır	2	21	İstanbul	1	6
Kayseri	2	6	Kırklareli	1	25
Balıkesir	2	15	Edirne	1	8
Manisa	2	10	Total	90	760

Considering the sectoral distribution of the companies in Turkey, 40 % is in oil industry while 21 % in agriculture, 18 % in chemistry, 11 % in liquid fuel and 10 % in other sectors [7]. That agriculture sector is in the second order is significant for Turkey.

Opportunities and Problems in Biofuel Production in Turkey

The source of biodiesel and bioethanol is vegetative and animal products, and high production potential of these materials in Turkey appears to constitute a significant advantage for Turkey. In this part, basic agricultural products and their future prospects in Turkey is discussed.

Agricultural products used as basic raw material for biodiesel and bioethanol production are oil-rich products such as canola (rapeseed), soybean, sunflower, safflower, sorghum and cottonseed. Turkey has an advantage for the production of these crops in terms of ecological conditions. Acreages and production amount of these products are given in Table 5.

Table 5. Acreages and production figures of crops used in biodiesel production in Turkey [9]

Crop	Acreages (ha)				
	2001	2002	2003	2004	2005
Soybean	17 000	25 500	27 000	14 000	10 000
Canola	290	550	2800	1700	500
Sunflower	510 000	550 000	545 000	550 000	480 000
Cottonseed	684 665	721 077	637 329	636 332	600 000
Safflower	35	40	250	165	165
Sorghum	0	0	0	0	0
	Production (ton)				
Soybean	50 000	75 000	85 000	50 000	30 000
Canola	650	1 500	6 500	4 500	1 150
Sunflower	650 000	850 000	800 000	900 000	950 000
Cottonseed	2 358 000	2 542 000	2 346 000	2 355 000	2 290 000
Safflower	25	25	170	150	150
Sorghum	0	0	0	0	0

An important part of the crude food-purposed vegetable oil used in Turkey is imported. About 900,000 tons of 1,500,000 tons of the yearly needed amount is imported. Consequently, Turkey has to increase acreages and production amounts of oilseed crops such as canola (rapeseed), soybean, sunflower, safflower, sorghum and cottonseed in order to reduce the imports and increase biodiesel production. Ecology of Turkey is considered as an opportunity for the production of these crops. However, main problem is the lack of agricultural policies that can promote the production of such crops. Turkey imports significant amounts of soybean, canola, sunflower and cottonseed. Good commodity policies and subsidiary programs can increase the production of these products and prevent the foreign exchange spending for them.

Basic agricultural products used in bioethanol production are sugar beet, corn, wheat, sugar cane and potato. All of these products except sugar cane have been produced in Turkey in large acreages for a long time. Acreages and production amounts of these crops are given in Table 6.

Because of production insufficiency, there have been imports of wheat and corn, basic raw materials for bioethanol production, in recent years. Sugar beet can be considered as an opportunity in Turkey in terms of bioethanol production. Production of sugar beet, an established crop in Turkey, is favorable because of the ecological conditions. However, quota system used in recent years constitutes a significant problem for this crop. It is strategically important for Turkey, which meets a large part of its petrol need from abroad, to consider "energy farming" as an opportunity to decrease the dependence on external supplier and, at the same time, to solve the quota problems of sugar beet producers [10].

Table 6. Acreages and production figures of crops used in bioethanol production in Turkey [9]

Crop	Acreage (ha)				
	2001	2002	2003	2004	2005
Sugar beet	358 763	372 468	315 303	315 344	317 000
Corn	550 000	500 000	560 000	700 000	800 000
Wheat	9 350 000	9 300 000	9 100 000	9 300 000	9 300 000
Potatoes	200 000	198 000	195 000	179 000	160 000
	Production (ton)				
Sugar beet	12 632 520	16 523 166	12 622 900	13 517 000	13 500 000
Corn	2 200 000	2 100 000	2 800 000	3 000 000	3 500 000
Wheat	19 007 000	19 508 000	19 008 200	21 000 000	21 000 000
Potatoes	5 000 000	5 200 000	5 300 000	4 800 000	4 170 000

In the context of its common market system, aim of the European Union in its sugar reform studies is to sustain sugar beet production via directing production in the areas abandoned for sugar beet production from food industry to energy and chemical industries. Thus, premium applied to the crops used in energy farming should also be applied to sugar beet [1]. Turkey should consider its production potential and established sugar factories, which can be supplemented with bioethanol production facilities, as an opportunity.

CONCLUSIONS

In the modern day, factors such as industrializing rate, population growth, use of new technologies and development of trade increase energy consumption. However, fossil fuels which are largely used to meet the energy used in the world have been decreased. Therefore, nations should consider novel, renewable alternative energy sources which can be obtained within country. Turkey has to determine some alternative energy sources in order to decrease the dependence to imports and to meet its energy needs within the country during the EU integration process regarding EU conformity.

Biomass energy comes to the fore as an alternative energy source in Turkey. The source of biodiesel and bioethanol is vegetative and animal products. High production potential of these materials lends Turkey significant advantages for this kind of energy production.

For Turkey to exploit this advantage, efficient agricultural policies for basic products used in biofuel production need to be developed. Turkey has four million tons of gasoline and ten million tons of diesel fuel consumption annually. In order for Turkey, a country in the EU integration process, to achieve the 5.75 % mixture rate required by the EU within the context of biofuel regulation by 2010, about 350,000 tons of bioethanol and 600,000 tons of biodiesel productions are required annually. Turkey also has about one billion dollar import spent for its crude oil deficit.

In order to meet its future energy needs from national sources and thus decrease the dependence on imports, Turkey has to take certain measures:

- In order to complement and improve the food-purposed agricultural production, energy-purposed agricultural production is also required. In the realm of energy farming, it is necessary to devise and impose special incentive policies for increasing the production of high-oil crops such as canola, soybean, cottonseed and sunflower. In addition, energy-purposed sugar beet farming should be supported. Such an effort will also eliminate the problems arising from quota application in sugar beet farming.
- For the production of such crops, an efficient contract-based production, after its infrastructural and legal basis has been established, should be considered. Specifically, it is necessary that biofuel firms should take part actively within this production system.
- Incentives should be devised and supported for businesses in agricultural industry that produce biofuel. Specifically, producer-based organizations such as unions and cooperatives should be supported. In addition, investments of already existing sugar factories to participate the biofuel production should be supported.
- Standards should be set for biofuel production, and supervision mechanisms and legal regulations should be established.
- After bringing the crude vegetable oil production to a sufficient level via efficient commodity policies toward energy crops, deterring measures should be taken to prevent crude oil imports.
- Training activities should be performed toward increasing environment awareness in the society and toward introduction and use of biofuels.

In conclusion, Turkey has to realize and improve biofuel production to decrease her dependence on external sources for oil and to meet her energy needs via domestic, new and renewable sources. That the raw material of this energy source is based on agricultural crops and that these crops have high production potentials in Turkey should be considered as a great advantage. As a result of policies implemented toward this direction, future energy needs of Turkey should be met through national sources. Thus, agriculture will have an efficient contribution for industrialization process. Besides, rural development and employment will be developed, and a healthier environment will be left for the generations to come.

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THE POTENTIAL BIOGAS PRODUCTION FROM LIVESTOCK MANURES: A CASE STUDY FOR GAP REGION-SANLIURFA

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This case study was carried out with the overall objective to evaluate the application of the biological treatment methods using poultry farm wastes in the GAP Region-Sanlıurfa. The specific objectives of this paper are; to investigate of Sanliurfa's biogas potential, to calculate the energy quantity of the biogas, to design energy recycling plants. Sanliurfa province is center of the GAP. 65 % part of its land, 1.202.925 ha.s, is in agriculture use. Some of the products grown on the plains of Sanliurfa are cotton (industrial plant); wheat, barley, lentil (regular field plants); tomato, pepper, eggplant (vegetables). The region is also quite fit for all varieties of animal husbandry. According to the 2005 data, there have been 1,578,222 livestock raised in Sanliurfa of which 140,556 were cattle. It is possible to extract 207,081 m^3 of biogas energy (approximately 1,124 MW/day) from livestock fertilizers in Sanliurfa. The conversion of livestock waste to biogas in the city center and the surrounding districts will be determined by the optimization work between the origination points of wastes. It is planned that the energy produced at the conversion centers in the city center and the surrounding districts will be given to the owners of the waste. This will enable cost savings by not collecting the waste in one center and not having to distribute the produced energy afterwards. It is aimed that the produced energy will be used for heating and electricity and this will be a model for the other regions. This process will enable the elimination of waste without any harm to the environment and energy will be produced through recycling in the process.

Key Words: Biogas, Energy Recovery, Livestock fertilizers.

1. INTRODUCTION

Biological treatment (anaerobic and aerobic) is used for the conversion of the organic solid materials that are relatively high in volatile solids. Applications of biological treatment include organic fraction of municipal waste, wastewater treatment plant sludge, animal (cow, pig, poultry etc.) wastes, industrial organic solid wastes and agricultural wastes. An attained product of attained biological treatment process for organic solid wastes are stable and can be used as fertilizer in the parks, gardens and as soil conditioner in the rehabilitation of old mines. Also, biogas can be recovered from the organic materials by means of anaerobic biological treatment, which is known as environmentally friendly technology. Since animal husbandry and agriculture are highly developed in Turkey, a substantial amount of animal waste and agricultural crop residues are produced each year. Organic wastes are of vital importance for the soil, but in Turkey most of these organic wastes are used as fuel through direct combustion (Kaygusuz, K. and Türker, M.F. 2002).

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Animal wastes are mixed with straw to increase the calorific value, and are then dried for use. This is the principal fuel of many villages in the rural regions of Turkey, especially in the east and southeastern Anatolia regions. Anaerobic digestion for methane production is a possible solution to recover the wastes as fertilizers and produce energy. In Turkey, much effort has been put into biogas research and development projects since the 1960s. In addition to feasibility studies on biogas utilization, many digesters have been constructed at different places in the country. Universities, national research institutes, companies and international organizations have actively been involved in the subject. Unfortunately, due to a lack of collaboration and organization between these different projects, further development has not resulted.

Past experience indicates the necessity of reorganizing the biogas programs and the development of a digester for the conditions of Turkey. It should also be taken into account that livestock farming mostly occurs in central and eastern Anatolia, where winters are very cold. As the digester temperatures should be at least 20°C, a good design should be developed to operate well under these climatic conditions (Kaygusuz, K. and Türker, M.F. 2002). Even though community digesters for a whole village appear to be economically more attractive, family type designs should also be studied. Moreover, detailed realistic economic and cost–benefit comparisons with other alternatives will help in determining the level of incentives that could be introduced by the government for the construction of digesters.

The most obvious example for the interest in the subject is the biogas production facilities established at permanent storage areas, particularly in the big cities. There is a lot of interest on the part of multinational companies to establish biogas facilities in Turkey. In 2004, encouraged with the poultry farms leading the way, sheep and cattle farms put emphasis on the subject in order to meet some of the increasing costs in the sector (Kaygusuz, K. and Türker, M.F. 2002). The 8th 5 Year Development Plan has anticipated 15 GWh of actual biogas production in 2005. This number comes as good news. The biogas potential for Turkey is stated at 2.5-4.0 Billion m^3 (Approximately 25 Million kWh) (World Energy Council, 1999).

2. METHODS

2.1. Significance of Biyogas Energy in the GAP Region

Turkey is an energy importing country and more than half of the energy requirements have been supplied through imports that have caused financial problems. Because of the economical problems in Turkey today, the Turkish energy policy should be concentrated on the assurance of energy supplies; reliability, domestic sufficiency, economic feasibility, and renewability. Therefore as a renewable energy source, biological treatment (fuelwood, agricultural residues, animal wastes, charcoal and other fuel) seems interesting because its share of the total energy production at 25% is high and the technique for converting it to useful energy is easy. On the other hand, biomass may, however, see greatly expanded use in response to the environmental problems caused by fossil fuel use in the country (Kaygusuz, K., 1997). Biological treatment has been proposed to have a central role to play in the future in more sustainable energy scenarios. For this to become a reality several real problems need

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to be overcome. In Turkey, as in other developing countries, modernization of biogas energy provision is an urgent necessity for the sake of human health, protection of the environment, and climate change abatement. Given sufficient recognition, resources and research biogas could become the environmentally friendly fuel of the future.

The Southeastern Anatolia Project (GAP) is a multi-sector and integrated regional development effort approached in the context of sustainable development. The project area covers nine administrative provinces (Adiyaman, Batman, Diyarbakir, Gaziantep, Kilis, Mardin, Siirt, Sanliurfa and Sirnak) in the basins of the Euphrates and the Tigris and in Upper Mesopotamia. Sanliurfa is the capital city of the project. The region has 3.2 million hectares of land fit for crop culture. Favorable climatic conditions in the region make it possible to reap two crops a year. Since stockbreeding and agriculture are highly developed in Sanliurfa, a substantial amount of animal waste and agricultural crop residues are produced each year. Organic wastes are of vital importance for the soil, but in Sanliurfa most of these organic wastes are used as fuel through direct combustion. Animal wastes are mixed with straw to increase the calorific value, and are then dried for use. This is the principal fuel of many villages in the rural regions of GAP, especially in the Sanliurfa province(www.gap.gov.tr). Furthermore, the prevailing continental climate results in very high temperature variations between the day and the night especially in the winter. From that perspective, it is important to note that the energy produced will also be used for heating. Moreover, it is projected that the collection of waste in local centers, the recycling and the use of the energy will result in an increased employment.

3. RESULTS

3.1. Potential of Biogas Energy in Sanliurfa

In addition to the central district, Sanliurfa consists of the Akçakale, Birecik, Bozova, Ceylanpınar, Halfeti, Harran, Hilvan, Siverek, Suruç ve Viranşehir districts (Figure 1). It is 18.584 sq km (SIS, 1999). Sanliurfa is Turkey's seventh largest city and it makes up around 2.3 percent of Turkey's total area. Geographically, Sanliurfa is closer to the Equator than most of Turkey's cities and it is far from the effects of the sea. So, continental climate is prevalent in Sanliurfa and it shows itself in the temperature and precipitation statistics. The atmosphere is not humid enough and the earth heats and cools rapidly. So, the daily and yearly temperature differences are severe. For this reason, it is very important for the waste to be recycled as biogas and for that energy to be used in heating and electricity.
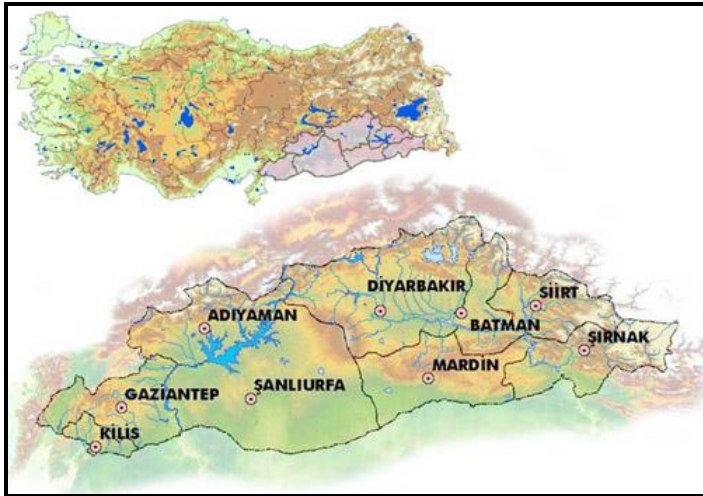
Figure 3.1. The Map of GAP and Sanliurfa

In this section, the statistics of the animals which form the base for biogas production in the districts of Sanliurfa for 2004 and 2005 have been shown in Tables 3.1 and 3.2. Although we don't see an apparent increase in the number of livestock over the years, it is clear that there is a potential for biogas.

Table.3.1. The Number of Cattle and Sheep at Sanliurfa in 2004 (Sanlıurfa Farming Directorate, 2006)

Districts	The Number of Cattle in 2004			The Number of Sheep in 2004		Total
	Cattle	Buffalo	Calf	Sheep	Goat	
Center	28000	-	7700	380000	20000	435700
Akçakale	1043	-	400	40000	4000	45443
Birecik	1210	-	2600	10000	210	14020
Bozova	4000	-	1500	10000	2000	17500
Ceylanpınar	3500	-	850	75000	2000	81350
Halfeti	3000	-	1000	28000	7000	39000
Harran	1000	-	482	8000	2000	11482
Hilvan	3220	30	3000	65000	10000	81250
Siverek	35000	600	10000	450000	5000	500600
Suruç	4700	-	1000	21350	11580	38630
Viranşehir	4300	-	4400	203053	41507	253260
Total	**88973**	**630**	**32932**	**1290403**	**105297**	**1518235**

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In 2004, while the number of cattle is recorded as 88,973, the number of sheep is 1,290,403. In 2005, the number of cattle decreased to 140,556 while the number of sheep increased to 1,319,553. These numbers show that sheep are preferred over cattle for its flesh and other purposes.

Table.3.2. The Number of Cattle and Sheep at Sanliurfa in 2005 (Sanlıurfa Farming Directorate, 2006)

Districts	The Number of Cattle in 2005			The Number of Sheep in 2005		Total
	Cattle	**Buffalo**	**Calf**	**Saheep**	**Goat**	
Center	25500	-	6000	380000	20000	431500
Akçakale	1040	-	234	3500	500	5274
Birecik	3000	-	1200	50000	2000	56200
Bozova	3500	-	700	20000	5000	29200
Ceylanpınar	3500	-	1000	60000	2000	66500
Halfeti	3000	-	1100	18000	4000	26100
Harran	1200	-	484	10000	2000	13684
Hilvan	4500	10	1500	70000	8000	84010
Siverek	30000	250	7000	480000	7000	524250
Suruç	61000	-	867	25000	3000	89867
Viranşehir	4316	-	2761	203053	41507	251637
Total	**140556**	**260**	**22846**	**1319553**	**95007**	**1578222**

3.2. Calculation of Sanliurfa's Potential Biogas

In this section of the study, establishing some expectations for the conversion of waste to biogas energy in Sanliurfa and determining the capacity of the site in light of these expectations. Table 3.3 shows the expectations to be used in the calculations for the Biogas site to be constructed in Sanliurfa (Batgı, S., 2006). Table 3.4 and 3.5 show the waste from the cattle and sheep in light of the expectations, the capacity of the sites to be used in the recycling and the amount of biogas produced for the center and surrounding districts.

Tablo 3.3. The Expectations to be used in the calculations of the Site in Sanliurfa (www.tarim.gov.tr)

Expectations	Values	Used Values
The daily waste of cattle	10-20 kg	15kg
The efficiency of the waste of cattle	0.033	0.033
The daily waste of sheep	2kg	2kg
The efficiency of the waste of sheep	0.058	0.058
Fermentation temperature	19-50 ^{0}C	30 ^{0}C
Holding time	30 days	30 days
The % water content of cattle waste	30	30
The % water content of sheep waste	40	40

Table 3.4. The Produced Biogas According to the Animal Numbers of 2004 and the Site Capacity (Batgı, S., 2006).

	Total Cattle	Waste Amount kg/day	Site Volume m^3	Biogas Produced m^3	Total Sheep	Waste Amount kg/day	Site Volume m³	Biogas Produced m³/day
Center	35700	535500	32130	17672	400000	800000	48000	46400
Akçakale	1443	21645	1299	715	44000	88000	5280	5104
Birecik	3810	57150	3429	1886	10210	20420	1226	1185
Bozova	5500	82500	4950	2723	12000	24000	1440	1392
C.pınar	4350	65250	3915	2154	77000	154000	9240	8932
Halfeti	4000	60000	3600	1980	35000	70000	4200	4060
Harran	1432	21480	1289	709	10000	20000	1200	1160
Hilvan	6250	93750	5625	3094	75000	150000	9000	8700
Siverek	45600	684000	41040	22572	455000	910000	54600	52780
Suruç	5700	85500	5130	2822	32930	65860	3952	3120
V.şehir	8700	130500	7830	4307	245560	491120	29468	28485
Total	**122485**	**1837275**	**110237**	**60631**	**1396700**	**2793400**	**167606**	**161318**

Table 3.5. The Produced Biogas According to the Animal Numbers of 2005 and the Site Capacity (Batgı, S., 2006).

	Total Cattle	Waste Amount kg/day	Site Volume m^3	Biogas Produced m^3	Total Sheep	Waste Amount kg/day	Site Volume m^3	Biogas Produced m³/day
Center	31500	472500	28350	15593	400000	800000	48000	46400
Akçakale	1274	19110	1147	630	4000	8000	480	464
Birecik	4200	63000	3780	2079	52000	104000	6240	6032
Bozova	4200	63000	3780	2079	25000	50000	3000	2900
C.pınar	4500	67500	4050	2228	62000	124000	7740	7192
Halfeti	4100	61500	3690	2030	22000	44000	2640	2552
Harran	1684	25260	1516	834	12000	24000	1440	1392
Hilvan	6010	90150	5409	2975	78000	156000	9360	9048
Siverek	37250	558750	33525	18439	487000	974000	58440	56492
Suruç	6987	104805	6289	3459	28000	56000	3360	3248
V.şehir	7077	106155	6370	3504	244060	488120	29288	28311
Total	**108782**	**1631730**	**97906**	**53850**	**1414060**	**2828120**	**169988**	**164031**

The important thing that can be seen from both of the tables is that it is not necessary to recycle all the waste in one center. It is feasible for the waste to be converted into energy in local sites. Table 3.6 summarizes, on a district basis, the estimated daily energy amount from biogas and the income that could be derived from the sale of that energy at market prices.

Tablo 3.6. The Estimated Energy Figures According to the Biogas Produced in 2004 and 2005 and the Equivalent YTL Values (Batgı, S., 2006).

Districts	2004		2005	
	Total Biogas Produced m³	Estimated Energy KWh/Day	Total Biogas Produced m³	Estimated Energy KWh/Day
Center	64072	301138	61993	291367
Akçakale	5819	27349	1094	5142
Birecik	3071	14434	8111	38122
Bozova	4115	19341	4979	23401
C.pınar	11086	52104	9420	44274
Halfeti	6040	28388	4582	21535
Harran	1869	8784	2226	10462
Hilvan	11794	55432	12023	56508
Siverek	75352	354154	74931	352176
Suruç	5942	27927	6707	31523
V.şehir	32792	154122	31815	149531
Total	**221.952**	**1.043173**	**207.081**	**1.124.041**

4. CONCLUSIONS

A lot of research needs to be made on many issues for the Biogas production technology to be successful in GAP Region, especially in Sanliurfa. The studies made until today have enabled a certain amount of knowledge accumulation but it is not enough. The priority in research should be given to the following topics;

- The adaptation of the construction of Biogas Sites to regional conditions,
- The determination of cheap and regionally available insulation materials,
- The development of biogas powered vehicles,
- Exploring the possibility of obtaining biogas from plant waste,
- Research on the effects of remains fertilizers from Biogas sites on plant production and soil,
- The development of the mechanism for the transportation and distribution of remains fertilizers from Biogas sites,
- The favorable effects of Biogas on environmental health,
- The socio-economic effects of the Biogas production technology on the rural areas.

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ENVIRONMENTAL POTENTIALS IN IRAN FOR DEVELOPING RENEWABLE ENERGY RESOURCES

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ran is a wide country in southwest Asia and it is regarded as one of the richest countries in the world which holds about 8.5 percent of world's crude oil deposits, 15 percent of world's Natural Gas and a huge volume of world's coal deposits. This country is a member of OPEC (organization of petroleum exporting countries) with the production of 3.5 million barrels of oil per day.

Daily increase in energy consumption due to: 1) population and economic growth, 2) governments' rigorous dependency on oil incomes, 3) environmental threats, 4) increase in fossil fuel consumption, and 5) considerable potentials such as wind, water, solar and geothermal renewable resources in the country; has led the government to consider plans on Renewable Energies development in a 10 or 20-year prospect. If these plans' objectives are achieved, a great amount of energy production will be allocated to renewable resources.

1. INTRODUCTION

Iran with the area of 1648000 sq km and a population of nearly 70 millions in the south-west of Asia is located between Geographical latitudes of 25°3′ to 39°47′ north and longitudes of 45°5′ to 63°18′ eastward. More than 50 percent of its area is mountainous, 25 percent deserts and the rest are fertile lands. Along the southern margins of the Caspian Sea, a humid climate dominates the region and precipitation is relatively high. As a result, thick forests cover the northern sides of Albourz Mountains. Western parts of Iran have a Mediterranean climate and southern regions' climate is hot semiarid. Inner parts of Iran have also got a hot-dry climate.

Considering energy resources, Iran is one of the richest countries in the world by having 90 billion barrels of crude oil (8.5% of world's oil deposits) , 24 trillion cube meters of natural gas (15% of world's natural gas deposits), and 13 billion tons of coal. Although the country's wideness and its geographical location in arid and semiarid belt have forced a lot of environmental restrictions and difficulties for its inhabitants, it has offered them good potentials. Wide variety of researches shows that in Iran there are excellent potentials for developing renewable energies. At the present time, only 50 megawatts of electricity is produced by non-fossil fuel which is only near to 0.2% of the total generated electricity in the country, however environmental capabilities for developing new energy resources are far beyond that.

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Despite of having huge fossil fuel resources and deposits, Iran is one of the countries that have implemented plans for improving the efficiency of energy consumption and optimizing the energy consumption in a variety of sectors. Of these efforts are: 1) Rational and gradual increase in the price of energy bearers, 2) approbation of rules and regulations related to optimization of fuel consumption in buildings, industries, transportation, as well as 3) supporting the researches related to Renewable Energy Resources.

In the 3rd constitutional Development plan of the Islamic Republic of Iran (2000-2004) the government is seriously responsible for allocating financial facilities to solar water heater manufacturers, supporting researches and producers in the field of solar water heaters, solar ovens, and wind turbines. In addition, the government is liable for making clear the socio-environmental advantages of using new energies through text books, mass media and press in order to boost the public awareness towards irregular consumption of fossil fuels and advantages of renewable energies.

2. RENEWABLE ENERGY RESOURCES IN IRAN

With regard to intellectuals and experts warning about fossil fuel resources run-out in the world within the next 100 years, those countries which have difficulty in energy security will obviously encounter crisis and depression. At that time, modern countries would be probably those who would have applied the technology wisely and recognized and controlled the new energy resources. Accepting the fact that our country will face this upshot completely reveal the necessity of applying all the available facilities to achieve the sources of renewable energy. Conducted surveys show that Iran has good potentials for developing renewable energy resources such as solar radiation, wind ,waves, water power and geothermal which will be briefly discussed in the following section.

2.1. SOLAR ENERGY

Iran is located on a belt called shining Sun. The radiation factor rate in Iran is estimated 19.24 Mega joules per square meter which is a big number. Many parts of Iran have the sun in their sky about 300 days a year. The average sunny hours in Iran is more than 2800 hours annually which in some central parts it reaches to 3200 hours. Coefficient of air clearance is high in many cities in Iran. The measure of this coefficient in weather stations nationwide is rated between 0.36 and 0.69 which is a good potential in respect of radiation rate[9]. The annual average of received solar energy in Iran is 140 to 220 kilocalories per square centimeter and the daily produced solar energy in Iran is estimated from 4.5 to 6 kilowatt-hours per square Meter.

Statistics show that vast parts of Khorasan, Fars, Yazd, Tehran, Isfahan, Semnan, Sistan & Balouchestan,and Kerman are very suitable for developing solar energy resources[2]. To profit from solar energy advantages as an unlimited energy resource in the country, new energies development center in Iran's nuclear energy organization, continuing the policy of producing electricity from renewable resources, has conducted efforts for producing sun-generated electricity. The first sun-generated electricity site in Iran with the annual capacity of 5 kilowatts started the operation in Dourbid, Yazd in 1993. Iran's second Photovoltaic site

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with the annual capacity of 27 kilowatts was also established in Hoseinian village, Semnan in 1998. Although 5 solar power plants have been constructed so far in Yazd, Khorasan, and Tehran, with regard to their relatively heavy costs, production of sun-generated electricity has not yet been generalized. Future projects in the field of solar energy are listed in table1 [4].

According to data in table-1, up to 2005, 101.25 megawatts sun-generated electricity will be produced in the form of complex cycle with steam plants. At the present time regarding the subsidized low-price Natural gas used by power plants, the cost of producing electricity in these power plants is cheaper than solar power plants. Analysis show that the cost for each kilowatt of sun-generated electricity is estimated between 13.6 and 14.3 U.S cents, however this cost for fossil fuel power plants is 5.9 to 6 cents. Despite that, in Iran, electricity production by fossil fuel power plants is more cost-effective than that by renewable resources like solar energy, the environmental consequences are very crucial. In case of fuel price adjustment in Iran in the future, operating such resources will completely have an economic feasibility [10].

2.2. WIND ENERGY

The background of using Wind energy in the world goes back to more than 5000 years ago when the ancient Egyptians equipped their boats with sails, using wind power to sail along the Nile River. Around 2200 years ago, Persians invented the first windmills. In the West, applying wind energy for grinding grains goes back to 12th century A.D. hundreds of years later, the Dutch thought about using wind energy for pumping out water from the sea. Between 1930 and 1940, hundreds of wind turbines were made for producing electricity in the United Sates. In the early 1950s with developing electric central networks (power grids) and expanding them towards the remote sites in the country, electric power market faced a depression in the U.S. yet, after 1973 Oil embargos imposed by OPEC and a global energy crisis; wind energy caught the attentions again.

Wind energy potentials in Iran have estimated about 6500 megawatts which is 20 percent of total energy generation in the country[10]. result of studies on Iran's wind capabilities for electricity production and terrain suitability in order to constructing wind farms are as follows:

Region 1: Tehran, Zanjan, Semnan, and Markazi   16128 square kilometers
Region 2: East and West Azarbaijan and Ardabil   5000 square kilometers
Region 3: Mazandaran and Golestan   3780 square kilometers
Region 4: Gilan, Yazd and Isfahan   14800 square kilometers
Region 5, 6: Khorasan   12000 square kilometers
Region 7, 8: Sistan va Balouchestan   35000 square kilometers
Region 9: Hormozgan   15000 square kilometers
Region 10: Fars, Kohkiloyeh va Boier Ahmad and Khouzestan   14794 square kilometers
Region 11: Kordestan, Lorestan, Ilam and Tehran   7920 square kilometers

According to mentioned studies, the total area of suitable locations for placing wind farms is estimated 124423 square kilometers which is 10 percent of the total area of the country[3]. the first experience of installing and using wind turbines in Iran goes back to 1994. Two cluster arrays of 500-kilowatt turbines were installed in the regions of Manjil and Roudbar in 1999. These turbines have generated more than 1.8 million kilowatts of electricity. The average velocity of wind in the region is estimated 15 meters per second over a period of 3700 hours in a year and for manjil during 3400 hours in a year the average velocity of wind is 13 meters per second[6]. After these successful experiences, in 1996 a contract for installing 27 wind turbines was signed which were to be constructed in Manjil, Roudbar and also in the 3rd wind farm in Harzvil (figure 1). There are totally 21 wind turbines (one with the capacity of 500kw, five with 550kw, and fifteen with 300kw capacity) installed in Manjil. In Harzvil there's also a capacity of 21 wind turbines to be installed, yet there are only two turbines established so far. In Roudbar one 500kw and three 550kw wind turbines are connected to the network. A project for installing a wind farm with the generating capacity of 1.23 megawatts has been started since 2001.

In May 2004, a wind power plant has started the operation in Binaloud, Khorasan.. The total capacity of installed wind turbines in Iran has reached 10.5 megawatts. Meanwhile Iran is 28th among those 46 countries which produce wind generated electricity. Authorities are hoping to reach the total capacity of wind generated electricity in Iran up to 60 megawatts by the year 2004. Estimations on generating electricity for the year 2005 are presented in table 2. At the present time, the contributions of wind generated electricity among other sources of generating electricity are as follows:

Steam: 43.81 percent, complex cycle: 21.5 percent, natural gas: 19.94 percent, diesel: 4.76 percent, water: 9.95 percent, wind: 0.04 percent

Table1: SOLAR ENERGY PROJECTS UP TO 2005 IN IRAN [11]

Capacity	Project
250 kilowatts	Taleghan complex solar power plant
100 megawatts	Yazd complex solar power plants
1000 kilowatts	Central collector system

Table 2:WIND GENERATED ELECTRICITY PRODUCTION ESTMATION FOR THE YEAR 2005[11]

Turbine type	Project
300 kw	3.3 MW
550 kw	5.5 MW
660 kw	6 MW
660 kw	25 MW
660 kw	60 MW
660 kw	100 MW
Total	199.8 MW

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Figure 1: one of the 600 KW turbines that installed in Manjil
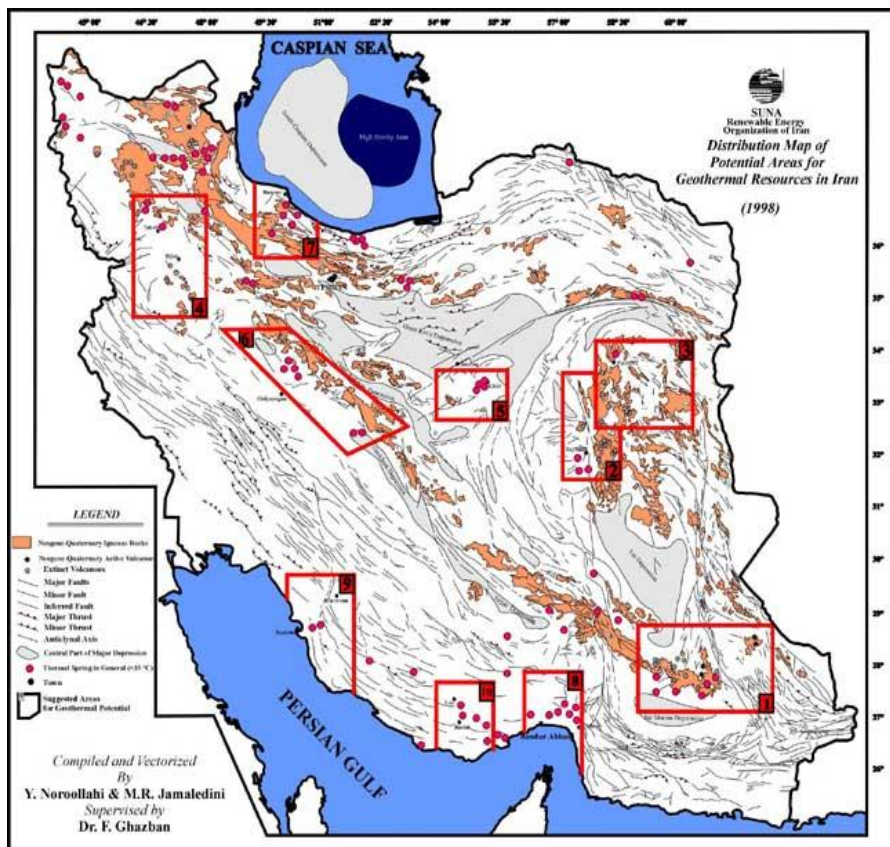
Figure2: Potential Areas for Geothermal Resources in Iran [5]

2.3. GEOTHERMAL ENERGY

Nowadays, there are about 7000 megawatts of geothermal electricity installations across the globe. In addition to electricity production, geothermal energies are used for heating purposes. The United States, Italy, Iceland, Japan, New Zealand, and Turkey have been using geothermal energy for electricity generation since 1975. Capability studies have been conducted in the field of producing electricity from geothermal energy reservoirs in Sabalan, Khoui, Makou, and Damavand which led to install a 100-megawatte geothermal power plant in 2004 in Meshkin shahr, Ardabil[12].Primary study on this development plan has been carried out by an Italian company "ENEL ", in 1975. Analysis shows that this area has the generating capacity of 1200 megawatts of electricity. In addition to the mentioned regions, studies concerning geothermal energies have also been carried out in 10 other regions which are mostly located on Orumieh-Taftan volcanic belt. These regions have a vast capability of generating thousand megawatts of geothermal-generated electricity (figure 2)

2.4. WATER POWER

Existence of large permanent rivers in Iran has offered the opportunity for building Dams and hydroelectric power plants. For instance one Japanese research company has confirmed that there is a capability of building 13 dams over the Karoon River. With a view to discharging enormous amount of water through rivers around the country, by building small Dams, water lost can be prevented, recreational activities will develop and a higher percentage of total production in the country can be allocated to hydroelectric power. At the present time, aside from building the total of 3020 megawatts hydroelectric Dams, another 15000 megawatts of hydroelectric power plants are either under study or construction over karoon, Karkheh, and Dez sites. Studies and analysis shows that in addition to these all, there's also the capability of building 206 megawatts of medium-sized as well as 4200 megawatts of small-sized hydroelectric power plants across the country.

2.5. TIDAL ENERGY, SEA WAVES, BIOGAS AND BIOMASS

Iran with having hundreds of kilometers of costal margins, considerable resources of animals and plants, has suitable potentials for developing other renewable energies such as tidal energy, sea waves, biogas and biomass. At present, due to abundance of other energy resources particularly inexpensive fossil fuels, the mentioned energy resources have not yet been developed that much. In the field of biogas, a unit of biogas reactor with the volume of 65 cube meters has been designed and installed in Mahdasht institute of agriculture in Karaj as well as an experimental biogas reactor with the volume of 13 cube meters in Kish Island. Although several other studies are under way about each of theses energies independently, no exact commentary is possible as long as the studies outcomes are not yet released.

3. IRAN'S MOTIVATIONS FOR DEVEOPING RENEWABLE ENERGIES

Iran has a huge volume of fossil fuel reserves, though economical and environmental effects related to vast consumption of invaluable fossil resources force the authorities to use these resources cautiously and consider alternative energy sources for fossil fuels seriously. It is evident that replacing profuse and inexpensive fossil fuels with other energy resources require convincing explanations. In the following we are going to discuss all the related causes and incentives under two categories of 1) economical and 2) environmental reasons.

3.1. ECONOMOCAL MOTIVATIONS
3.1.1. GOVERNMENTAL INCOME INCREASE THROUGH EXPORTING MORE FOSSIL FUEL

7-8 percent of increase in annual rate of energy consumption in various sectors especially in residential consumption due to: 1) population growth and higher standards of life in cities, 2) government policies toward using renewable energy sources for recovering part of growing demands in energy and 3) reserving fossil fuels for more export and income increase, all and all have forced Iran's government to strive acutely for replacing fossil fuels with renewable energies. As mentioned earlier, 80 percent of Iran's income depends on oil and Natural gas exports. Daily oil production in Iran is 3.5 million barrels which 1.2 barrels of that are for domestic consumption and the other 2.3 barrels are for export. Generating energy through renewable resources would provide more chances to export fossil fuels like crude oil. Increasing export rate will increase countries' income with respect to high price of oil and natural gas in the world. The excessive income would be again used in developing energy resources and other ongoing projects which suffer from lack of finance.

3.1.2. DECREASING SUBSIDIES AND INCREASING GOVERNMENTAL INCOME

Iran's government spends considerable sums of governmental income on paying energy subsidies to the nation and also to most of the power plants which use natural gas as their fuel. It's estimated that the government pays 3 billion dollars (11 percent of national pure production) for energy subsidy. Low price of fuel bearers compared to other countries, led to fuel smuggling, energy lavishness and considerable waste of national capital. Replacement of renewable sources and developing such energies with the original costs will improve fossil fuel export and increase income and investments in the energy sector.

3.1.3. SUPPLYING ENERGY FOR REMOTE VILLAGES AND SCATTERED TRIBAL COMMUNITIES

Most part of rural population live in low-density villages (more than 50 percent of villages in Iran are inhabited with less than 20 families.) and tribal communities are regularly traveling between summers and winter quarters. As a result, transferring electrical energy and transporting fuels face many difficulties and heavy costs. In case of developing renewable energies such as solar, wind, geothermal and water power, supplying light and heat demands for scattered communities, pumping water from wells and rivers for villages, seasonal moving tribes, wild life, etc. will cause great deals of savings in subsidized energy resources and therefore increase in governmental income.

3.1.4. OPTIMIZING ENERGY CONSUMPTION NATIONWIDE

Low price of energy in Iran causes soaring energy consumption and wasting national resources. For instance the price of energy in Iran is one third of that in turkey. Low price of energy bearers in Iran causes great deals of various fuels - gasoline and gas oil- to be smuggled away from our geographical borders. Meanwhile, energy consumption in buildings, transportation, residential and commercial sectors are high, so great amounts of national income are wasted. Reasonable increase in prices as well as publicizing the importance of fossil fuels and environmental effects due to over consumption in addition to attracting the public attention toward the importance of renewable energies will cause decrease in energy consumption in different sectors and as a result investment opportunities in a variety of projects will be provided.

3.2. ENVIRONMENTAL MOTIVATIONS

Carbon dioxide spread in Iran from 1980 till 1998 with 240 percent growth, from 32.1 million tones in 1980 has reached 79.4 million in 1998. This amount of carbon dioxide has been generated from 6 sources which power plants with 27.6 %, residential buildings with 23.5%, industries with 23.4%, transportation with 15%, commercial buildings with 6% and agriculture with 4.5% are ranked from 1st to 6th. With the respect of carbon dioxide spread, Iran is ranked on the 21st place in the world.

Population growth, economic boost and life standard development in Iran have caused increase in energy consumption and as a result increase in carbon dioxide spread in the atmosphere. For instance, Tehran is one of the most polluted cities whereas 1.5 million tones of different polluters especially carbon-monoxide is spreading in the air.

With respect to statute 50 of Iran's constitutional law which states that the environment belongs to all the people in the country and forbids all activities that are harmful to the environment, decrease in fossil fuel consumption with respect of their harmful effects to the environment and replacing them with renewable energies are regarded major responsibilities for authorities.

4. SUMMARY AND CONCLUSION

Iran, with having a deposit of 90 billion barrels of crude oil (8.5 percent of world deposits) and 24 trillion cube meters of natural gas (15pecent of world deposits) and 13 billion tones of coal deposits, is one of the richest countries in the world in respect of energy resources. In addition to having huge resources of fossil fuels such as oil, natural gas and coal, geographical features and locating on the world's dry-semi dry belt and Alp-Himalya volcanic belt as well as mild climate advantages, has other considerable environmental capabilities. Studies show that there are suitable potentials for developing renewable energies in Iran. Although at the present time, only 50 megawatts of electricity is produced from renewable energies (0.2 % of total electricity production of the country) however, the country's capabilities are far beyond that.

The authorities' estimation in a 10 -year time scale showa that the contribution of the electricity generated from renwable resource will reach to 3 percent of total electricity production in the country. Although iran with having vast deposits of fossil fuels can not be compared to many other countries with limited and expensive resources of fossil fuels, it has plans for producing energy from renewable sources to achieve its long term objectives.

The sun shines unsparingly over this land all the year long. Every square merter of this land receives 4.5 to 6 kilowattes of energy. Studies shows that in most parts of iran the rate of sunny houres is more than 2800 hours and in many central parts it reaches to 3200 hours. Although the potentials for producing Photovoltaic electricity in iran are much, only 101.5 megawattes of solar electricity are currently produced in the country. A solar power plant with the generating capacity of 17 megawattes is about to be operated.

Of other invaluable environmental potentials is the existence of regular and relatively strong winds in some parts of the country. In recent years with the growing global concerns toward new energies, wind energy as an alternative for fossil fuels has caught the attention of authorities in iran. As a result, several wind-generated electricity installations in Manjil, Roudbar, Harzvil, in the north, and Binaloud and Dizabad in north-east of the country have been operated. The total generating capacity of the country as of 2005 reaches to about 200 megawattes but at the present only about 10 megawattes are generated from wind energy.

The existence of semi-active volcanoes scattered within Iran has caused the formation of too many hot springs which have been used by people since long time ago as treatment and recreational facilities. (such as Sarein hot springs in Ardabil province) in recent years, by signifying the usage of geothermal energies as generating source of electricity and other direct utilizations such as central heating systems in buildings, these sources have also gained such importance in iran. Since 1975 studies have been conducted related to possible production of electricity from geothermal sources in north, north-west and north-east of the country by an Italian company, ENEL. Reports indicate that in 2004, the first geothermal generated electricity power plant operated in Meshkin shahr, in Ardabil province with the generating capacity of 100 megawattes. Studies are still underway in Damavand, Taftan, Takab, Khoui, and Makou.

Iran has also good potentials for developing hydroelectric energy. The existence of permanent and rich big rivers such as karoon, Karkheh, dez, etc. has provided the opportunity to utilize hydroelectricity. Nowadays, only 10% of total electricity production in the country is produced by hydroelectric stations. A big power plant with the generating capacity of 15000 megawatts is under construction over karoon, Karkheh and dez. In addition, about 5000 megawatts of medium and small-sized installations are under construction.

For developing tidal energy, seawaves, biogas and biomass there are good potentials in the country, but no fundamental considerations have been done yet.

In fact there's a difference in Iran's energy status compared to other countries across the globe due to having immense deposits of oil, gas, coal, uranium, etc., energy price and its economical outcomes inside the country. The strongest incentive of countries for utilizing alternatives for fossil fuels is lack of fossil fuels in these countries and their high price in international markets, for renewable sources in these countries have competitive prices with fossil fuels, thus the price of fossil fuels may increase excessively and renewable sources cost cheaper. Other incentive of these countries for replacing fossil fuels with renewable energies is harmful environmental effects of fossil fuels which have been considered seriously by scientific communities, political and environmental groups in these countries.

This subject is somehow different in Iran. Iran with having great amount of oil, gas and coal deposits in the world has vast inexpensive resources of fossil fuels. Paying energy subsidies in recent years, have artificially kept the prices of energy barriers so low. Then it seems that there should be stronger motives and incentives for Iran to invest considerably on renewable sources. However, wasting national resources abundantly which not only belong to the present generation but also to future generations, investing depression in various economical sectors due to lack of necessary financing, population growth and soaring rate of unemployment among younger generation, government's inability for increasing export due to increase in domestic consumptions and as a result increasing paid subsidies, are the most important economical incentives for Iran to consider renewable energies. On the other hand, the soaring spread of carbon dioxide and its environmental effects which are rapidly growing, encourage authorities to plan for utilizing energy resources productively which are the absolute right of people either current generation or future generations. Meanwhile take fundamental steps to consider existing potentials in the field of renewable energy development. In this way, there are great duties on press and mass media as well specially radio and television. All the cultural and advertising centers in the society are responsible to play more active role for awakening public awareness and introducing position and importance of fossil fuels as well as the necessity for serious considerations toward renewable energies.

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ENVIRONMENTAL RENOVATION OF THE SOLAR HOUSE IN MIDDLE EAST TECHNICAL UNIVERSITY WITH COMPUTER-BASED ANALYSIS AND DESIGN TECHNIQUES

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The Solar House of METU (Middle East Technical University) was designed at the beginning of 1980s with the aim of exhibiting the role of solar energy in the thermal and energy balance of buildings. After 24 years from the time of its opening day, the solar house was found to be in complete obsolescence in terms of solar energy utilization. Being in such an unfavorable condition, the solar house became one of the noticeable examples of buildings causing considerable threats to the environment with their excessive CO_2 emissions due to the use of nonrenewable energy sources. A renovation study was initiated by METU – UMA (University Members Association) which was accommodating the solar house. This paper summarizes the results of the first phase of this renovation study in which computer-based environmental analysis and design techniques were extensively used so as to quantitatively evaluate the existing conditions prevailing in the solar house and provide recommendations. Environmental monitoring studies were conducted with on-site observations and measurements (of temperature and humidity). Results were then transferred to computer medium to create environmental simulation models on which thermal comfort ranges and air-conditioning loads of the solar house were predicted. Finally, necessary recommendations for the renovation study were provided based on these predictions. With this study, possible uses and subsequent advantages of computer-based environmental analysis and design techniques on renovation of existing buildings are revealed.

Keywords: Environmental renovation, Computer-based analysis and design, Solar house.

1. Introduction

It is no doubt that one of the major challenges facing architects today is the development of a more sustainable and ecological built environment. As the applications of energy conscious building design have been in the forefront of building science research for the recent years, the growing awareness of global and local environmental issues has made their adoption a matter of more immediate concern. In this respect, providing a high standard of occupant comfort and environmental quality with minimum use of conventional (non-renewable) energy sources becomes the main objective of energy efficient, environmentally sustainable approach to building design [11]. This is achieved with the intentional manipulation of siting, building form, internal planning and constructional parameters of a building in order to meet the predefined desirable targets of environmental performance and occupant comfort. Such kind of an approach to building design, in turn leads to a reduction in the emission of greenhouse gases (of which CO_2 is proved to be the most harmful) and other environment degrading substances [10].

Design of new buildings with environmentally sustainable approaches mentioned above will certainly be a vital step in the preservation of the current state of natural and ecological systems for the future generations through attenuating global warming with minimum expenditure of non-renewable energy sources. However, the negative environmental and energy conditions of the existing buildings, which are the legacy of our previous generations, should not be underestimated. The buildings that were designed to be dominated by HVAC (Heating Ventilating and Air Conditioning) systems to provide thermal comfort conditions for indoors, extensively rely on the consumption of non-renewable energy sources. As a result, renovation and retrofitting of such buildings become as important as designing new ones with environmental sustainability issues in mind [1].

From this point of view the material of this study which is a 24 years old solar house in the campus of Middle East Technical University (METU), Ankara, Turkey, constitutes a noticeable example for an energy conscious building which was designed to be a demonstration place of the possible utilization techniques of passive solar energy for space heating purposes. On the other hand, currently being in complete obsolescence, the solar house of METU becomes also a noticeable example for buildings with negative environmental impacts (such as excessive levels of CO_2 emissions due to use of non-renewable energy sources for space heating and cooling). Since, apart from its malfunctioning solar energy utilization system, the solar house could not provide occupant comfort conditions for indoors and consequently yielded considerable energy consumption as opposed to its ideology of existence [3]. Under these circumstances, METU – UMA (University Members Association, Prof. Dr. İnci Gökmen as the head) which was using the solar house for the last four years initiated a renovation study with the objective of retrofitting this place back to its original conditions (both physically and functionally). The renovation project is then developed through a collaborative study conducted by an interdisciplinary team whose members were from the Department of Physics METU – Prof. Dr. Ahmet Ecevit, Mechanical Engineering METU – Dr. Derek Baker, Architecture METU – Françoise Summers and Department of Architecture Gazi University - Ömer Tuğrul Karagüzel. Undergraduate students from those departments were also involved in the renovation project with their term project proposals [3].

This paper summarizes the results of the first phase of the renovation activity, which constitutes the contributions of Department of Architecture, Gazi University to the other studies of the collaborative team listed above. In this phase existing environmental conditions prevailing in the solar house were quantitatively evaluated through the use of computer-based environmental analysis techniques including the use of a dynamic thermal simulation program named ECOTECT v.5.20 [6]. These were supported with environmental monitoring studies which included on-site observations and measurements. On-site observations were conducted through a walk-through survey so as to detect existing physical conditions and altered geometry of the solar house. On the other hand, the aim of on-site measurements was to reveal the current environmental condition of the solar house through systematic recordings of dry-bulb temperature (^{o}C) and relative humidity (%) with data-loggers. Environmental simulation models were then created with ECOTECT v.5.20. through the use of information obtained during observations and measurements. The results of these simulation models were human thermal comfort ranges (indicated as temperature) and predictions (indicated as

Predicted Mean Vote - PMV and Percentage of People Dissatisfied - PPD values) and HVAC loads (indicated as kWh/m^2) for space heating and cooling. Investigation of environmental and energy profile of the solar house through measurements and simulations made it possible to provide necessary recommendations for the renovation activity. The recommendations that were acquired through quantitative assessments based on computer simulations and their architectural interpretations, constitute alterations in the envelope materials of conservatory space of the solar house as well as its roof and main spaces. Recommendations on the existing roof system of the solar house with air-heating solar collectors were also provided in this study.

2. History of the METU Solar House

After designed by an architect named İbrahim Canbolat, construction of the METU solar house was started as a summer practice for the students of architecture at the year 1975. The construction process was finished after five years from its start at the end of 1980 (Fig. 1).
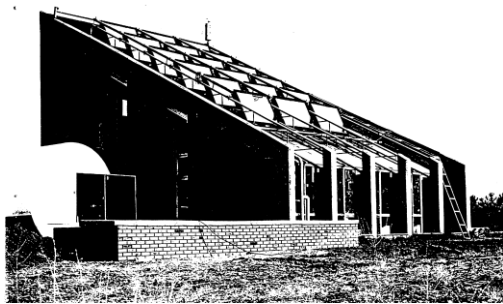
Fig. 1. Photo of the METU Solar House at 1981 [2].

At those times, the basic objective of constructing such a building was providing the university with an experimental laboratory, which could be used for research activities related with solar energy and its possible utilization in buildings. This should first be achieved with the solar house itself. So this building was designed to utilize solar energy as much as possible through the use of integrated passive and active solar energy systems. A large south facing conservatory, increased south-facing glazing areas for solar energy intake and dense brick walls (with high thermal storage capacity) to store this valuable energy were the elements of passive system of the solar house. Active system constitutes three main elements. These were water heating solar collectors, a tank that was storing the heated water in these collectors and a set of radiators that enabled emission of heat to the indoor spaces in the solar house [2]. After some university members, who were responsible for the operation and maintenance of the solar house, left the university, nobody took care of the building for years. As a result the solar house could not perform its function due to the lack of support and maintenance till the year of 1991. At that year, a group of academicians (who were coordinated by F. Nur Demirbilek) from the departments of architecture and physics decided to handle the flag and they prepared the first renovation project for the METU solar house.

The main objective of the first renovation project was not only to repair deteriorated parts of the building but also to change the existing active solar energy system to a hybrid one, which was dominated by some passive solar elements. Some of the achievements that were realized with the first renovation project of the solar house can be briefly listed as follows [2]:

- Thermal resistance of roof section was increased with additional thermal insulation materials; 50mm Extruded Polystyrene (EPS),
- The roof was redesigned to act as an air-heating solar collector so the water heating solar collector system (collectors, storage tank and radiators together with circulating pipes) which was found to be inefficient and not properly functioning due to some leakage and freezing problems was completely removed,
- The required duct system for the air heating solar collector was installed,
- The floor was rearranged with embedded air ducts to provide transfer of heat from ground level,
- A drought lobby was built at the entrance,
- Thermal insulation (50mm EPS) was applied to north, east and west walls,
- All the fenestrations of the solar house were fitted with double-glazing units with weather proof stripping,
- Conservatory was rearranged by changing the type and position of its fenestrations.

At the very beginning of this new renovation study (2004), it was observed that air heating solar collectors and other systems constructed during 1991 renovation phase, were not functioning properly. This was due to material deteriorations in the solar collectors (at the glazing, selective surfaces and air ducts) and malfunction of air distributing pump. Consequently, expected environmental conditions inside the solar house could not be achieved. Furthermore, when this system failure was combined with poor envelope material quality due to deteriorations, the result was naturally an inhabitable environment which could only be sustained with extensive use of air conditioning systems using conventional energy sources instead of renewable ones [3].

3. Methodology

The first phase of the renovation project (provision of recommendations) of the solar house was realized depending completely on the results of a study which could be briefly defined as environmental performance assessment of buildings with experimental and comparative analysis. This methodology has four main stages. These are observation and measurement followed by calculation and simulation. Observation and measurement are there for environmental monitoring of building case under investigation. This will make it possible to determine environmental conditions inside the building and to produce necessary technical data for the next stages [3]. Calculations and simulations are required to quantitatively evaluate the environmental performance of the building so as to provide recommendations for renovation studies (as in the case of METU Solar House project).

They can also be used to make quick, objective and reliable comparisons between different design options in mind or to compare different building cases in different architectural context or climatic locations [11]. It should also be noted here that another inherent relationship between these two couples of environmental analyses is that the actual field data obtained in the first couple (observation and measurement) can be used to calibrate the virtual and mathematical models created in the last couple (calculation and simulation) [11].

4. On-site Observations

On-site observations were the first step of the renovation study. They were performed in two stages. First stage was the evaluation of architectural projects and documentations of the building together with constructional specifications. All the evaluations were carried out using the RFP/AFP (Research Funding Project – Araştırma Fonu Projesi) report, which was released after the first renovation project at the year 1994. The intention here was to identify geometries and internal layouts, construction components, window areas and other parameters derived from site and floor plans, sections and construction details. Second stage, which could also be named as walk-through stage, included visits to site of the building. This stage of the study provided invaluable information about existing situation of the solar house. Fig. 2 shows a number of architecture students taking external measurements of the solar house so as to detect altered geometry of building elements.

Fig. 2. Students of architecture taking external measurements from the solar house.

These measurements were later used to develop geometric models of the solar house in computer medium. With on-site observations including interviews with the occupants, necessary information about occupancy patterns, building schedule for occupancy and air-conditioning together with number, type and operation schedule of appliances, were collected. Such kind of information was used to define operational profile inputs for thermal simulation models of the solar house. In addition to these, such observations were very useful for detecting alterations of constructional and operational parameters of the building case which was under consideration.

5. On-site Measurements

On-site observations were followed by on-site measurements with data-loggers (Fig. 3), which performed systematic recordings of dry-bulb temperature (^{o}C) and relative humidity (%) from inside and outside of the solar house over a period of days between 12 March and 03 April 2004. This was found to be the most significant stage of environmental monitoring studies conducted in this renovation study. Data obtained through these measurements were very useful for assessing the existing thermal environment inside the solar house. Besides, the measurements of temperature and humidity provided reliable technical data on indoor environmental conditions of the solar house without which its performance could only be discussed in hypothetical terms.

Fig. 3. A data-logger used during the environmental monitoring activities.

6. Analysis of the Thermal Environment Inside the Solar House

In this section some interpretations of existing thermal environment prevailing inside the solar house were made. Recordings of dry-bulb temperature and relative humidity levels from data-loggers were first structured into a chart format and relevant evaluations were made accordingly. The same recordings were then transferred to a computer-based interactive psychrometric chart; PSYCH TOOL [7] and consequently human thermal comfort analyses were conducted.

6.1 Analysis of Dry-bulb Temperature and Relative Humidity Levels with Charts

Fig. 4 shows the chart on which analysis of dry-bulb temperature (^{o}C) taken by data-loggers in a five days period between 12th of March and 17th of March 2004 was conducted.
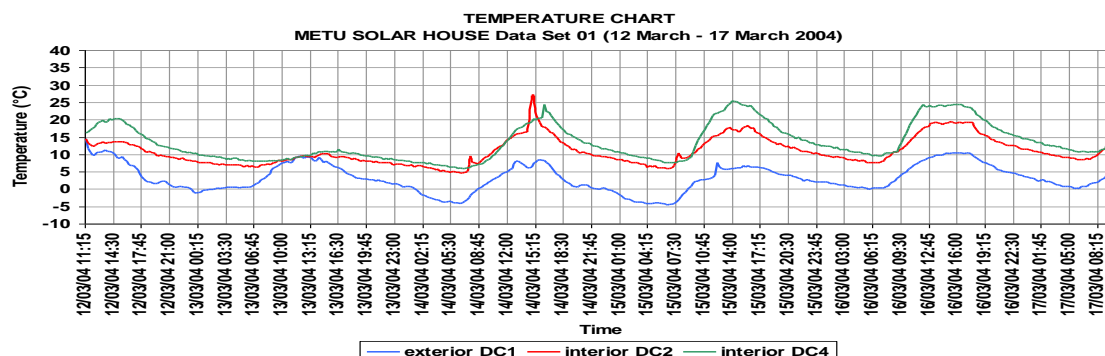
Fig. 4 Temperature chart showing the results of measurements taken wit
h data-loggers.

This chart was prepared by loading the raw data from data-loggers to computer medium and structuring them in MS Excel. In this chart, time parameter runs in the X-axis while the temperature runs in Y-axis. Levels of inside temperatures are indicated by a red colored line (for ground floor) and a green colored line (for mezzanine floor). In the same chart, outside temperatures (indicated by a blue colored line) are also given so as to construct correlations between temperature fluctuations occurred at outside and inside spaces. The temperature chart given at Fig. 4 clearly shows that temperature fluctuations inside the solar house nearly follow those of outside ambient temperature. Furthermore, peak indoor temperatures were achieved nearly at the same time with the outside. These analyses indicate that the solar house do not have adequate thermal inertia (heat storage capacity) so as to reduce the effects of temperature fluctuations (attenuating the decrement factor) inside the building. This results in considerable differences between day-time and night-time temperature levels and consequently yields an indoor space with low human thermal comfort conditions unless auxiliary mechanical heating and cooling systems (air-conditioning systems) are extensively used. Fig. 5 shows completely the same type of chart as the previous one but data used here belong to relative humidity levels (%) at inside and outside of the solar house between 12th and 17th of March 2004. It can be seen from the chart that indoor humidity levels show considerable fluctuations while outside levels appear to be relatively marginal. This situation is considered to be due to the operation of the air-conditioning unit which changes wet-bulb temperature (^{o}C) levels at inside, so the relative humidity levels. However, for the period between 14th and 17th of March this effect could not be observed, since this period constitutes the weekend days and the solar house was neither occupied nor heated in those days. This analysis also indicates that without the operation of an air-conditioning system inside the solar house, the effects of outside weather conditions are also prevailing at inside spaces. This is one of the significant indications of the inhabitable environment created by the solar house in its current situation.
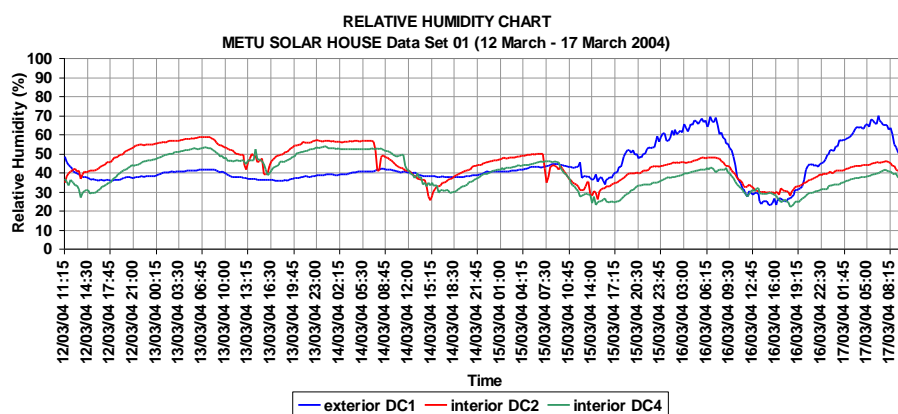
Fig. 5 Relative humidity chart showing the results of measurements taken with data-loggers.

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6.2 Thermal Comfort Analysis with a Computer-Based Interactive Psychrometric Chart

So as to further investigate existing thermal environment inside the solar house, recordings of dry-bulb temperature and relative humidity levels were transferred to a computer-based psychrometric chart (PSYCH TOOL). With the help of this tool, an analysis of human thermal comfort conditions inside the solar house was conducted. Table 1 and Table 2 given here show the results of two single day thermal comfort analyses conducted to monitor existing environmental conditions inside the solar house. In each table dry-bulb temperature, mean radiant temperature and relative humidity levels are given for specific hours of a day and thermal comfort ratings of PMV (Predicted Mean Vote) and PPD (Percentage of People Dissatisfied) are calculated according to these levels and according to certain effective parameters (such as clothing level, human metabolic activity, inside air movement). Necessary calculations for thermal comfort analysis are performed by the computer-based program named as PSYCH TOOL [7].

Table 1. Thermal comfort analysis for the solar house at 13th of March 2004.

METU SOLAR HOUSE THERMAL COMFORT ANALYSIS					
Single Day Analysis (13 March 2004)					
Clothing Level:	1.3 Clo	Light Business Suit			
Activity Rate:	1.1 Met	Sedentary Activity			
Air Speed:	0.1 m/s	Not Noticeable			
Date/Time	Dry Bulb Temp	Radiant Temp	Relative Humidity	PMV Rating	PPD
dd/mm/yy	*°C*	*°C*	*%*	*(+3/-3)*	*%*
13.03.04/00:00	8	10	55,1	-3	98
13.03.04/03:00	7,2	9,2	56,5	-2,6	95
13.03.04/06:00	6,7	8,7	57,9	-2,7	96
13.03.04/09:00	7,5	9,5	54,6	-2,6	95
13.03.04/12:00	9,3	11,3	49,5	-2,1	81
13.03.04/15:00	10,1	12,1	46,8	-2	77
13.03.04/18:00	8,5	10,5	49,5	-2,3	87
13.03.04/21:00	7,7	9,7	56	-2,5	94
PMV:	Predicted Mean Vote				
PPD:	Percentage of People Dissatisfied				

The results (Table 1) reveal that throughout the investigated day (13th of March 2004) human thermal comfort conditions inside the solar house were always below the lowest acceptable limits for both PMV (ranging between -3 and -2 which was below thermally neutral level of 0 - zero) and PPD (ranging between 77% and 98% percentage of people being unsatisfied) ratings. As an example, at 3:00 am in the morning and without any air-conditioning system operating inside, dry-bulb temperature and mean radiant temperature can fall to 7.2 and 9.2 °C, respectively. With a relative humidity level of 56.5%, the PMV rating was calculated as -2.6, which was well below the 0 (zero) point (indicating thermal neutrality) and which imposed a feeling of cold on the occupants. Hence, PPD rating for that particular time indicates that 95% of people under such environmental conditions feel thermally uncomfortable. From Table 2, it can be understood that thermal comfort levels can fall below acceptable limits (for PMV and PDD ratings) especially during the times when air-conditioning unit is not in operation. As an example, at 03:00 am in the morning the PMV rating falls to the level of -2.1 (cold region). However, between 12:00 am and 18:00 pm the

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PMV rating (ranging between 0.01 and 0.62) is very close to 0 (point of thermal neutrality). Such a comfort rating clearly indicates the effect of auxiliary heating inside the solar house. The results from this analysis also reveal that so as to shift the PMV ratings from the levels of -2 to the level of thermal neutrality, air-conditioning unit was possibly operated at high levels for heating, which increased energy consumption levels considerably.

Table 2. Thermal comfort analysis for the solar house at 15th of March 2004.

METU SOLAR HOUSE THERMAL COMFORT ANALYSIS					
Single Day Analysis (15 March 2004)					
Clothing Level:	1.3 Clo	Light Business Suit			
Activity Rate:	1.1 Met	Sedentary Activity			
Air Speed:	0.1 m/s	Not Noticeable			
Date/Time	Dry Bulb Temp	Radiant Temp	Relative Humidity	PMV Rating	PPD
dd/mm/yy	°C	°C	%	(+3/-3)	%
15.03.04/00:00	11,2	13,2	40,8	-1,8	68
15.03.04/03:00	9,3	11,3	43,1	-2,1	82
15.03.04/06:00	7,7	9,7	44,9	-2,5	93
15.03.04/09:00	8,8	10,8	45,4	-2,3	87
15.03.04/12:00	21,8	23,8	30,4	0,15	5
15.03.04/15:00	24,4	26,4	25,1	0,62	13
15.03.04/18:00	20,2	22,2	26	0,01	5
15.03.04/21:00	15,1	17,1	33,5	-1	26
PMV:	Predicted Mean Vote				
PPD:	Percentage of People Dissatisfied				

7. Computer-Based Environmental Modeling and Simulation Studies

Computer-based environmental modeling and simulation studies were conducted in two stages. First stage was developing orthographic and three dimensional drawings of the solar house in a CADD (Computer Aided Design and Drafting) environment. This was achieved by using the information obtained from on-site observations (measurements taken during site surveys) and from relevant architectural documentation (including geometric information) related to the solar house. The geometric models of the solar house developed in CADD environment were then prepared to be exported to a computer-based environmental performance analysis and modeling program named as ECOTECT v.5.20, which is written by A.J. Marsh, 2003. Second stage constituted three dimensional and environmental modeling of the solar house using the information exported from CADD environment. Fig. 9 shows orthographic (elevations) and three dimensional (wire-frame view) drawings of the solar house.

7.1 Environmental Simulation and Performance Assessments with ECOTECT v.5.20

Simulation is the process of developing a simplified model of a complex system and using the model to analyze and predict the behavior of the original system. The key reasons for simulation are that real-life systems are often difficult or impossible to analyze in all their complexity, and it is sometimes unnecessary to do so anyway [6]. By carefully extracting from the real life systems the elements relevant to the stated requirements and ignoring the relatively insignificant ones, it is generally possible to develop a model that can be used to

predict the behavior of the real system at a certain level of accuracy. Increasing complexity and reliability of simulations that are under consideration can be achieved by calibrating the building models according to actual data obtained from a monitored building [5]. Due to the fact that simulation models are just representations of buildings as an abstractions of reality (in architecture this is virtual reality), the complexity of this abstraction will surely determine the accuracy of simulation results. In this respect, development of a building model can be achieved with successive increasing levels of complexity (increasing the number and detail of all kinds of inputs to the model) based on the information obtained from site-visits and actual data obtained from on-site measurements during the environmental monitoring phase [4]. At this point, it will be useful to give information about the computer based environmental analysis and modeling program used in this study together with information about its basic logic of operation.

7.1.1 ECOTECT v.5.20

ECOTECT v.5.20 [6] is defined as a complete computer-based environmental analysis and modeling tool with features of solar, lighting, thermal and acoustic analysis (Fig. 10). Resource consumption analysis and environmental impact assessments can also be conducted with the help of ECOTECT v.5.20. The program features a user friendly interactive and three dimensional graphic interface. Necessary thermal simulations in this study are performed with ECOTECT v.5.20 using real weather data and taking into account hourly solar and internal heat gains, heat storage in the building fabric and energy exchange between rooms and with the outside. ECOTECT v.5.20 provides a range of thermal performance analysis options which are calculated according to UK CIBSE (Chartered Institute of Building Services Engineers) Admittance Method. This method constitutes the basic mathematical algorithm used to perform calculations during thermal simulations with ECOTECT v.5.20. This algorithm is proved to be relatively flexible and imposes no restrictions on building geometry or on the number of thermal zones that can be simultaneously analyzed [6].

7.1.2 Geometric Modeling

Detailed geometric models of ECOTECT v.5.20 are mostly used for solar analysis such as insolation levels on selected critical surfaces or shading and overshadowing analysis. The same type of models can also be used for daylighting analysis of building interiors (detecting daylight factor levels on working planes) with artificial sky conditions simulated by ECOTECT v.5.20 or the effects of artificial lighting can be investigated with radiance calculations. In this study developed geometric models of the solar house are used to visualize its existing situation and architecturally compare it with different design options produced during the renovation study. High quality views with shade and shadows from the detailed geometric model of the solar house were developed with the advanced visualization tool of ECOTECT v.5.20 named as OPEN GL. It is a fact that this help to approach the problem more architecturally. Fig. 6 shows shaded and rendered three dimensional view of the geometric model of the solar house. This figure also shows the results of a solar analysis conducted on the geometric model of the solar house with shadows cast for the geographical location of Ankara at 17th of June at 13:45 pm. Daily sun-path diagram for that particular day

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of the year is also depicted on this solar analysis.
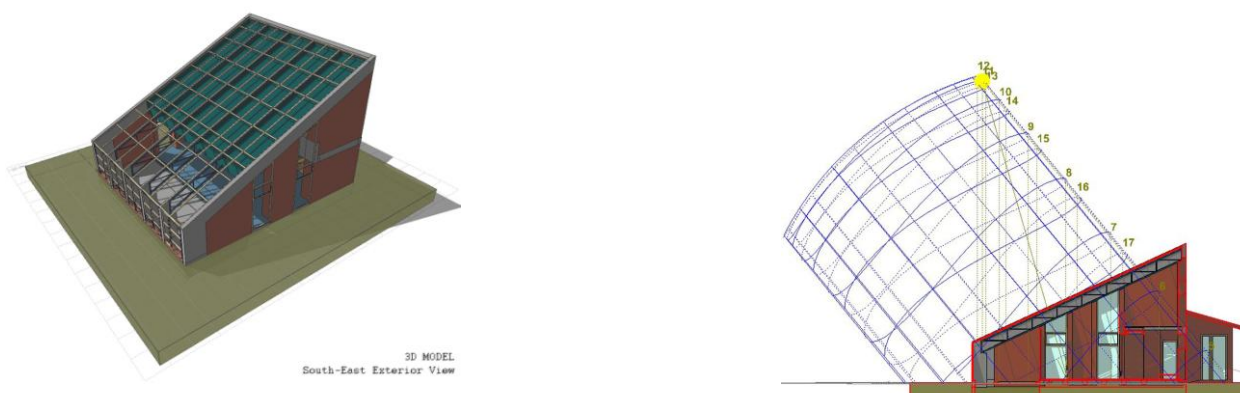
Fig. 6. Shaded and rendered three-dimensional views of the geometric model from ECOTECT v.5.20.

7.1.2 Thermal Modeling

In the thermal modeling process of ECOTECT v.5.20, each building under investigation should comprise one or more fully (geometrically) enclosed zones. A zone in ECOTECT v.5.20 is the basic unit in thermal simulations for which internal temperature levels and heating/cooling loads are calculated. All zones in a thermal simulation must be geometrically complete, meaning that they have surfaces enclosing their full volume. During thermal simulations, external obstructions at the vicinity of a building, or integrated external or internal shading devices that do not form thermal zones should be placed on the outside zone or on a different zone tagged as non-thermal [6]. In this study thermal zones developed in ECOTECT v.5.20, can be listed as; zone-01; conservatory place, zone-02; main hall and ground floor spaces, zone-03; mezzanine floor, zone-05; solar collectors and shading devices and finally zone-04 and 06; entrance porch and service spaces. Distinction between the zones listed above is made according to their different responses to heat and mass (air and humidity) flows between themselves and with the outside weather conditions.

7.1.3 Building Materials Input

In addition to geometric information about building components and elements of the solar house, relevant information about building materials (thermo-physical properties) should also be provided as an input to the thermal model developed in ECOTECT v.5.20. Required information about building layers and materials of the solar house was obtained from architectural documents, site surveys and on-site observations and from interviews with people who were previously involved in the construction of this building. Physical and thermo-physical properties of the existing building materials were found from the material database of ECOTECT v.5.20 and from TSE 825 (Regulations for Thermal Insulation of Buildings in Turkey) Handbook [9]. Building components (i.e. walls, floors, ceiling and roof) of the solar house were developed in ECOTECT v.520 using all the information collected so far. In Fig. 7 is given the result of a study conducted to identify and explain building material layers, which were used as inputs to the thermal model of ECOTECT v.5.20.
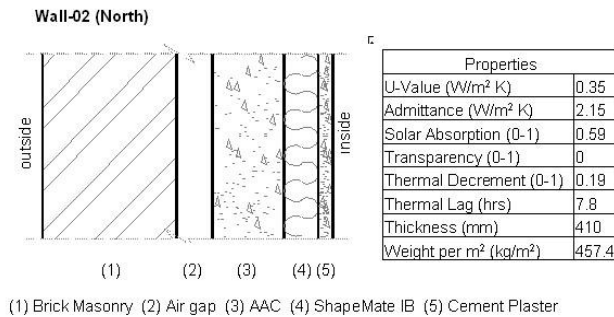
Fig. 7. Wall layers and their thermophysical properties defined as inputs to thermal models of ECOTECT v.5.20 [3].

7.1.4 Climate Data Input

One of the most significant inputs of thermal model is the climate data of a building's location. Required climate data for the location of solar house (Ankara, Turkey) were originally obtained from databases of TME (Turkish Meteorological Institute). These data contain long-term average values for dry-bulb temperature (^{o}C), relative humidity (%), average wind speed (km/h) and wind direction (Degrees Clockwise), cloud cover fraction (%), direct and diffuse solar irradiations (W/m^2). All of these climatic data constitute full year hourly climate data for the location of Ankara. These data also made it possible to perform thermal simulations with ECOTECT v.5.20 after being loaded to a sub-program named as WEATHER TOOL [8] and processed for final integration. Raw data coming from TME databases were imported to WEATHER TOOL and by the help of this tool they were converted to a format (*.WEA) which was recognizable by the thermal simulation engines of ECOTECT v.5.20. Fig. 8 presents the results of climate analysis for the location of Ankara. The graph (constructed in WEATHER TOOL) shows monthly diurnal averages of dry-bulb temperature with direct and diffuse solar irradiation values.
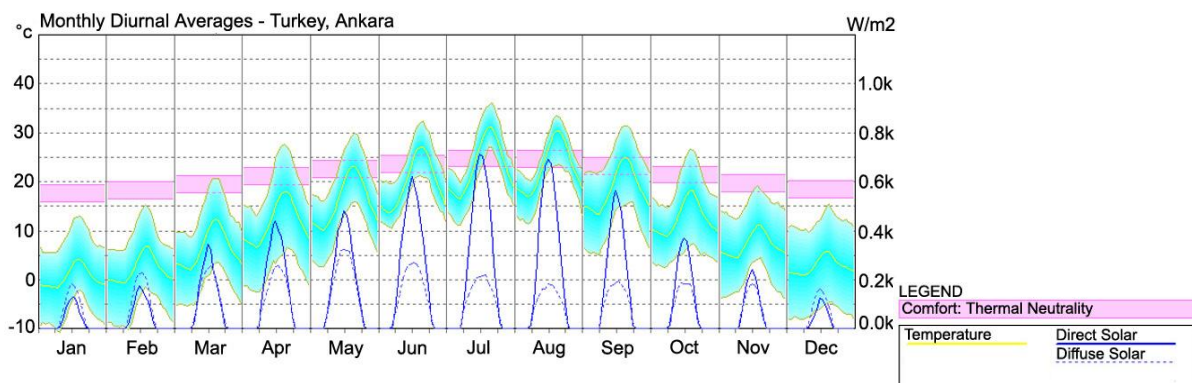
Fig. 8. Graph showing monthly diurnal averages for the climate of Ankara. (WEATHER TOOL) [8].

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7.1.5 Operational Inputs

Final set of data inputs that are required to launch thermal simulation in ECOTECT v.5.20 is the operational ones. They constitute inputs for HVAC system (type, electrical efficiency, operation schedule, thermostat ranges for heating/cooling), occupancy (density, metabolic activity levels and schedule), incidental gains (internal heat gains from people and building appliances) and infiltration rates (air-change rates and wind sensitivity).

8. Results of Environmental Simulations Performed with ECOTECT v.5.20

Results of environmental modeling and simulation studies conducted with ECOTECT v.5.20 constitute analyses of hourly temperature profiles for specific days (coldest and hottest day and the day with strongest wind gusts) of the year, monthly heating and cooling loads, and finally human thermal comfort analyses for the coldest and hottest days of the year.

8.1 Hourly Temperature Profile for 21st of January (Coldest Day of the Year)

The graph showing hourly temperature profile inside the solar house for 21st of January is given in Fig. 9. This particular day was defined by the simulation engine of ECOTECT v.5.20 as the coldest day of the year in terms of ambient air temperature and direct solar radiation levels. The X-axis of this graph shows hours of the day from 0 to 23, whereas the Y-axis shows temperature in $^{\circ}$C. Temperature profiles of each different zone are indicated by lines of different colors. This graph also displays a range of environmental information as well as internal zone temperatures. Outside air temperature and wind speed, as well as beam and diffuse solar radiation, are displayed as dashed lines within the graph. This makes it quite clear exactly what climatic factors the internal temperatures are responding to. In the graph given in Fig. 9, zone-02, which is the main hall of the solar house at ground floor, is highlighted for interpretations. It is clearly seen from the simulation result that indoor temperatures in the solar house can fall below freezing level, even to the level of -7 $^{\circ}$C (without any air-conditioning) averaging to -4.6 $^{\circ}$C throughout the day when the outside average is -7.1 $^{\circ}$C. This result indicates that there should be taken serious thermal insulation measures for external envelope of the solar house. Sudden drops in indoor temperatures during the periods of low or no solar radiation (at nights) indicate the poor thermal resistance of glazing of the solar house which tend to cause excessive conduction losses.
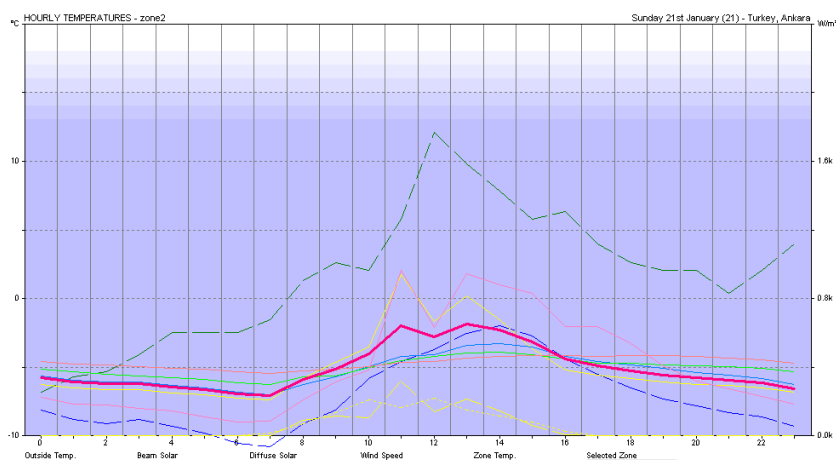
Fig. 9. Hourly temperature profile for 21st of January (coldest day of the year).

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Furthermore, during simulations it is recognized that whether it is in smaller amount or not, the air-conditioning unit inside the solar house have to be turned on to cooling and to heating in a single day. In other words, solar house needs to be heated and cooled at different times in the same day. This interesting result is the direct indication that storage of solar gains in the mass of the solar house cannot be able to stabilize indoor temperatures, thus cannot reduce the drop in overnight temperatures. Consequently, temperature fluctuations inside the solar house cannot be moderated by thermal capacity of the building mass. It seems that temperatures in the solar house should be more effectively modulated by increasing thermal capacity of the building structure. This will also provide more efficient use of solar gains during night time.

8.2 Hourly Temperature Profile for 17th of July (Hottest Day of the Year)

For the graph given in Fig. 10, simulation engine of ECOTECT v.5.20 scans the climate data of Ankara for all the days of the year and found the hottest day (17th of July) in terms of ambient air temperature and direct and diffuse solar radiation levels, which are affecting sol-air temperatures.
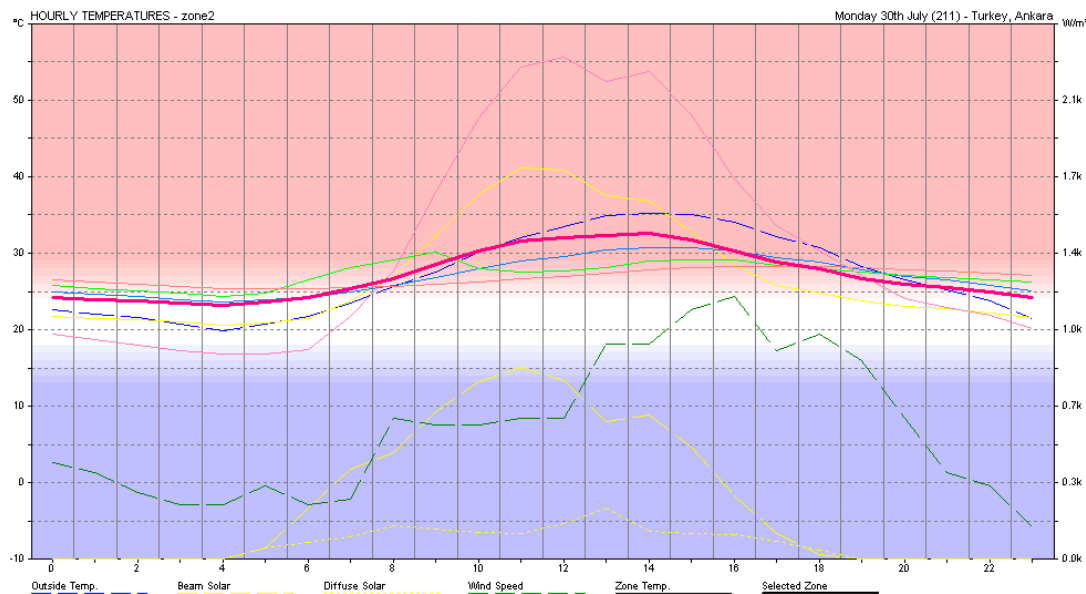
Fig. 10. Hourly temperature profile for 17th of July (hottest day of the year).

The highlighted zone here is also zone-02 (main hall). The simulation results clearly indicate that indoor temperatures hardly drop below 24 °C upper comfort limit and these were the times of late night and early morning. Average indoor temperature for that day was found to be 25.4 °C, whereas average outdoor temperature was 26.9 °C, which was interestingly very close to that of indoors' average. This strongly imposes the reconsideration of thermal insulation levels of the solar house. Another important aspect is the lack of natural (which is more preferable) or mechanical ventilation inside the solar house with which accumulated hot and humid air at the upper parts of the building spaces can be dissipated.

8.3 Hourly Temperature Profile for 15th of April (Day of the Strongest Wind Gust)

Hourly temperature profile for 15th of April is chosen in order to show the effects of infiltration heat losses. Since this is the day of strongest wind gusts. The average wind speed is pretty high throughout the day. If the hourly temperature profile is investigated, it is seen that indoor temperatures closely follow outdoor temperatures from 0 ^{o}C to 11 ^{o}C and they even fall below after that hour of the day. This indicates that in windy weather conditions outside and inside temperatures tend to be closer. This is probably due to low airtightness of the solar house, and probably due to higher values of air infiltration rates and wind sensitivity. It is also seen during observations that especially fenestrations of solar house are really in bad conditions due to material deterioration and most of the window and door frames lost their weatherproof quality over time.

8.4 Monthly Heating and Cooling Loads

The graph seen at Fig. 11 shows monthly heating and cooling loads of a HVAC system that is assumed to be located in the solar house. The X-axis shows months from January to December and the Y-axis shows the amount of energy consumed by the HVAC system in kWh/m^2. It is seen that solar house requires considerable amounts of heating and cooling loads so as to maintain thermal comfort conditions throughout the year. Heating loads, which dominate the total energy consumption, appear to be 170.2 kWh/m^2 and cooling loads are 41.5 kWh/m^2. They made a total of 211.7 kWh/m^2, which is a figure well above the energy consumption level of a notional building given in TSE 825 [9] in its regulations for thermal insulation of buildings. The solar house is assumed to be located in Ankara and according thermal regulations stated in TSE 825, it should not have higher annual energy consumption level above 104.5 kWh/m^2. January is the month with highest heating loads occurred and August is the month with highest cooling loads. The most interesting results of this analysis is that in months of March and September solar house needs both heating and cooling during different hours of the same day. This was also stated by frequent occupants of the solar house during the interviews. They gave the information that similar to the simulation results in March they had to use both cooling and heating functions of the air-conditioning unit during different times but in the same day.

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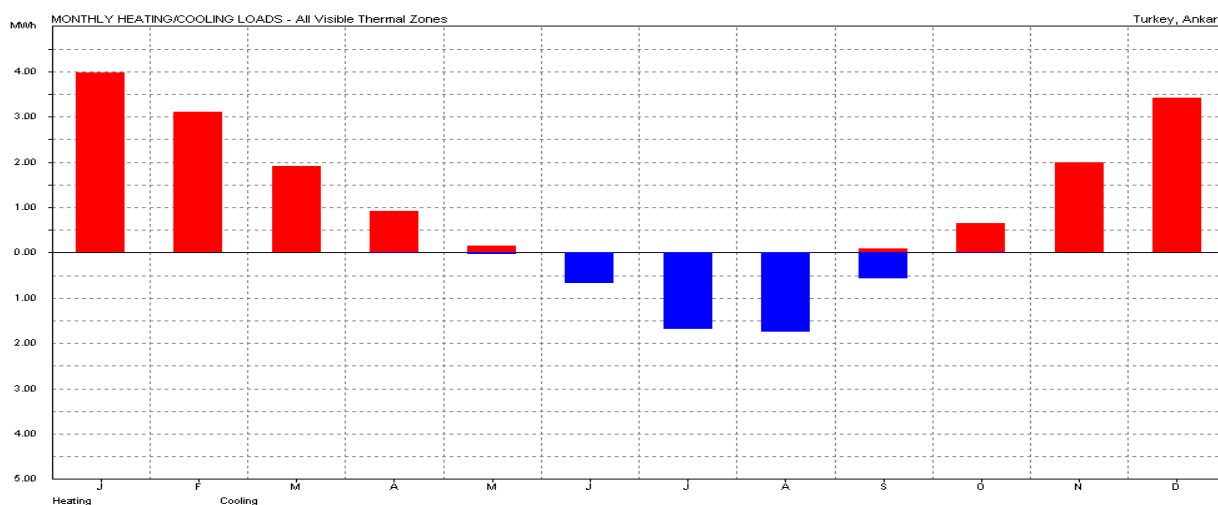
Fig. 11. Monthly heating and cooling loads.

8.6 Human Thermal Comfort Analysis for 21ˢᵗ of January and 17ᵗʰ of July

The results for this section are obtained from spatial comfort analysis function of ECOTECT v.5.20. In Fig. 12 is seen an analysis grid with a colored scale located at a 130 cm distance from the ground floor level of the solar house. With this colored scale MRT (Mean Radiant Temperature) levels are shown for each different analysis grid. The cut-perspective view of the solar house on which simulation results are imposed as a color scale is developed with advanced visualization tool of the program named as OPEN GL. It is seen from the graph that MRT levels are changing from 4.6 °C to -5.4 °C inside the solar house at 12:00 am at 21ˢᵗ of January. It can be concluded from the results that there can be considerable temperature differences (about 10 K) throughout the building at a specific date and time. It can also be understood that useful solar gains from conservatory section cannot reach to all parts of the solar house. Since temperature levels at service spaces at the north side are found to be below the freezing level. This situation indicates that possible solar gain potential of the conservatory is reduced by sidewalls at east and west elevations. The simulation results shown at Fig 13 – left, also belong to the date of 21ˢᵗ January, but time is now set to 15:00pm which is approximately one hour before the sunset. From the results, it is seen that when solar radiation levels outside the solar house start to decrease, inside MRT levels also start to decrease without any considerable time lag. This situation indicates that the solar house does not contain adequate thermal mass in its structure to store heat during high levels of solar radiation and to release this useful energy at night when it was most needed. The simulation result given at Fig. 13 shows MRT levels at noontime for the hottest day of the year (17ᵗʰ of July).

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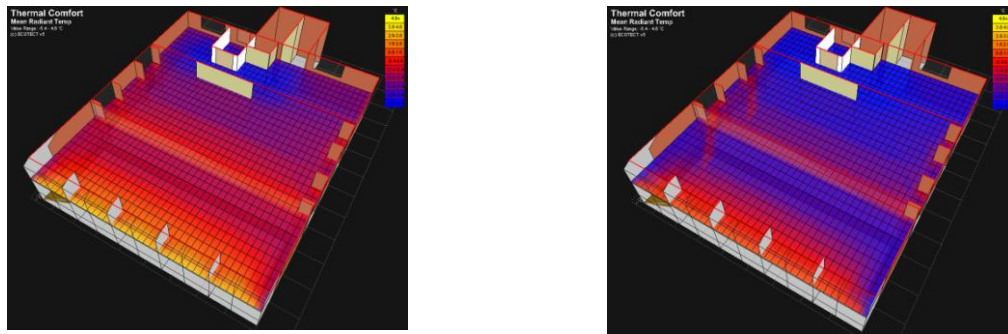
Fig. 12. Thermal comfort analysis for 21st of January at 12:00am (left) and 15:00pm (right).

The conservatory of the solar house with its MRT levels ranging between 39.5 °C and 43.5 °C is now acting as an efficient heater at such a hot day in the middle of the summer. As a result, cooling loads are augmented with such kinds of overheating problems. This result indicates another important item in the renovation of the solar house. It is the design of conservatory. It is seen that both in summer and in winter the conservatory leads high energy consumption levels with its adverse effects on indoor thermal conditions. Type and quality of glazing, level of thermal storage capacity existing in the conservatory, its relationship with the rest of the building and most importantly night ventilation and shading conditions are some items that are found to be significant for the renovation study of the solar house.
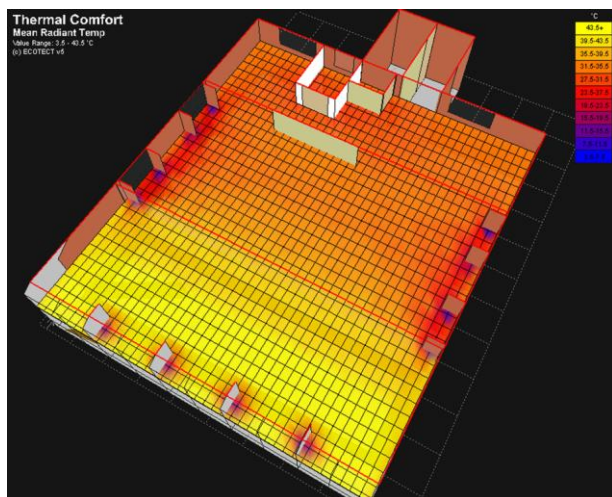
Fig. 13. Thermal comfort analysis for 17th of July at 12:00am.

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9. Recommendations for Environmental Renovation of the METU Solar House

Recommendations provided with this study are completely based on the results of environmental modeling and performance analyses conducted on the METU solar house through the use of ECOTECT v.5.20 software. These recommendations are listed as items under three main headings, which are conservatory design, properties of main building spaces and elements and design of the roof. Following the recommendations are given initial building material requirements (for reinforced concrete, thermal insulation layers and glazing) so as to start constructions which are the next stage of this renovation project [3].

9.1 Design of Conservatory Space

- Conservatory floor should be covered with 300 mm reinforced concrete slab with 50 mm thermal insulation underneath with waterproof membrane (felt) and 100 mm blockage,
- Sidewalls (east-west walls) of the conservatory should be supplied with thermal insulation of 50 mm thickness,
- Fenestrations should be changed to double-glazing units with aluminum frame. More efficient frames are timber and PVC but their performance in terms of resistance to UV (Ultra Violet) rays should be checked,
- Ventilation openings should be provided to the lower parts of walls (east-west side walls) and to the upper parts of roof glazing of the conservatory in order to produce a natural ventilation path inside,
- Seasonal shading: Roof of the conservatory should be shaded in summer time. This shading should be applied from exterior in the form of rigid panels. Summer shading of the south façade is not as important as that of the roof,
- Nighttime insulation can be applied to transparent surfaces (glazing of the roof and the south façade) of the conservatory. Such kind of insulation can be applied as external insulated shutters to the south façade and the rigid panel that is used for summer shading can also be used as nighttime insulation in wintertime. External insulated shutters can be simply made by filling a timber frame with a certain thickness of (25 mm) polystyrene insulation and plywood can be glued to this frame as a cover,
- The fenestration separating the conservatory from the main hall of the solar house should be reconsidered; -This fenestration section can be partly turned into a solid wall (such as a single layer of brick masonry-190 mm). The rest can be a full storey-height glazed door (Low-Emissivity – Low-E coated double glazing units should be used for this portion),
- Another design option for the conservatory can be the rearrangement of the thermal relationship of this space with the rest of the solar house. This can be realized by applying shading devices, nighttime insulation shutters and natural ventilation openings to the fenestration part in between the conservatory and the main hall. By this way at certain times of the year when excess heat from the conservatory is desirable, this space will be combined with the rest by opening vents, and external insulated shutters. However, during the times of high solar radiation levels

(summertime) conservatory can be totally isolated from the rest by closing the vents, and insulated shutters.

9.2 Properties of Main Building Elements and Spaces

- If air-heating solar collectors and their duct system will not be used, then the floor ducts (that are distributing hot-air from ground level) should be refilled with concrete in order to increase thermal capacity of the floor structure,
- The floor of the main hall as well as that of conservatory should not be covered with lightweight insulation materials such as carpets which have the effect of decreasing their thermal storage capacity. The floor surfaces of the solar house can be covered with either concrete-based floor tiles or paving bricks which will enhance the architectural quality of interiors while providing the required thermal capacity to building structure,
- If a more feasible architectural solution can be found, the thermal insulation layers for east and west walls (which was applied from inside in order not to spoil external brick facing appearance of the solar house) should be applied from outside. The thickness of such an insulation layer should not be smaller than 50mm.
- Glazing of east-west walls;
  - Glazing areas for east and west facing walls can be reduced provided that adequate daylight reaches to the horizontal surfaces of working planes in the mezzanine floor. This reduction can be realized by filling the lower sections of the window openings with a certain height of brick masonry. This will also cut some portion of the reflected solar radiation from the exterior surfaces at the vicinity of the building,
  - Windows of east and west facing walls should be fitted with Low-E coated double-glazing units with PVC frames, which have high thermal resistance and low air-leakage,
  - Shading devices in the form of vertical fins should be installed to two corners of east-west facing windows. The height of these devices should be the full window height, whereas their width should be calculated so as provide maximum shading to interiors in the cooling season for the climate and geographic of location Ankara,
  - Designing these vertical shading fins as adjustable (moveable) devices will make it possible to use them as external shutters for windows for night ventilation in winter nights. Since there will be considerable conduction losses from the windows of east-west walls as well as those of south walls during the times of low or no solar radiation reaching the interiors,
  - Another solution for shading is changing position of the fenestrations on east-west walls so that vertical brick walls surrounding them will stay at the outside of the building. Thus, walls will act as vertical shading devices for the fenestrations. In fact this alteration is simply putting these fenestrations to their original location, which was before the first renovation project realized between 1991 and 1994.

9.3 Design of the Roof

- Retrofitting the existing solar roof system (air-heating solar collectors):
  - All of the roof glazing should be renewed with double-glazing units with aluminum frames (with drought-stripping),
  - Rock wool insulation (70 mm), which is completely deteriorated in time, should be removed from the roof structure,
  - The second insulation layer, which also lost its structural and thermal integrity, should be replaced with the same type of insulation material with a thickness of at least 50 mm,
  - The whole roof structure should become completely weatherproof (water and air-tight) with suitable building membranes,
  - The thickness of air-heating solar collectors (which is 150 mm in its original situation) should be decreased (to 100 mm) for more effective air-circulation through the system,
  - The duct system should be checked for any air leakages and if there exists such a problem, necessary replacements should be done,
  - The air-pump (located at the entrance lobby) should be changed with a more efficient one (which consumes less electrical energy while provides more uniform hot-air distribution more rapidly and operates without producing noise),
- Changing the existing system to water-heating solar collectors with panels located at the roof.
  - Such kind of a system should be carefully engineered and preferably a high efficiency solar collector panels should be used,
- The other possible option for the renovation of the roof can be removing the existing solar system completely and changing the roof to a conventional one, which has a high level of thermal insulation and airtightness.

10. Conclusion

This paper summarizes results of the first phase of an environmental renovation study conducted on the METU Solar House with extensive use of computer-based analysis and design techniques. Necessary recommendations for the renovation activity were provided after quantitative evaluations and comparative assessments of the existing environmental conditions of the solar house. These were further strengthened with the acquisition of actual field data from on-site observations and measurements (with data-loggers). As a result, reliable and generalizable conclusions were drawn so as to provide efficacious recommendations for the renovation activity. Furthermore, the objective reproducibility of computer-based environmental models of the solar house made it possible to evaluate consequences of different design decisions (or options) which were impossible to experiment in real life conditions. This study also indicates the possible use and subsequent advantages of computer-based environmental analysis and design techniques on renovation of existing buildings that are providing serious threats to natural systems with their excessive consumption of non-renewable energy sources. It is stated here that new computer systems and technologies integrated into architectural activities such as building renovation have the potential to foster the contribution of the act of architecture for the development of more sustainable built environments that are in harmonic existence with natural ones.

Acknowledgements

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NO CHOICE BUT ENERGY TRANSITION

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Oil prices and economic growth

The US economy attained it highest-ever postwar annual growth of real GDP, achieving what today would be the impossible all-year rate of 7.5%, in the Reagan re-election year of 1984. At the time, in dollars of 2006 corrected for inflation and purchasing power parity, the oil price range for daily traded volume light crudes was about 58 - 70 US dollars-per-barrel (USD/bbl). In late June 2005, for the first time in more than 20 years, oil prices crossed back over the 60-dollar threshold (using 2006 USD purchasing power parities). In early 2007, after a powerful speculative slide, they are again close to 60 USD/bbl.

Since June-July 2004, and again since December 2006-January 2007, oil prices have broken into a system of extreme volatility with higher daily, weekly or monthly peak and average prices being accompanied by ever higher volatility. The previous pattern, through Sept 2003 – June 2004, was of regular, smoother upward movement, with far less volatility. This already suggests that what can be termed 'incipient undersupply' or looming physical shortage is now on the horizon. Extreme volatility maps and reacts to now structural surges of demand, while supply reacts and responds only slowly and with difficulty.

The 2005 book by Matthew Simmons "*Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy*" , despite its many factual errors, as well as studies by some ASPO national groups, and by Ali Samsam Bakhtiari (former consultant to Iran NOC) date Peak Oil to anytime in the 2006-2009 period. This argument is supported by the bellwether Ghawar (Saudi giant field) and the Mexican Cantarell, or Kuwaiti Burgan (the two other 'mega' fields) all entering into disputed, but increasingly sure and certain decline. One important point, here, is that true Peak Oil will be manifested by year-round structural undersupply of markets, and not only by irremediable decline of 'conventional' oil production capacities and supply. So-called 'conventional', lower-cost and easier-produced oil now only covers about 75% of total 'all liquids' petroleum supply, and has been in net or overall decline for up to 5 years.

World depletion loss of production capacity is naturally a 'controversial' subject, but increasing data tends to suggest a rate of at least 4.5%-per-year. Regarding natural gas reserves and production capacities, it is evident that oil and gas depletion are related trends, in some cases directly related – for example natural gas flaring by oil production installations, due to gas being treated as 'low value' and 'highly abundant'. Peak Gas is a complex subject, but serious supply shortages of natural gas are likely by 2010.

Overproduction of oil by Mid East and other producers is one cause of fast depletion, and the main driver of this is deliberate overproduction chasing buoyant world demand. World economic growth in 2004, 2005, and 2006, on IMF data, has consistently remained at 'vintage' rates, the highest for over 15 years, at about 4.75%-5% each year, on a real GDP base. This is despite – or because of - oil prices rarely falling below 50 USD/bbl since 2004.

In 2004, and again in 2005-2006, as oil prices increased, economic growth rates in all regions of the world (except the Eurozone) also significantly increased. This trend was especially marked in East Europe, West Asia, the Far East, many of the oil-importer countries of Sub-Saharan Africa, and several countries in Latin America. Economic growth in nearly all nonOECD countries, from 2003-2004, has strongly rebounded from the lows of before 2002, surprising many analysts. World trade growth has remained, since 2002-2003, at record highs of around 9% to 10%-per-year.

Directly due to this 'vintage economic growth', world oil demand growth is also at 'vintage' rates, estimated by the OECD IEA at 2.68 Mbd for 2004, but unrealistically estimated at close to, or below 2 Mbd-per-year for 2005 and 2006. There should therefore be no real surprise that oil prices also tend to attain 'vintage' levels, in a context where net annual additions of oil production capacity are well behind the average annual growth of world oil demand.

Despite the simple economic facts of record economic and trade growth, and low inflation, current oil prices are regularly described by J-C Trichet of the European Central Bank, by A. Greenspan, and then B Bernanke of the US Fed, and other major institutional finance players, as 'very high' or even 'extreme'. Regular claims are made that 'high oil prices' will 'inevitably hurt economic growth', or at least increase inflation – and that this outcome will entrain defensive interest rate hikes.

This 'classic' or conventional economic and financial viewpoint ignores or sideleines the reality of what can be called 'Petro Keynesian growth', in other words strong economic growth fed by growing prices for raw materials and energy, assuring sustained growth of national revenues for exporter countries. These countries, as for beneficiaries of income transfer within OECD countries – the Keynesian model for aiding economic growth – show high marginal propensity to consume. In other words, they quickly address new solvent demand to world exporters of industrial goods and commercial services. This tends to lever up world aggregate economic growth, with only minor loss of purchasing power in OECD mature economies, this process described as the revenue effect displacing the price effect.

No more supply side solutions: Energy Transition

Since the tripling of oil prices in 1999 from their 14-year low of around 10 USD-per-barrel, followed by another doubling through 2003-2004, we are habituated to announcements by OPEC that 'big production increases' can be delivered. Oil analysts with an eye on media exposure regularly come in with pronouncements of the same type, claiming that 'new supply' well above depletion losses is likely or possible through 2007 and 2008. They go on to argue that OPEC 'overproduction' has returned, when in fact OPEC is now more than ever 'the producer of last resort'.

Due to now structural slow growth of net supply, and continuing strong demand growth, oil prices are likely set to continue their progression, in a context now marked by extreme volatility.

Short-term sparring for the economic and trading rent available from shifting oil prices high and low mask the real crisis for world energy. Due not only to oil and gas depletion, but also to climate change mainly caused by massive burning of fossil fuels, it is now widely agreed that Energy Transition must move ahead very fast. Yet as we know from the 'collateral damage' to ethanol fuel prices when oil prices are weak, high and stable oil and energy prices are strictly necessary for any progress towards the urgent task of Energy Transition away from fossil fuels.

Serious effort to this goal will by necessity address the linked goal of oil and gas intensity reduction in the economies and societies of the energy-intensive OECD group. The arrival of Peak Oil, or the absolute peak of world oil production, which is almost certain by year 2007-2008, will drive home the message that there are no supply side solutions.

The Table, below, indicates the gravity of the situation/

Table: Oil and Gas Intensity

Country or region **Rounded averages, 2006**	Oil intensity (barrels per capita per year, bcy)	Gas intensity (barrels oil equivalent per capita per year, boecy)
United States	25.5	13.4
South Korea	17.5	5
Netherlands	17	18.8
Japan	14	5
Italy	12.4	8.2
Germany	11.8	6.9
Turkey	4.5	4.5
China	2.5	0.3
India	1.3	0.25
Low income Africa	0.5	0
WORLD AVERAGE	**4.8**	**2.75**

> **At an oil intensity of 15-20 barrels/capita/year, the current world population of about 6.6 Billion would consume more than 100 Billion barrels-per-year**

Only 7 countries of the planet have proven remaining oil reserves significantly above 50 Billion barrels. More than 120 countries are oil importers.

Current world consumption of around 86 Mbd oil, and about 52 Mbdoe (gas) and 60 Mbdoe (coal) produce about 28 – 30 Billion tons/year of CO2 emissions, equivalent to around one-fifth of total geotectonic volcanic CO2 emissions (approx. 120-220 Billion tons/year).

Durable solutions to the growing threat of world oil markets being faced with long-term or 'structural' undersupply, followed within at most 5-7 years by world gas supply also peaking, must and will include treatment of the demand side. Markets will give little advance warning of coming structural undersupply - the 'spontaneous' or normal response by energy markets to persistent undersupply will be immense speculative oil price surges. It can be argued this was in fact the underlying reality in July-August 2006, when traded oil prices (WTI on the NYMEX) briefly attained 78 USD/bbl.

In this context, real and committed long-term energy system adjustment, and energy economic adjustment and adaptation strategies must be dusted off from their 'antique' status, and brought forward. In the US case, these date back to president Nixon's 'Energy Indepdendence' plan of 1974, and later energy saving plans advanced by president Carter. Elsewhere in the world, plans and programmes for energy saving, oil intensity reduction and oil import dependence reduction, as well as renewable energy development, go back more than 25 years - that is more than a quarter-century. The January 23, 2007 'State of the Union' address by G W Bush gave large prominence to biofuels development, to limit US dependence on 'foreign oil'.

In all cases, the 1970s and 1980s plans and programmes were shelved or 'placed on the back burner' when oil prices eased back. Through the long Cheap Oil interval of 1986-1999 there was effective abandon of serious political support, relegating the concept of oil and natural gas substitution to minor interest except during crisis events, such as the Iranian Revolution of 1979, the Kuwait liberation war of 1991, or the start of the Iraq war in 2003.

We are now facing *physical undersupply of world oil markets* rather than any short-term political embargo or supply limitation. With the arrival of Peak Oil, and Peak Gas quite shortly after, we face the real prospect of permanent energy shock. In other words, those forgotten 'emergency plans' and programmes for energy conservation, efficiency raising, transition to renewable energy, and restructuring towards a low energy economy, habitat and society must this time be be put into practice, not shelved when oil prices fall back to some level judged 'manageable'.

This will likely only become crystal clear when oil and energy prices reach some critical level or 'panic point for decision makers and the public. This 'pain threshold' could be in the region of 90 US dollars-per-barrel. Build up to these price spikes may take some time, perhaps until 2008, but the more time we waste before 'biting the bullet', the worse the adjustment conditions and circumstances will be.

The only Plan B – 'Demand destruction' through unplanned economic rout

Without strategies for an 'energy lean' economy and society, there is only one method and type of economic adjustment to oil prices, that can at any time move fast to 'exotic' highs through geopolitical instability in the Mid East, in Central Asia, in Africa, or elsewhere. This economic adjustment would be through using the interest rate weapon, generating so-called demand destruction through quick-acting and intense economic recession.

Economic 'adjustment' through destroying demand, by self-imposed recession is a tried-and-tested strategy. The last time it was used widely in the OECD countries, in 1980-83, the impact was surely to reduce oil prices (in 2006 dollars from a peak around 110 USD/bbl in late 1979 and early 1980, to around 60 USD/bbl in 1984), but the collateral economic and social damage was very intense and wide-ranging. In addition, the actual oil savings generated by this self-imposed recession was no more than about 9.6%, measured by world demand decrease through the early 1980s recession. Actual falls in oil demand were concentrated in the 3 years of most intense recession (1980-82). World demand starting growing again, from 1984, the moment world economic growth was restored.

Unlike today, the OECD economy entered this 'adjustment-by-recession' with balanced budgets in most countries, including the USA, in 1979-80. The financial, economic and geopolitical risks of using the interest rate weapon, today, with many of the big OECD economies having huge accumulated national and private debt, are almost open-ended.

The simple conclusion is that the interest rate weapon would backfire, today. No 'softened landing' is currently on offer. The world economy is driven by intense growth in the emerging industrial superpowers of China and India (and other large population industrializing economies such as Brazil, Pakistan and Turkey), in a global economic context of very strong economic growth. In the case of the USA, generating about 30% of world GNP and taking about 30% of world oil imports, both public finance and trade deficits are now at all-time record high extremes.

Hiking interest rates, in today's economic and financial context, would result in near-instant world economic and financial crisis. The interest rate weapon, today, wielded in the same way that Volker applied it in the early 1980s would surely entrain complete collapse of world stock markets, severe financing problems for so-called 'emerging economies', runaway domino effect bankruptcy of many major service and finance sector corporations, mass layoffs and unemployment in the OECD countries, and grave problems for financing the *structural* trade deficits of especially the US and UK. The US would expose itself to perhaps uncontrolled flight from the dollar as the interest rate weapon firstly produced stock market collapse, with inflationary recession as the sure outcome.

An urgent situation due to past inaction

The lack of action to stabilize or reduce oil intensity of the economy in the most oil-intensive and gas-intensive economies and societies (USA, Europe, Russia, Japan, Asian Tigers) dates back, now, for more than 25 years. This has resulted in ever-rising oil import dependence on ever-shrinking numbers of exporter countries still having large export surpluses above their

domestic demand. The number of countries where oil-intensity, measured in barrels/capita/year, has fallen since 1980 can be counted on the fingers of one hand, in all cases for exceptional or special reasons, such as very big increases in gas supply. Recent, and growing Kyoto-related interest in a form of 'energy transition', mainly focused on reducing oil consumption due to oil being more expensive than natural gas, is resulting in some movement towards economy-wide oil ibtensity reduction, in the signatory countries.

The current situation is however, in the real world, marked by almost unlimited upward potential for oil demand growth in the 'emerging industrial superpowers', including China and India, as well as other large population industrialising countries such as Brasil, Pakistan and Turkey. The close-to unlimited upward potential for oil import demand of China and India can be understood by a few simple figures: oil intensity per person in China and India is respectively about 2.5 and 1.3 bcy (barrels/capita/year), compared to over 25 bcy in the USA, around 14 bcy in Japan, and close to 12 bcy in most EU countries. Car ownership in the USA, Japan and Europe is close to saturation, at around 500 – 740 cars per 1000 population, but is less than 25 in China and under 15 in India. This makes it certain that we are entering a new context, in which oil price rises are virtually certain, if there is no quick-acting and deep economic recession at the world-wide level. And we have the proof, on a daily base, that despite the somber warnings of 'recession due to high oil prices', the evolving range of around 60 – 70 USD/bbl has done less than nothing to curb world oil demand. In fact, through 'Petro Keynesian growth', higher oil prices have done the *exact opposite.*

No easy alternatives

In real terms, oil prices are still below their highs of the 1980-83 period. Also, the real limiting factors on faster economic growth in most OECD countries do not feature oil or energy prices, but personal debt, delocalisation and de-industrialization, aging populations, fears of job losses, terrorism, climate change and other worries in what are essentially *consumption saturated* economies. There are ever fewer possible strategies for restoring high levels of conventional economic growth on a long-term base in the aging democracies of the OECD group. So-called 'de-growth' towards a sustainable economy and society, with extremely rapid development of all feasible and rational forms of renewable energy, is the sole logical response to this predicament. The climate change issue, which will not go away, reinforces all the above arguments for energy economic restructuring that is Energy Transition, with initial goals being oil intensity reduction, gas intensity reduction, energy conservation, and renewable energy development.

This strategy will include 'de-growth' that is restructuring economic concepts of wellbeing, because this way ahead is one of the few which can quite rapidly reduce oil and natural gas intensity in the OECD countries. This in turn will buy time for the giant industrialising economies of Asia, who for some time will be forced to increase their oil burn – or face total chaos and almost certain civil war. Unless the OECD countries rapidly adopt oil and gas saving, and intensity reduction policies and programmes (which can be modeled on Kyoto Treaty provisions), the potential for terminal energy crisis, or unlimited growth of oil prices, will remain a real possibility.

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Conclusions

For various economic doctrinal reasons, and due to long-standing social and economic myths, Cheap Oil is seen by decision makers and public opinion manipulators in the richer nations as the 'passport to economic growth'. This is a pure fantasy.

Abundant if not cheap oil and energy underpin the service oriented, but industry based 'Globalized Economy'. This drives the urban-industrial reference format, model and framework for economic development and social progress, excluding and dequalifying all other alternatives. This in turn locks-on the economy and society to high, or extreme energy intensity, almost anyplace in the world. Upward potential for personal consumption of fossil fuels is essentially unlimited in this context.

Physical depletion is either rejected or ignored as a price setting factor for oil and gas. Concerning oil, there is mounting evidence that net additional production capacity is decreasing every year and may soon fall below the product of new capacity demand + annual lost capacity. By 2007-2008, and perhaps before, structural supply deficit will be a reality on world oil markets. By about 2012, or before, this will also apply to world natural gas.Conventional or classic economic growth will be enabled and facilitated at the world or 'composite' level by rising oil prices, even to $60 - 70$ USD/bbl year average price for traded oil.

Also because of depletion, but in addition because of environment and climate limits, Energy Transition away from fossil fuels must and will happen. Price signals, in the existing economic system and framework, are needed if this is to start, and to build from the immediate near term. Existing and developing frameworks provided by the Kyoto Treaty offer some potential for adaptation and direction to the task and goals of energy transition.

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PEAK OIL AND PEAK GAS: RATIONAL ENERGY UTILISATION AND INTERNATIONAL ENERGY TRANSITION

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At least in Europe, the political and economic acceptance of Peak Oil can be surely said to have arrived. Some countries, Sweden for example, have announced plans to "eliminate oil from the energy mix" in a certain period, by 2020 in the case of Sweden. All the European Union countries have signed and ratified the Kyoto Treaty, which we can call an anti-oil, pro-gas and pro-electricity treaty. Even a republican ally of G W Bush, Arnold Scwharzenegger of California, has signed the Kyoto Treaty. The climate change film of Al Gore is a major conference circuit and media success. Former World Bank chief economist Nicolas Stern, of UK, has produced very dire warnings of the potential economic damage caused by climate change unless very strong action is taken now to avert and limit this change, mainly due to burning fossil fuels. The measures proposed by Al Gore or Nicolas Stern feature reducing oil consumption even further than present Kyoto Treaty targets.

At the same time oil prices are accepted, now, to never again become as low as they were in the 1990s, when oil prices were rarely above 18 US dollars per barrel (USD/bbl). Many experts, or supposed experts such as Matt Simmons, a friend of G W Bush, claim that oil prices could attain 200 - 250 USD/bbl. In any case, due to now increasing seasonal variation in world oil demand, with seasonal change of demand able to exceed 2.25 Million barrels-per-day (Mbd), unrestrained market trading of oil can easily produce very extreme volatility, and 'cheap oil windows' for example in September-November 2006, when oil prices fell about 20 USD/bbl, from 78 to 58 USD/bbl, before increasing again with cold weather in major consumer markets. In other words, oil prices are now set by demand changes - because supply is so very difficult to expand. In addition, most data on world oil supply is very unreliable, and manipulated in an attempt to maintain an appearance of adequate supply.

There is now "demand overhang" on world oil markets, due to approach of Peak Oil. The related challenge, of Peak Gas is closely related to Peak Oil: in fact, world oil production and world gas production are now highly interelated and increasingly inter-dependent because of diminishing resources and depletion. The so-called "Gas Bridge to the Future", using cheap and abundant gas from Russia or Iran, is a favourite myth or legend developed by leaders and media in the big consumer countries, specially in Europe. In fact, there will be no "Gas Bridge" because depletion will reduce gas supplies quite fast - faster in fact than oil depletion will reduce oil supplies. Due to this emerging context, new policies and programs for Energy Transition are needed. The goals of Energy Transition will include sharp and constant reduction in oil consumption, and stabilised gas consumption by OECD countries of the North, and worldwide development of renewable energy sources.The special cases of China and India, and other emerging industrial countries including Turkey, will need to be addressed by international forums such as this conference.

Peak Oil and Peak Gas - A Complex Question

As we will see in this presentation, Peak Oil and Peak Gas are complex questions involving many variables, especially for oil - from the definition of oil and oil-like hydrocarbon liquids, to the interplay of factors controlling world oil and gas supply and demand. Regarding gas, the concept of Peak Gas is denied strongly by many so-called experts, but above all by politicians and the "financial community". The reasons for this are evident: they have accepted that oil supplies will decline, and oil will now remain expensive. Because of this they require a cheap energy replacement for oil, and this is provided by the myth that gas reserves are "unlimited", especially in Rissia and Iran. To discuss the depletion issue it is therefore better to start with the argument for Peak Oil.

Role of oil in world energy: We can say that oil currently supplies about 40% of all commercial energy, that is about 4.25 Billion tons of oil on a total of 10.75 Bn tons oil equivalent consumed in 2006. World oil demand, since 2000, have been increasing at an average of about 2.25% to 2.75% per year. In the 1990s, world oil demand increased at about 0.9% to 1.5% per year, with much lower prices. Eliminating the two-fifths of world energy supplied by oil will surely not be easy - in fact it will be a Herculean task.

The task is heavily complicated by the fact that substituting oil is only practical by using natural gas, coal or uranium for nuclear power electricity. This only exchanges one faster-declining fossil energy resource for three other, relatively slower-declining fossil energy resources, including natural gas which will rather surely decline from about 2009. All of them, including uranium, result in climate changing gas emissions directly related to the quantity of energy produced. Substituting oil with non-oil energy depends on many factors, including the physical, technical and economic feasibility, social acceptability, and time needed to switchover from oil to the substitute type of energy.

In the case of nuclear power, we can say that its extreme financial costs, and extreme security risks make this so-called 'alternative' a paper solution to the structural energy crisis set by Peak Oil. As North Korea is the most recent to demonstrate, there is no intrinsic barrier or separation between ヵ civil サ and ヵ military サ nuclear technology. Today, there are only about 445 "civil" nuclear reactors operating, worldwide. These provide about 14% of world electricity, which is about 14% of world total commercial energy - in other words nuclear energy provides no more than about 1.2% of world commercial energy, while creating extreme danger security risks for all the world's citizens.

Defining Peak Oil

Problem defining Peak Oil/ Defining Peak Oil is complex because we need several definitions of what "peak" means, and what "oil" means. Several definitions are presented here, including the ASPO (Association for Study of Peak Oil) definition, which only focuses the total extraction or production of narrowly-defined, mostly 'conventional' petroleum liquids in the whole-year period of the defined peak year.

This ASPO definition excludes the more normally used and much wider concept of oil, the ォ all liquids サ definition, as used by world oil trader companies, the IEA and Eurostat, for example. Even using this wide "all liquids" definition, and taking account of the 2 annual peaks of oil demand - as noted seasonal demand is very large and is now the most powerful price setting variable - we are in fact very close to Peak Oil. In other words, whatever the definition we use ("conventional oil" or "all liquids").

I propose a better and more operational definition of 'peak'. This is an effective effective financial and economic definition, which is:

-> oil price context of extremely volatile, unpredictable and uncontrollable price swings, able always to bounce further and higher when the supply/demand balance becomes negative.

-> continuation of this leadiing to year-round physical undersupply of oil markets, until and unless there is no rapid cut in world oil demand led by OECD countries.

This Peak Oil context is in my estimation possible by as early as August 2007. Year-round extraction in 2007, on an ォ all liquids サ base will attain about 31.9 Gb (Billion barrels), and decline from 2008. Summaries of these key forecasts are included in this paper.

The rush to gas: Peak Oil, plus the impact of Kyoto Treaty obligations for ratifying countries will surely reinforce the 'rush to gas', and certain but relatively small growth of renewables, particularly wind electricity. There are likely possible some moves to oil and energy saving in the Kyoto ratifying OECD countries, in a general context of generally accelerating change of regional and national energy mixes. These energy mixes will change faster and more than they have changed in any previous recent period. Evolving mixes, certainly including energy economic restructuring and reduced energy intensity in OECD countries, that is 'Negawatts instead of Megawatts', the quite fast growth of renewable energy sources, greater energy network integration, much more transparent energy pricing, these and other trends can be fvorecast in most OECD countries.

In general, this is called Energy Transition. This will above all be a time of energy challenge, financial and economic risk, and investor opportunity. The strong need for international discussion and agreement on goals, timelines, planning and financing of Energy Transition are easyt to identify as major needs.

Changing Energy Mix

New consumer demands: The changing energy mix will generate, and also be caused by new and emerging consumer and user needs, expectations, values and ways of using energy. The political interest in environment protection and development of renewable energy sources is now very strong in many OECD countries. This includes many countries willing to send troops to Afghanistan, and even to Iraq ! Changing the energy mix in these countries will demand new energy economic infrastructures, and surely provoke sometimes contradictory

political and national economic policy stances, that is intensify the opposition between � top-down � and � ground-up � models and processes of change. Separating the two is the key to mapping likely sequences of change, and identifying investor opportunities, and strategies for Energy Transition.This will also apply in nonOECD countries including Turkey.

The second � ground-up � group of motors for change includes local, NGO, community, municipal, urban and urban regional associations and collective entities seeking new and renewable energy development, and protection of the environment.. but in fact their basic response is to simple market signals of Energy Transition : higher energy prices and declining energy security. Self-reliance will become a major real world solution to declining energy security and higher energy prices.

Defining Peak Oil and Peak Gas

Several definitions are possible, and a large number are in circulation, contributing to confusion of political, media and public opinion on the subject. We can list the following definitions:

- ASPO-Association for Study of Peak Oil definition - the maximum total extraction and production of oil in a 12-month period, this period being the peak year, the same definition being used for Peak Gas
- Peak production rate definition - the maximum total extraction and production rate, held for a certain period, say 30 to 90 days, in the so-defined peak year
- Peak demand rate definition - the maximum possible daily average demand satisfied by world supply before physically undersupply intervenes
- Peak price definition - maximum possible price attained in a given year or period, following which oil and gas demand and production durably decline (long term decline)

How to define oil: All these definitions require a subsidiary definition of what "oil" means, this problem not applying to "gas". ASPO's definition of oil is 'petroleum liquids', including condensates, NGL-Natural Gas Liquids (linked to gas production), extreme depth offshore oil, from 3500 metres water depth and below, heavy oils, and certain syncrudes, notably Athabasca syncrude (Canada) and orimulsion (Venezuela).

We can note that some national ASPO groups, for example ASPO France, use much more restricted definitions, that is "conventional" oil.. Conversely the US EIA (Energy Information Agency), for example, uses a wide definition of 'oil-like hydrocarbons', including maize bioethanol. Many of the oil major corporations, for example Total, ENI, Shell, BP Amoco etc, use several definitions at the same time (that is "conventional" oil, and "unconventional" or "all liquids" oil).

Another problem for defining oil production and production capacities is the question of net versus gross production and capacities. On a worldwide basis, loss of oil production on land,

and especially loss from offshore production, and loss of oil and gas in transport, storage and utilisation totals at least 1.5 Million barrels/day (Mbd), for oil, and at least 0.5 Mbd of oil equivalent for world gas. In the case of gas, this loss rate is increasing at about 7.5% per year.

The oil loss rate is about two-thirds the current national consumption of France or Italy. The gas loss rate is more thazn the total energy use for all electric power production in Black Africa.

The Depletion Crisis

Depletion: ASPO's widely recognised specialty is technical study of oil depletion rates and factors. The massive data bases of ASPO groups, worldwide, enables us to confidently forecast likely net addition to world oil production capacities after depletion. This is now low and erratic from year to year. For 2006, net capacity growth is unlikely to exceed 1.05 Mbd, far less than world production, transport and storage losses. According to Exxon Mobil Exploration, world depletion losses of oil production capacity in 2006 are about 2.25 Mbd lost each year, but this rate will increase to about 3 Mbd-per-year by 2015.

World gas depletion is a much more difficult subject to predict or forecast. In some cases, for example North Sea gas reserves, Groningnen gas reservoir (Holland), forecasting the depletion rate is much easier. What is important to note is that gas reservoir depletion tends always to be unpredictable and rapid.

World demand and Peak Oil: We can confidently say that world oil demand, and world gas demand are now almost totally disconnected from world supply. For oil, the approx. 35% of world oil that is either priced by major markets like NYMEX and Singapore, or priced close to day quoted prices on these markets, has its price governed almost exclusively by world demand and its seasonal weather and climate variations.This is especially strong in Winter 2006/2007.

The world oil and gas pricing system, treating oil on the same basis as seasonal fruits and vegetables is highly speculative, opaque and inappropriate for the 'lifeblood of industrial civilization'. When we focus net additions to oil supply, and net increase of world demand and consumption, we find there is a near total de-connection between demand and supply. This is shown by this simple figure: net additions to world oil production capacity will be unlikely to exceed 1.05 Mbd (+ 1.2%) in 2006.

Conversely, world oil demand net of substitution and oil-saving technology will likely grow by 2.2 - 2.4 Mbd (+ 2.5%) in 2006.

Terror of the 100-dollar Barrel: For a variety of reasons related to the spectre of 'triple digit oil prices', world oil demand data is highly opaque and contradictory. Almost all major institutions with an interest in energy, such as World Bank, OECD IEA, US EIA, the 5 major oil corporation, Eurostat and others claim or imply that world oil demand is now at 'historically low rates', of about 1.5% pa.

The average Even ASPO groups retain a world demand inflator of only 1.7% pa. The underlying rationale - totally contradicted by real macroeconomic mechanisms in play, that we can call 'Petro-Keynesian Belle Epoque growth' - is that high oil prices lead to price elastic fall of demand.

Demand forecasting: I can present ground-up and transparent calculations concerning the world automotive industry, to show that world oil demand growth is very surely alive and well.

We can note that with about 75 Million cars and car equivalent land transport vehicles produced in 2006, and world human population growth in 2006 also being about 75 Million, that we are now at the state of 'For every baby a new car is born'. About 98% of these new vehicles operate with petroleum hydrocarbon liquids and GPL, not hydrogen, flexfuel, bioethanol or biodiesel, despite the talk of After Oil
.

Close to 35% of world oil demand, and around 50% of demand growth can be traced directly and indirectly to land transport vehicles. Each car equivalent unit needs about 5 barrels oil equivalent (boe) of energy to produce, of which about 2 barrels will be liquid hydrocarbons. Other forms of transport - world airplane construction and movements, world shipbuilding and ship movements - need to be analysed by oil demand impact, to which we add the habitat, construction and public works industry, the agriculture and fisheries industries. Concerning electric power production, we can note the 'perverse factor' of climate change, increasing summer peak airconditioning electricity demand in many countries, as well as irrigation agriculture power demand.

Worldwide, oil-fired electric power production is certainly not declining. In brief, we quickly arrive at my estimate of 2.2 - 2.4 Mbd growth of world oil demand for 2006, net of substitution and oil-saving.

Iceberg lettuce and oil price peaks: World oil demand variation due to seasonal factor is very surely increasing, but the annual changes are difficult to estimate. With gas, the pricing system uis surely more "opaque" than for oil, but this situation and context will not be durable. By 2007-2008 the linkage and relation between oil prices, and gas prices, will become very clear.

I present schematic series of seasonal demand estimates and forecasts for world oil demand in 2005-06-07, using an extended "all liquids" basis for defining 'oil'. What we can see is that the 2007 Northern Hemisphere 'summer motoring, airplane movement, airconditioning and irrigation demand peak' could attain 89 Mbd. It is very unlikely that the OPEC and nonOPEC producers can supply this amount.

The Demand Overhang
During the "cheap oil interval" of 1986-1999 the common call and chant of oil price "experts" was that there was 'supply overhang' on world oil markets. That is there was structural oversupply and too much oil on world oil markets, so oil prices were always very low. In turn, gas prices were even lower (often the eqivalent of 10 to 12 USD per barrel oil equivalent).

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This situation and context has completely changed.

Unlimited demand potential: While supply is surely limited, shown by the very weak growth in world output capacity despite 6 years of ever-rising annual average prices, world *oil demand potential* is effectively unlimited. As I show in the Presentation, all the OECD countries have extreme oil intensities or average consumption per capita, led by the USA at about 25.5 barrels/capita/year.

If by miracle, planet Earth was allocated a half-dozen extra Ghawar, Cantarell or Burgan fields, enabling China and India to attain the present US oil intensity, their combined oil demand would run at 150 Mbd and their annual consumption would be 54.75 Billion barrels. Even at 'moderate' European country oil intensities - around 12 bcy - China and India would generate a demand of about 70 Mbd, or about 58.5 Mbd *more than* their present oil demand.

Returning briefly to the car industry, we can note the role of this industry in producing explosive oil consumption growth. Taking 'before car' and 'after car' in economic success story countries such as South Korea, we note that their oil demand can increase 10-fold (900%) in as little as 35 years.

Rational Oil Utilisation (ROU): Nothing in theory, but only in theory prevents China, India, Brazil, Turkey, Pakistan or other industrialising countries reproducing the Asian Tiger, oil-driven economic success story.

We must however accept, very soon, that this is no longer possible, and for many reasons in addition to Peak Oil, such as runaway climate change and geopolitical rivalry in the Middle East, aggravated by struggle for access to and control over the world's remaining oil resources.

We first note there is no chance whatsoever that the Oil Age will end tomorrow or next week. What is urgently required are openly debated, internationally agreed measures for ROU, and planned Energy Transition away from fossil fuels.

Are We Close to Peak Oil and Peak Gas ?

The fact that 'After Oil' has entered the vocabulary of political leaders, at least in Europe, and world media constantly refers to 'declining oil supplies', together with rapidly increasing stress and political tension between Ruisia and Europe because of gas, all these facts and factors suggest that we are close to Peak Oil and Peak Gas

We can take the case of "oil price collapse" in September-November 2006. This event may indeed be serendipitous timing ! Already in July-August 2006, world oil demand on a wide 'all liquids' basis was likely running at around 87 Mbd. At this time in July-August 2006 we also attained a historic nominal-price high of about 78 USD/bbl, but this was quickly explained away as due to the 'geopolitical risk premium'. This "risk premium" was placed by so-called oil price experts at 10, or 20 or even 30 USD/bbl.

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In fact, as we know, any number will do if that contributes to nicely large speculative trading changes of the daily price, becausen oil traders are paid on base of margin changes each day, that is the amount of change in oil price in one day.. This so-called 'geopolitical risk premium' disappeared in August with the last Israeli F-16 raids on Beirut. however, the Iran nuclear crisis, saga or "bande dessin馥" continues; the Iraq war is a rising threat to region-wide stability and is completely out of contreol of the G W Bush regime of USA; the Palestine-Israel conflict continues, and the so-called 'Clash of civilizations' or 'Islamic menace' is a media favourite and *fonds de commerce* for the rush-to-print Al Qaida book industry. Any time the traders like, they can bring back the "geopolitical risk premium".

World oil demand entered its second, and largest seasonal trough from late August, and this simple factor can easily be identified as the real basis of oil price falls since then, and ending very surely by mid-November or before, depending on seasonal weather. The fact that a historic oil price peak was attained with the 2006 Summer demand peak suggests that world demand was then *at the limits of physical supply*. This theory can be checked and analysed, and I can propose several methods for doing so.

Mid East and Central Asian geopolitical instability: This region holds at least 55% of remaining world oil reserves and about 45% of remaining gas reserves. All major oil and gas import dependent countries have a vital interest in this region. The traditional methods for assuring vital supplies of oil do not necessarily start with military invasion and occupation, but they certainly include this option. The problem, of course, is there are big new players in this 'game', as well as many historical and traditional players, many of them local, but as yet not declared.

My next book with the title 'The Next Oil War' treats this dangerous endgame struggle for control of the world's largest remaining oil reserves, to a backdrop of religious schism and conflict, and its risky 'divide and rule' options for external players seeking increased leverage.

Prices and PO: We return the probable most 'operational' definition of Peak Oil, the price at which world oil demand finally exhibits price elasticity, demand growth shrinks to zero, and world supply adjusts to emerging energy mixes with a declining oil share. Ideally, the rate of decline of this share would be at least equal to the decay rate, or decline rate of world oil output after PO, placed by ASPO at around 3.5% pa from either 2009 or 2010, using ASPO definitions and ASPO's unrealistically low demand growth inflator.

A price-induced energy mix shift away from oil, enabled also by ROU, could in my opinion be triggered by oil prices attaining about 95 USD/bbl. At present we have no sign whatsoever of any meaningful shift way from oil in the world energy mix.

The urgency of the situation is deliberately downplayed by institutions such as World Bank and OECD IEA, claiming that PO will occur 'sometime after 2025'. Using published data from the World Bank and IEA, and data from the World Bank consultant M. G. Salameh's presentation to the ASPO5 Conference (Pisa, July 2006), we obtain an estimated world oil demand of about 115 Mbd in the 2020-2025 period. This is at least 28 Mbd above current day average production capacity. Adding 28 Mbd to world capacity, net of depletion, will require the discovery and sustained production of about 3 "new Saudi Arabias", 6 or 7 "new Irans" or 20 "new Iraqs" of the post-2003 liberated variety.

Achieving this in 15 years is simply impossible. It is surprising that supposedly 'serious' institution continue to publish these fantasy figures.

It is sure and certain, however, that oil prices above 80 USD/bbl will help to transform the easy talk of 'After Oil' into organised, real world action for the simple reason there is legitimate doubt that the world will even sustain world oil production above 90 Mbd.

Concerning narrowly-defined "conventional oil", we can note, PO occurred at least 5 years ago, and possibly as far back as 1996-1998.

SUMMARY OF KEY ESTIMATES AND FORECASTS

2006 net additions to world output capacities: 1.05 Mbd
2006 net annual demand growth: 2.2 - 2.4 Mbd
Peak summer demand August 2007: 88.5 - 89 Mbd
Total annual extraction and production 2007: 31.9 Billion bbl
Oil price range Dec 2006-Feb 2007: 65 - 80 USD/bbl
Oil price range Jul-Aug 2007: 75 - 95 USD/bbl
Operational Peak Year: Jun 2007 - Jun 2008

The Chnaging Energy Mix

Concerning oil, we can note that oil depletion, forcing a rapid increase in extreme depth offshore oil, increased land condensates production, increased syncrude and tertiary solvents-based extraction, has led to 'The Lighter Barrel', now averaging about 1165 litres-per-ton, compared with under 1100 l/ton in the 1970s and early 1980s. Not unassociated, but in fact physically and geologically linked with this, we have the so-called 'Gas Bridge' or continuing very fast growth of world gas production, network interconnection, and fast increased dependence on the very few major suppliers - notably Russia for European consumers.

Cynics can call this a bridge to nowhere because Peak Gas is as sure and certain as Peak Oil. In addition, gas reservoir depletion is not at all like oil reservoir depletion, with a fast and unpredictable decay rate or decline after peak is attained. Peak Gas is probable by as early as 2015-2018.

This essentially leaves coal and uranium as fossil energy sources for the post-2025 world underlining, if needed, how vital it is to develop ROU, rational gas utilisation, energy conservation and the renewable sources. It is sure that 'clean coal' technology exists, if expensive, and that uranium reserves at acceptable extraction prices certainly exist, but the growth rate of demand on these relatively static reserves will determine to what extent they can palliate decline of oil and natural gas reserves. Regarding nuclear electricity, and other than its extreme financial cost, almost every day brings further proof there is no 'firewall' or barrier between so-called 'civil nuclear', and real 'military nuclear'. Every single nuclear reactor among the approx. 445 'civil' reactors in service worldwide is a potential Chernobyl.

Changing forecasts: If we turn to official and 'consensus' forecasts for the changing energy mix these are easy to obtain and view, for example the imaginative projections published in the IEA 'World Energy Outlook' series of publications. The best way to appreciate these impressionist rather than impressive artwoks, and their unimpressive predictive capabilities is to compare energy mix forecasts produced at certain dates, say 1990, 1995, 2000 and 2005 for the same future dates, say 2010, 2015, 2020 and 2025. The constant large change of forecast mixes, for the *same date* in the future will leap from the page.

Consensus views: Consensus views, or claimed consensus views are in fact mobile and changing. One example is the 1990s 'consensus' view used by IEA and other institutions, claiming that Saudi Arabia, Iraq, UAE and Kuwait could or would produce a total of about 40 Mbd in 2020. This kind of 'consensus view' has totally disappeared from currently published artworks, or energy mix forecasts of the IEA. A better and more reasonable forecast would be 16 or 17 Mbd, with domestic oil consumption of the four exporters at about 4 Mbd, and net export capacity around 12 or 13 Mbd.

Current 'consensus views' on the world energy mix of the 2010-2020 period include:

- Certain but perhaps only short-term 'Gas Bridge', ie. fast growth of gas utilisation
- Certain but relatively low growth of coal utilisation, mostly 'dirty'
- Official consensus view that currents fast rates of electrification (about 9% pa growth of electricity demand) will be sustained for at least 10 years
- Certain but rarely admitted decline of OECD country oil intensity, perhaps rapid
- Certain and rapid growth of renewable energy production
- Continuing uncertainty regarding the role of nuclear energy

Gas Bridge and Electrification: Most of these views can be criticised, and especially the Gas Bridge theory, and continued very fast electrification in OECD countries as well as nonOECD countries.
We should first note that many countries, eg. practically all countries in Asia and the Mid East, are increasing their gas consumption at over 10% pa, and some like China and India at more than 13% pa. World demand trends for gas are very comparable to world oil in the period of fastest growth, that is about 1960-1975, immediately preceding the first Oil Shock.

World gas reserves are far from limitless, and gas transport infrastructures, especially LNG, are expensive. Gas reserves in the Middle East and Central Asia, we can note, are already the focus of intense geopolitical rivalry. The potential for "gas shock", much stronger than that of January 2006, is most certainly real and possible.

Electrification was a favoured theme of Lenin, for communising the masses, and also a founding idea of the European Community, but thermodynamically it is an aberration. Study of what electrification does to the energy economy is a 'worst of all worlds' story, notably ratcheting up economy-wide energy intensity, including oil intensity, and especially during periods or phases of strong economic growth. The capital costs of electricity production, especially if we project fast growths of wind and nuclear electricity, will themselves act to depress future growth of electrification.

Top-down and Bottom-up: official consensus energy mix forecasts are almost exclusively 'top-down' views of the energy economy, the economy, and society. From the 'bottom-up' we get different, more flexible, and above all real world responses and signals for change of the energy mix, in responses to the same cluster of causes. These causes include resource, technology, financial, economic, political, legislative, environmental, associative and social determinant, factors, demands and constraints. Spanning a range of these 'motors for change' we have the Kyoto Treaty, and various 'Kyoto processes' for attaining national target obligations in the 35 or so ratifying countries.

Energy consumers in the urban markets of the OECD countries, and in nonOECD urban markets more simply react and respond to the following perceptions: energy prices are high and set to rise further; energy security is declining; urgent action is needed to reduce environment deterioration and to slow climate change.

Combined with Kyoto Treaty obligations in the ratifying countries, this results in a powerful number of levers for change of the energy mix.

Kyoto Treaty and the changing energy mix: The mediatised promise of the Kyoto Treaty, to almost painlessly stop or limit what is essentially runaway climate change, must be separated from actual and real provisions of the Treaty, as negotiated and modified over the last 10 years. In the ratifying countries, however, it is sure that 2007 will be a hinge year for energy policies, investment, energy pricing, the regulatory framework, because from 2008 compliance will be programmed into the 2008-2012 period. The Group B Associated Countries, currently only covered by low-impact measures such as Clean Development Mechanism (CDM) credits, may quickly widen Kyoto-related their energy sector investment potentials, depending on ongoing discussions and negotiations. The 'reverse application' of CDM programmes in the ratifying countries, and extended to cover urban habitat, energy, transport and food supply development, offers very large potentials in the near-term.

Energy Transition

Energy Transition means the large and structural change of national energy mixes. At the world level, if there is rational oil and gas utilisation, and rapid worldwide development of renewables, it is likely the tapering-down of world oil consumption can be manageable, rather than catastrophic. This will notably include long-term and continued decline of oil intensity in the OECD countries, the relatively short-term 'Gas Bridge', and other changes within a context that will however remain unsure and unwilling.

NonOECD transition: The four-fifths of the world's population outside the OECD countries will experience a very different trajectory. Taking notably the cases of China and India, these two supergiant economies will firstly and surely transit *towards* the OECD oil intensive and energy intensive economic model. Their current extreme low oil intensities can be compared with those of South Korea, Taiwan, Singapore - the Asian Tigers - when these countries launched their copybook and fast economic expansion they sustained from the early 1970s. Today South Korea has an oil intensity of about 16.5 bcy.

It is surely significant that China, today, uses about 1.1 Billion tons of coal per year and that reduction of this coal burn, together with the US coal burn of about 0.9 Billion tons/year would be desirable to reduce the rate of climate change. However, if China was to start a switch away from coal, reducing its annual coal burn by 50%, and substitute this with oil, China's oil demand would increase by about 45% above its current oil demand. China is already the world's second biggest oil consumer, and third biggest oil importer country, after the USA whose import demand, at about 13.5 Mbd, is about 25% more than the *combined total* of Chinese and Indian oil consumption. Any argument that high oil prices will penalize the economic growth of countries such as China and India, causing them to reduce oil imports, is totally discredited by economic and financial data regarding China and India, whose current (mid year 2006) foreign exchange reserves stand at a combined figure of about 1400 Billion USD.

Energy Transition must therefore be discussed, agreed and planned taking account of such realities. I have made various proposals to this end, recently published by 'Global Cement and Global Fuels' magazine. No acceptable plan or programme will be possible without full participation by world oil and gas producers, with powers in the setting of prices and decision on supplies.

The IET Fund

We can surely hope there will be 'top-down' responses to what is a worldwide problem, or crisis, but we will surely not ignore existing and emerging 'ground-up' investor opportunities generated by Energy Transition on today's real world. At present these opportunities are concentrated, or most easily exploited in urban markets of the OECD countries and certain nonOECD countries.

These Energy Transition-linked and -driven opportunities arise from a few, widely stated consumer and user perceptions, amplified and structured in many cases by community association, NGOs, municipal and urban authorities, private business owners, and other economic players large and mature urban markets.

These drivers of the IET Fund concept can be summarised as below:

☐ Energy prices are high and set to rise further, due to opaque and unsure supply systems, to resource depletion, and to fiscal and tax burdens set by the State

☐ Habitat, transport and food supplies and services are of rising cost and declining quality, with decreasing autonomy and freedom of choice for 'captive' consumers

☐ Environment deterioration and climate change are serious issues, requiring individual and citizen action

☐ All or most market solutions offered are high-cost and/or ineffective, not consumer friendly

The IET Fund proposal addresses this new and emerging cluster of consumer and business needs, with a range of proposed investor vehicles spanning the key sectors of energy, habitat, transport and food supplies and services in urban markets. The strategy is above all *low cost* and *local supply*, tapping into and complementing local associative, community and collective action in the domains considered.

Further details on the IET Fund proposal are available on request.

THE EVALUATION OF ENERGY BALANCE OF EGG-PLUM IN WEST AZERBAIJAN PROVINCE, IRAN

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Health and security of the societies need energy and the land cannot respond to every amount of consumption. However, managing agricultural ecosystems for the utilization of solar energy and agricultural reserves is so important in production. In this consideration, energy flow of egg-plum was evaluated with using of statistics and information related province agricultural organization (preparation of questionnaire from province farmers). The related data of inputs and outputs are become equivalent values of input and output energy, and then was calculated energy efficiency. Energy value of used factors and input of egg-plum was 20433842.8 Kcal/ha^{-1} and output (production) of egg-plum yield 10410255. Also, energy efficiency value (output: input ration) was 0.5. The most of using of energy of egg-plum were irrigation (%53.34) and nitrogen (%34.45) fertilizer. Which is due to the right management in utilization the reserve through standing cultivation method rather than traditional ones increasing the efficiency of energy consumption is possible.

Key Words: Energy efficiency, Cost, Input, output and Egg-plum

Introduction

Agricultural lands are ecosystems that import the energy [4]. Away of estimation agricultural true development to product stability in agricultural location using of energy flow methods [11]. The major result that food and energy is exigent source in natural societies (clause human), limited because amount of sunny energy that stabilized or transform to biomass [6]. The man can increase the evaluation of sunny energy stabilized in agriculture yield with correct management that this subject possible with improve the continental condition, the correct activities of cultural and supply the optimum necessary unit of inputs and improve the high yield varieties. Apprehension distribution energy method importance in developed and management of ecological related to development [3]. Energy efficiency of the agricultural product system can determine with the equivalent energy production of yield and all inputs energy and agricultural activities [8]. Energy cycles are a subject of agricultural ecology and in different agricultural ecosystems that calculate amount of input and output energy [7]. Study of energy distribution method very important, for sustainable agriculture designs [3]. Agricultural ecosystems depends on to ecological energy and cultivation energy, ecological energy source is sun energy that using for photosynthesis and environmental temperature control, atmosphere currents and create rain.

Table 1- Consumer and production energy of egg-plum garden in west Azerbaijan province

Kind of energy	Amount in hectare	Unit energy (kcal)	kcal/ha
Input energy			
Labor	539 hour	465	250635
N	400 kg	17600	7040000
P	250 kg	4790	1197500
Manure	4 ton	15000	60000
Insecticide	5 liter	27170	135850
Fungicide	8 kg	27170	217360
Oil	66 liter	9583.3	632497.8
Irrigation	400000 m^2	272.5	10900000
Total			20433842.8
Output energy			
Egg-plum yield	11175	931.566	10410255

Cultivate energy divisible tow group biological and industrial. Principally need for energy in agriculture relative to change degree in natural ecosystem [6]. Agricultural strongly need to energy, especially related to fossil fuels, using fossil energy in agriculture increase the output energy [5]. Different input energy that impossible causes the increase output energy, analysis biophysical and energy in agricultural ecosystems necessary to affective output energy [2]. So in the agricultural ecosystems, coefficient return material is very few, because to remove the yield, all mineral materials out the ecosystem and plants remain usually using for feed so fertility ecosystem impossible only using the fertilizer or high manure [10].

With restudy the energy efficiency organic system and ordinary system in corn, wheat and potato yield show that increase the energy efficiency in corn and wheat organic system is 29-70 percent than ordinary systems and conversely on potato that energy efficiency in ordinary system is 70-93 percent more the organic systems. By the chemical material and distraction on nature and unfavorable effect in human and animals live [6]. Input, complete index of environmental effect on the plants and using for formulation manure that proper environment [11]. Because the few input, increase using mineral manure, important effect to the yield crop but increase the amount manure, growth and reaction plants reduce [6].

Citable that using the input energy related to output energy very amount variable and depends on to using the nitrogen amount, water management and kind of plant [6]. So intensive agricultural and increase using of chemical material (such as fertilizers, fungicide, insecticides, and another poisons), cause the problems in economic, environmental and ecological that major of environmental effect is: soil erosion, air and water pollution.

In this study determine the efficiency of energy balance of egg-plum garden in west Azerbaijan province and effect factors in reduce the energy efficiency this yield with using the information and statistic of agricultural office and field.

Materials and Methods

The study was conducted during 2004 and 2005 in Uremia area of the West Azerbaijan province in the northwest, Iran.

In this consideration, the energy flow in the agricultural ecosystem of egg-plum garden was evaluated with the use of statistics and information derived from the local agriculture government organization (preparation of questionnaires from 25 local farmers). A detail inventory of average different inputs (labor, chemical fertilizer, manure, oil, nitrogen, phosphorus, insecticide, fungicide, irrigation water) and output (egg-plum yield) was prepared following Scrolls, 1994. Various inputs and output data's were converted to their equivalent values in input and output energy (Table1). Than the energy efficiency was calculated as output: input ratio. So calculate amount energy efficiency (input and output ratio) [6].

Output energy
Energy efficiency = -------------------
                          Input energy

Egg-plum fruit component percent is in the table 2, that amount of energy in egg-plum yield calculate from the product of combination percent in amount of energy that's. Using this data we calculation energy effect in each combination of egg-plum yield and output energy per input energy or energy efficiency [6]. The consumption of water pumping is based on 40-kilo watt/ hour and among of energy have mind to produce one-kilowatt electricity. The cost of electricity production is 272.5 kcal for one kilo-watt [6].

Using this data we calculation energy effect in each combination of egg-plum yield and output energy per input energy or energy efficiency [4].

Result and Discussion

Table 1 showed the energy equivalents for different inputs in egg-plum production in the west Azerbaijan province and tables 2 and 3 showed percent of egg-plum fruit component and egg-plum yield energy produce in each hectare respectively.

Result of investigation showed that energy efficiency (output /input ratio) for egg-plum Yield/ hectare was 0.5 (e.g. use of 1 unite energy produce about 0.5) (table 3) and product protein, oil and carbohydrate of egg-plum /hectare was 0.0131, 0.005 and 0.051 respectively (table 2).

As for the table 4, amounts input energy in egg-plum is a lot. It reason is very irrigation water using in egg-plum garden due to unsuitable variety, susceptible to warm climate and water deficit, and using very N fertilizer (table 1).

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Table 2- Energy efficiency with estimate yield and composition percent in egg-plum garden

Components	Component percent	Energy in each gram (Kcal)	Amount in hectare (kg)	Production energy (Kcal/ha)	Energy efficiency
Protein	0.6	4	67.05	268200	0.0131
Oil	0.1	9	11.175	100575	0.0050
Hydrocarbon	2.33	4	260.37	1041480	0.0510

Table 3- Energy efficiency in egg-plum garden in west Azerbaijan province 2004-5.

Production	Output energy	Input energy	Energy efficiency
Egg-plum fruits	10410255	20433842.8	0.5

Table 4- Percent of input energy in egg-plum yield.

Energy usage	Percent of energy
Labor	1.22
N	34.45
P	5.86
Manure	0.29
Insecticide	0.66
Fungicide	1.06
Oil	3.12
Irrigation	53.34
Total	100

Data showed in table 4 that maximum using energy related to irrigation (%53.34) Nitrogen (%34.45) that major reason reduces energy efficiency in this research.

Major of factor in reduce the energy efficiency in this study, used a lot of energy for supply the water requirement, that reserved the inter energy it reasons reduce the amount of rainfall duration in several years and related the warmth air and reduction the underground water in this region. The availability of water for agriculture must be improved though irrigation. About 60% the water used in the west Azerbaijan for irrigation comes from underground aquifers, from which it is pumped to the surface. These aquifers are slowly and constantly recharged through rain percolation in the soil. But the rate at which they are being depleted is much faster than slow recharge, and the level of the water table is falling, mainly in the view of demand intensive aquatic systems to water requirements. Therefore, can be used the efficient irrigation systems, used the sprinkle system for increase the water efficiency in unit surface.

So using the extra fertilizers (nitrogen) that in this study are 34.45% (table 4) applying nitrogen in fertilizer in excess of the amount removed each year with the crop can lead to loss of nitrogen from the soil environment. Because nitrate is negatively charged, it dose not bind to negatively charged soil particles and so is poorly stored in the soil. When soil water exceeds plant needs (through rain or irrigation), nitrate leaches into soil ground water. This can contaminate the wells, and nitrates in drinking water pose a health problem to the animals and people who use such wells. In long time make the pollution soil, sub water, biological environmental and another factor [1]. Yet governments often have cheap inputs policies, providing subsidized water, fertilizers, oil, gas and electricity to farmers who grow crops. This promotes depletion of water resources and environmental pollutions.

So result that the management systems in different agricultural ecosystems (Iran) should be used of syncretism and combination methods, in this sense, used of modern methods in different farming and especially intensive farming such as egg-plum garden that should be notice to region potential and local capable [9].

In the end can be key suggestion that consist:
Used of modern irrigation systems replace the locality systems, using of resistance variety to dry and warm whether, resistance to water stress in less rain regions, cultivation on proper lands and used the organic matter (animal manure, green manure).

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BIOMASS RESOURCES AND MAINLY USING AREAS IN TURKEY

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Biomass energy is the most renewable and widely using energy resource in the world. As known well, Biomass energy is derived from plant and animal materials, such as wood from forests, residues from agricultural and forestry processes, and industrial, human or animal wastes.

In this study assesses the sustainable biomass energy resource's potential in Turkey. Turkey has a large potential for biomass energy (bioenergy). Various agricultural residues such as grain dust, wheat straw, and hazelnut shell are available in Turkey as the sources of biomass energy. At the same time, In Turkey energy wood is available in the form of forest chips, fuelwood, wood waste, wood pellets, and it is also produced to a very limited extent from willow crops in short rotation forestry. The major part of wood harvested in the forest area (approximately 10 million ha) ends up as energy wood directly or indirectly after having been used for other purposes first.

Researchings show that the potential of each source is estimated for the base year 1990, 2000 and for the years 2005 and 2010. The total energy potential of these sources in 1990, 2000, 2005 and 2010 is 21, 27,35 and 255 million TEP , respectively; the total potential is estimated to be about 39.5, 33% and 28% of the projected total energy consumption in 1990, 2005 and 2010, respectively. It means that a decrease of about 11% in the usage of biomass for energy will become between years of 1990 and 2010. On the other hand, these values are official. If 4-6 million MT (illegal cuttings) is taken into considerations, the official data mentioned above will increase by about 1-2%. Also, to obtained electricity energy from biomass resources is very important for Turkey developing at next years.

The production of biofuels, such as ethanol and biodiesel, has the potential to replace significant quantities of fossil fuels in many transport applications, electricity, generation of heat and steam, etc. Because the present energy sources, especially fossil-bored ones, increased energy requirement due to the speedily (speedy) –increasing the world population, and the recent studies on the energy have been focused on the renewable energy resources such as hydrogen, solar, wind and biomass in Turkey.

Keywords: Biomass resources, Boienergy using areas,Turkey.

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INTRODUCTION

Biomass refers to solid carbonaceous material derived from plants and animals. These include the residues of agriculture and forestry, animal wastes and wastes from food processing operations (Kaygusuz and Türker, 2002; Ramachandra et al. 2000). Since the present energy sources, especially fosil-bored ones, increased energy requirement due to the speedily (speedy) –increasing the world population, and the recent studies on the energy have been focused on the renewable energy resources such as hydrogen, solar, wind and biomass (Bektaş et al. 2005). To meet the need to raw material either for energy or other usages, plantation of the fast growing species, utilization from the whole biomass and usages of wood-based wastes e.g., wastes papers, wastes from cutting trees) is necessary(Bektaş et al. 2006).

Turkey's geopolitical locale made possible an important role in regional politics, while domestic energy needs required it to do so. Whether Russia will be able to re-dominate the region remains to be seen, but it can be assumed that Turkey will not accept that fact and intends to continue playing a major role in Central Asia and the Caucasus. Turkey's energy consumption and imports are experiencing rapid growth, as is the Turkish economy. In recent years, Turkey has experienced a significant change in its geopolitical situation with the breakup of the Soviet Union and the end of the Gulf War. Turkey has engaged in a relatively active effort to tie the newly independent Turkic republics to it, at least in cultural, educational and business matters. Turkey's port of Ceyhan is an important outlet both for current Iraqi oil exports and for potential future Caspian oil exports as well. With its economy now being the world's 16th largest and with 65 million people, Turkey's energy needs are increasing quickly. Turkey's gas demands during the 1990s have been growing at 10% per year, and by the year 2005, these demands are expected to quadruple to 45 billion m3. Oil needs are similarly urgent, with predictions that 22 million tons will have to be imported annually by 2010. Consequently, in recent years, the Turkish Government has made it an important policy goal to find and retain reliable energy supplies (Demirbaş, 2002).

Energy is one of Turkey's most important development priorities. Turkey's energy demand is growing at a rate of 8% per year. Over the next 10 years, about 3,500 MW of new energy generationcapacity has to be installed annually to meet the country's demand. To meet this requirement, both private and public financial sources are being utilized (Demirbaş, 2002).

Turkey's electric power demand has been growing steadily, averaging 11% annual growth over the past 40 years. Projections by the Turkish government indicate 8% annual growth over the next 15 years. Electric energy consumption in the year 2010 is projected to be 240 billion kW h. Government officials have developed plans for installing 33 lignite fired, 27 natural gas fired, 12 coal fired, 2 nuclear powered and 113 hydroelectric plants to meet this demand (Demirbaş, 2002).

On the other hand, Biomass using is very important for The European Union as well. Because one of the European Union's Reports (European Union' Report 2006) is determined that European Union is already working towards achieving a 12% share of energy for renewable in general and a 5.75% share for biofuels in transport by 2010.These targets are expected to rise. In fact, the European Summit in March this year discussed increasing the overall share of renewable to 15% and the share of biofuels to 8% in 2015. Even higher shares have been suggested by the European Parliament for 2020. Of course, any proposal for raising the limits needs to be subject to an Impact Assessment and this must assess the environmental consequences of the proposed change. Alongside energy efficiency, renewable energy is on the way to becoming a cornerstone of the energy and environmental policies of the European Union. There are a number of reasons for this. Firstly, the International Energy Agency predicts that worldwide energy demand will increase 50% by 2030 if governments stick with current policies. Oil and gas prices are the highest for many years. Many say the days of cheap oil are over. Europe's own oil, gas and coal reserves are diminishing. Today we import 50% of our total energy needs, and in two decades, if nothing is done, it is projected to be 70%. The precariousness of this situation is clearly illustrated by the recent gas price dispute between Russia and Ukraine – and the continued instability in the Middle East. The need to reduce dependence on imported energy and to increase economic stability and sustainability is reinforcing the case for diversification, particularly into renewable. We also stand to benefit from it economically. The renewable energy sector features amongst the fastest growing and most innovative sectors in the European Union. Annual turnover has reached 30 billion euro or about 50% of the world market, and more than 200.000 jobs have been created. With increasing volumes, we have also seen significant cost-reductions: renewables are becoming progressively more competitive. It is a highly innovative, fast-developing sector, where further growth is expected and should be encouraged. In the field of bio-fuels, there is much potential to develop more advanced, higher yielding bio-fuel production processes with a better environmental profile. This development can contribute to the substantial evolution of the sector. Secondly, there is more and more distressing evidence of the effects of climate change. 2005 was the hottest year ever recorded. In 2005, Europe witnessed devastating floods, droughts and forest fires. Hurricane Katrina demonstrated the staggering costs of climate-related disasters. Recent analysis of ice-cores has revealed that greenhouse gas concentrations in the atmosphere are higher now than at any time in the past 650.000 years. Among the renewable energy sources, biomass seems one of the most interesting because its share of the total energy consumption of Turkey is high at 10% (its sharen of the total production is 26%), and the techniques for converting it to useful energy are not necessarily sophisticated. Implementation of biomass-based energy programs will not, of course, be a definitive solution to the country's energy problem, but it will bring new insight for efficient energy use in the household sector, especially in rural areas where 40% of the population live (26 million) [4]. The estimates are based on the recoverable energy potential from the main agricultural residues, livestock farming wastes, forestry and wood processing residues, and municipal wastes(Kaygusuz and Türker, 2002).

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MAINLY BIOMASS RESOURCES and ITS POTENTIAL IN TURKEY

World wide, biomass ranks fourth as an energy source and provides about 14% of the world's energy needs. Furthermore, biomass is a clean and renewable energy source. Upon combustion, carbon dioxide is released into the atmosphere, but carbon dioxide was the source of the carbon to generate the biomass and so, there is no net gain of carbon dioxide.

Renewable energy sources have a high share in energy supply, due in particular to the extensive use of wood by households. In order for consumption to be sustainable in the long term, the Government has to address deforestation problems. Hydro and geothermal are both expected to increase substantially. Turkey's domestic energy consumption accounts for about 37% of total energy consumption. Of this, about 52% are from biomass based fuels. The most significant developments in production are observed in hydropower and geothermal energy (Demirbaş et al. 2001).

Wind Energy

The government considers source diversification an important issue in power generation. To meet the long term power demand, the Turkish administration and private industry are investigating renewable energy sources, including wind energy. Despite high initial capital cost, there are advantages to using wind power in Turkey: Turkey is facing serious fuel supply constraints for primary power generation. It has comparatively strong and consistent wind currents in some parts of the country. Thus, there is strong interest in wind energy, and serious efforts are being made to implement them as quickly as possible.

The first study on the utilization from wind energy is the determination of potential of wind energy. The wind measurements for energy and other related meteorological measurements have been conducted by General Directorate of Government Meteorology Works, so-called DMI. The possibility of making programs and plan depended upon the wind energy is possible with determination of potential of this source. With this aim, the records done in the stations of DMI between 1970 and 1980 were evaluated, and distributions of natural wind energy in the whole country were determined.

Yet, the detailed wind potential evaluation becomes necessary for the works ok the electrical energy production from wind. In the parallel to this purpose, in the places eligible to produce wind energy, wind energy observation stations were established and many data have been started to be collected. In these stations, data collection systems with low-powered micro process have been used. Measurements were usually taken after every 10 m and some times at 30 m height. The measurements were collected at periods of 10 min and 1 hour (EBI, 2005).

The investigations showed that the average wind speed data obtained in the pilot stations is acceptable for the application of wind energy in Turkey. These results encouraged the businessmen to establish wind fields and to measure their own wind speeds.

For this aim, the Turkish Wind Energy Association was established in 1993 to promote wind energy in Turkey. To date, MENR has received twenty-five BOT and two auto producer type wind energy project proposals. The total capacity of these projects is over 600 MW. It is estimated that 150– 200 MW capacity will be installed and put into operation by the year 2000, and by 2005, it is estimated that 600–700 MW wind capacity will be installed in Turkey. Currently, wind energy projects are concentrated in the Aegean region (16 projects) and the Marmara region (9 projects). The gross wind energy potential of Turkey is more than 400 billion kWh, of which 124 billion kWh is a technically feasible potential, and for some specific locations, the net economic potential reaches about 14 billion kWh (Guney et al. 1994).

Biogas

Since 1990s, the Ministry of Energy in Turkey has started to determine biogas potential. According to guess (Ministry of Energy of Turkey),in 2005, biogas potential in volume equal to animal based waste potential in Turkey is 1.7 billion m^3 pear year (stone coal equal value is 2.5 million ton pear year) (EBI, 2005).

Solar Energy

Turkey is of big chance because of having very convenient geographical position with solar energy. Based on study done by General Directorate of Government Meteorology Works (DMI) between 1966 and 1982, determined that the average annual total lightning power is 1311 kwh/m²year (daily totally 3,6 kWh/m² or 308 cal/cm^2). Still, residential places; solar energy has been used for heating residential houses and green houses (EBI 2005).

Hydrogen Energ

Recently, some scientists have started to propose some projects on the productor of hydrogen from biomass by using steam reforming methods and solar energy. It will be more important getting every day to use hydrogen energy all the World include Turkey

Geothermal Energy

In Turkey, geothermal energy resources were not efficiently utilized so far. Çengel (2004) reported that Turkey is the 7th biggest country in having potential of geothermal energy resources. If this energy is effectively utilized, 0.3% percent of total consumed energy can be supplied by geothermal energy for 2005.

For the time being, this energy is used for the purpose of electricity,18 mw (0.5% of potential electricity energy, 4500 mw) and for heating as 820 mw (2% of potential energy, 31.500mw). Geothermal energy has a capacity to meet 30% of heating needed.

Biomass Energy Resources

Turkey is of good position in view of biomass energy resources. Having 25% of total area of Turkey, Turkey has about 1.1 billion m3 tree wealth and about 32.4 million m3 annually wood increment (EBI, 2005). In Turkey, biomass energy resources including tree branches and industrial wastes were shown Table 1.

Table 1. The potential energy resources in Turkey (Bektaş et al. 2005).

Biomass sources	Potential (tone/year)	Energy value (kcal x10^9)
Wood (including branches and industrial wastes)	30.000.000	135.000
Crop wastes (wheat, barley, rye, tobacco and rice)	26.740.000	93.590
Cotton, mize, sunflower stalks	8.000.000	28
Jlax-hemp and canes	2.200.000	7.7
Grapewine canes	600.000	2.1
Total	67.540.000	266.39

As is shown Table 1, in Turkey, 67.5 million tone (MT) wood and annual plants have energy of 266x 10^{11} kcal every year. This value is equal to 2.6 million TEP (Tone equal petroleum). As shown in the same table, 45% of the annual production of biomass resources in Turkey is wood and the rest (55%) of them is annual plant resources. However, Turkey could not utilized the annual lignocellulosic wastes in sufficient. Moreover, these kinds of plants have not been collected and not used satisfactorily. It can be understood easily that When we make to meet the Turkey's biomass resources with European Union. As is shown Table 2, EU attach importance to produce energy crops from agriculture in the next years though wood and wood industry residues were mainly used for biomass consumption in 2003.

Table 2. EU biomass production potential(BAPEC, 2005)

Mtoe	Biomass consumption, 2003	Potential, 2010	Potential, 2020	Potential, 2030
Wood direct from forest (increment and residues)		43	39-45	39-72
Organic wastes, wood industry residues, agricultural and food processing residues, manure	67	100	100	102
Energy crops from agriculture	2	43-46	76-94	102-142
TOTAL	69	186-189	215-239	243-316

The usage of biomass energy in electricity, heat and transport areas in EU is seen in Table 3. As is shown Table 3, it is estimated that biomass energy using will approximately increase 116% in total usage.

Table 3 . A scenario to increase biomass energy using current Technologiesin European Comunity (BAPEC, 2005; REU, 2006)

mtoe	Current (2003)	Future (2010)	Difference
Electricity	20	55	35
Heat	48	75	27
Transport	1	19	18
TOTAL	69	149	80

Table 4 depicts the energy ratio resulted from lignosellulosic wasted out of total energy consumption in Turkey. When this table is investigated in detail, any one can easily understand the importance of lignosellulosic wastes in Turkish companies.

Table 4: The ratio of lignocellulosic energy resources in total energy consumption of Turkey.

Years	Total Energy Consumption (x1000 TEP**)	Lignocellulosic-based Energy resources in Total Consuption		Wood-based energy resources in lignocellulosic resources		Non-wood-based residue energy resources in lignocellulosic resources	
		amount (x1000 TEP)	ratio (%)	amount (x1000 TEP)	ratio (%)	amount (x1000 TEP)	ratio (%)
1990	52 987	20 929	39.5	6 498	31	14 431	69
1995	63 356	23 949	37.8	6 677	27.9	17 272	72.1
1999	74 735	25 484	34.1	5 082	19.9	20 402	80.1
2000	81 221	27 209	33.5	5 070	18.6	22 139	81.4
2001	77 044	26 888	34.9	5 904	21.9	20 984	78.1
2002	85 750	30 013	35.0	6 616	22	23 397	78
2005*	105 970	35 076	33.1	6 121	17.5	28 955	82.5
2010*	904 000	255 832	28.3	7 273	2.9	248 559	97.1

*Assumed values
** Petrol-equaled values

As one can see from Table 4, total energy sources consumption in Turkey increased by about 65% in 2002 in comparison to that in 1990. This increment is 50% in 2002, 57% in 2010. As illustrated in the same table, the lignosellulosic energy consumption sources increased by 77% and 60% in 2005 and will be assumed by 116% in 2010.

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THE USING OF BIOMASS RESOURCES OF TURKEY

It is evident that biomass consumption can be classified into two different divisions such as traditional biomass uses and modern biomass uses (Table 2). Traditional biomass uses are mainly, but not only, identified as biomass which is obtained without involving commercial transaction. Such biomass is commonly used for cooking and heating purposes.

Table 2: Present and planned biomass energy production (ktoe) (Kaygusuz and Turker,2002; WECTNC, 2000).

Years	Classic biomass (ktoe)	Modern biomass (ktoe)	Total (ktoe)
1999	7012	5	7017
2000	6965	17	6982
2005	6494	766	7260
2010	5754	1660	7414
2015	4790	2530	7320
2020	4000	3520	7520
2025	3345	4465	7810
2030	3310	4895	8205
Total	34,658	17,853	52,511

Modern biomass is characterized by market transactions and is used in the industrial, transportation and commercial sectors. Products of such activities are charcoal for the pig-iron and steel industries, firewood for thermoelectricity generation and other industrial boilers, firewood and briquettes (Kaygusuz and Turker, 2002). Briquettes were expected to be used with more frequency than they currently are. They have many advantages over firewood for commercial ovens and are seen as an alternative to slow down deforestation (Turker and Ayaz, 1997). Even so, there is evidence showing continuous interest in briquettes in some countries (Moreira, 1995) for commercial purpose ovens and liquid fuel production. Charcoal production is by far the largest industrial modern use of fuelwood, followed by thermoelectric generation, and industrial boiler producing steam, and localized electricity consumption. Charcoal production technology evolves very slowly, not due to the absence of opportunities but mainly to the low labour costs in many tropical developing countries. Examples of modern technologies are the collection of tars for use as chemicals (Rosillo-Calle et al.1996), the environmentally friendly and energetically self sufficient installation of wood carbonization by pyrolysis (Zandersons et al.1997) and the high-pressure charcoal production facility developed in Hawaii (Antal et al.1996).

CONCLISIONS

Wood fuels and biomass will be an important source of energy for the next century. Their use in households, mostly involving non-commercial operations, will continue and on a larger scale than that of today. Shortage of supply, which has already been a concern for some users, will increase. Their use in the industrial and transportation sectors is quite promising, based on credible forecast sand on the present trend observed in several developed and some developing countries.

Since Turkey is candidate for being member of a Europe committee/developed countries, the usage of biomass as fuel should be designed as is necessary. Particularly, value-added products such as charcoal, bio-oil, and densified fuel biomass (in the form of briquettes) must be produced, which is presently absent or unsufficient.

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AN APPROACH BIOMASS FOR FUEL

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Biomass, is one of the renewable energy including wood and nonwood has been used as a source of fuel for heat and power for many thousands of years. One significant enviromental advantage of biomass is that the carbon dioxide released on combustion was relatively recently fixed from atmosphere via photosynthesis.

Turkey has very much biodiversity. Therefore is determined renewable energy crops that its sustainable.

The role of power generation from biomass reducing green house gas emissions is evaluated alongside an evaluation of the wider enviromental. Also ıts social and economic impacts of the level biomass in the Turkey
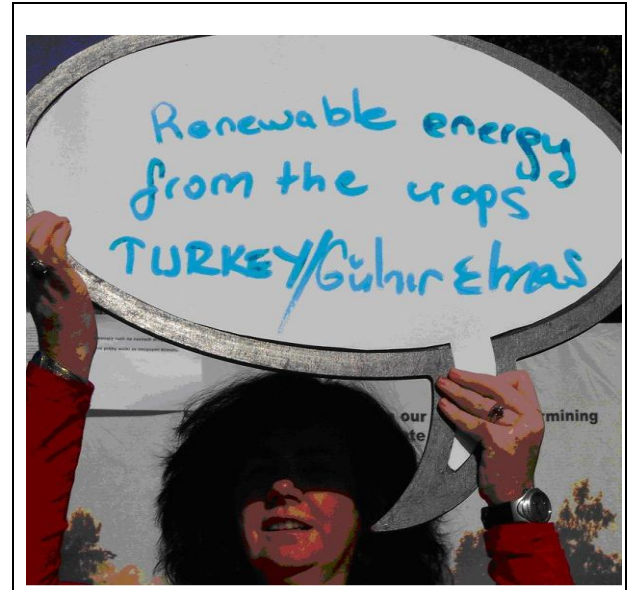
To increase ıts level of renewables based power generation, the contribution that biomass makes and could make in future is examined.

Biomass

Biomass is a renewable energy resource derived from the carbonaceous waste of various human and natural activities. It is derived from numerous sources, including the by-products from the timber industry, agricultural crops, raw material from the forest, major parts of household waste and wood [6].

Biomass does not add carbon dioxide to the atmosphere as it absorbs the same amount of carbon in growing as it releases when consumed as a fuel. Its advantage is that it can be used to generate electricity with the same equipment or power plants that are now burning fossil fuels. Biomass is an important source of energy and the most important fuel worldwide after coal, oil and natural gas [7].

Traditional use of biomass is more than its use in modern application. In the developed world biomass is again becoming important for applications such as combined heat and power generation. In addition, biomass energy is gaining significance as a source of clean heat for domestic heating and community heating applications. In fact in countries like Finland, USA and Sweden the per capita biomass energy used is higher than it is in India, China or in Asia.

Biomass, including one of source wood, has been used as a source of fuel for heating and power for thousands of years. Nowadays, besides coal petroleum, natural gas etc., the fossil originated first energy resources, new-renewable energy resources examination in energy technology subject to an increasing attention and intensity of application. Among new-renewable energy sources "biomass" has the biggest technique potential in this respect. Plant and animal as well as all matters, consisted of carbohydrate components, are "Biomass energy sources" and the energy, generated from these sources, is defined as the "biomass energy".

Vegetable biomass is a result of green plant's ability of charging solar energy into chemical energy by the help of photosynthesis than the storage of this energy. With photosynthesis, the organic matter which has the energy content by approximately 3.1021j / year is formed up[4, 5].

This value is the equivalent value of the world's energy consumption ten times. Firewood (energy wood, variable trees) oily seed plants (rape, sunflower, soybean etc.) carbohydrate plants (potatoes, wheat, corn, beet, artichoke etc.) fiber plants (linen, hemp plant, kenaf, sorgun, miskantus) protein plants (peas, beans, wheat, etc.) vegetal plants wastes (branch, stalk, straw, root, husk etc.) animal wastes urban and industrial wastes are examined within the framework of biomass energy technology. And alternative fuel can be maintained whereas the existing fuels are in solid, liquid, gas forms.

Renewable Energy Sources

There is substantial interest in increasing the proportion of primary energy supply from renewable energy sources, primarily to reduce levels of carbon dioxide emissions: but also to increase fuel diversity and improve security of supply.

The pulp and paper industry is one of important waste industries. This industry is made pulp from woods and nonwoods as natural plants sources to produce paper and board. Paper making is divided two classes in respect of the production of pulp and paper.

In the paper production, pulp is used as raw material, made of wood as well as of waste paper and filler material. Pulp pulping methods are mainly like kraft, sulphite and, mechanic pulpings. The Pulp Production Capacity of Turkey in 2003 and distribution on the basis of production type is given in the following Table1.

Tablo.1 Pulp Production Capacity (in tons) and production capacity rate (%) [3]

Pulp	Capacity	Production	Utilization Rate of Pro. Capacity (%)
Mechanic Pulp	66.000	15.355	23,3
CTMP	82.000	-	-
Bleached kraft pulp	70.000	55.000	78,6
Unbleached kraft pulp	215.700	51.650	23,9
Viskos Pulp	12.000	-	-
Hemp Pulp	3.630	697	19,2
Straw and reed Pulp	115.000	37.893	32,95
Total	564.330	160.595	28,5

Utilization rate of production capacity of pulp production of sector is low except kraft pulp (Table 1).

Production of the pulp and paper in the world with fiber raw materials which is used, are occurred 50 % of percent from forests, 44 % of percent from waste papers, 6 % of percent wastes of agricultural crops and from annual plants. Additionally, the average recycling rate is 85 % in the world, this rates totals around 33 % in Turkey

If it is taken into consideration that 3 tons of wood is required for the production of 1 ton of paper and that the waste paper can be recycled 5 times and ideal recycling rate is to be 65 %, then, it may be easier to understand the economical and social merit of the said recycling process to the biomass*[3]*

The number of enterprises for wood pulp, registered to the Industrial Database of TOBB (Head Office of the Association of Turkish Chambers) turned out to be 5 in 2004. Total capacities in these sectors are 314.523 tons. In the nonwood cellulose production, however, number of enterprises 3 and total capacity, however, 94.045 ton.

The scope of forest products except wood, includes of trees , bushes, herbaceous plants, without their wood, all kinds of balsam oils, fruits seeds, flowers, leaves, husk, early roots, branches and its suckers, humb, rhizo, galls, fungis are those what we accept as biological wealth forms the variety of the forest product except wood.

Our country has different types of ecology, because of its geographical situation and topographic structure. This ecologic variety causes an abundance of products. In our country 3000 endemic, above 9000 plant varity is variable. The balsam oils, fruits seeds, leaves, balls, rizoms that we maintain from these plant varieties are produced..

Tablo.2 Some Wood And Herbaceous Products Distribution of Turkey [2]

	Ha	Approximate Capacity (kg)/year
Sage (Salvia officinalis L.)	183,726	1,247,761
Juniper (Juniperus SP.L)	285,381	1,328,025
Tyme (Thymus serpyllum L.)	602,683	5,241,458
Linder (Tilia sp.L.)	18,128	252,940
Lurel (Laurus nobilis)	131,862	12,201,326
Chestnut (Castanea vulgaris)	109,270	6,647,415
Boxwood (Buxus L.)	20,424	939,115
Black pine (Pinus nigra)	1,782,159	555,000
Red pine (Pinus buritia)	2,413,083	24,600,000
Filbert (Corylus avellana)	5,292	209,200
Walnut (Juglans regia)	13,460	1,299,100
Carop (Ceratonia Siliqua)	21,816	554,350 ton/year
Pine barren (Pinus Pinea L.)	65,914	2,545,064 ton/year
Thornapple (Cretaegus monogyna jacq)	32,501	240810 ton/year
Sorbuz aucuparia	525	250 ton/year
Hypericum	19,023	179,000
Gentiana lutea	90	230 ton/year

As a requirement of Article 37 of the Law no. 6831 for Forestry, resinous piece of wood, pine wood with resinous piece of wood sweet gum and boxwood is either produced by the General Directorate for Forestry or is caused to be produced by the latter and relevant sales of them are effectuated out of appraised values.

The production in the pinus brutia forests of our country is carried out by the acid pastry method that is known as optimum and applied there in. Since it was appropriate to produce resin with the same area at the natural forest for years by the mentioned acid pastry method, the suitable potential area due to be allocated for this is 400.000 hectares. However, the area being allocated within this framework has been 300.000 hectares.

Over years distribution of production leaves of laurel and thyme is given in Table 4 and

5. *Tablo 3 According to Years Distribution Variety of Produced Plants* [2]

year	Plant varieties (number)	year	Plant varieties (number)
1989	37	1997	52
1990	41	1998	60
1991	41	1999	71
1992	26	2000	76
1993	33	2001	84
1994	38	2002	95
1995	44	2003	105
1996	65	2004	105

Tablo 4   Leaves of Lurel Production and Import [1]

year	Amount production(ton)	Amount import (ton)
1998	3551	3423
1999	4661	3782
2000	3732	4423
2001	8000	4611
2002	8172	4903
2003	7800	5099

Tablo.5 Thyme Production and Import [1]

Year	Amount production(ton)	Amount import (ton)
1995	2728	3077
1996	2235	4507
1997	3157	4825
1998	2440	5782
1999	3496	6612
2000	3692	6094
2001	8001	7381
2002	3426	6577
2003	3940	8791

In addition to a clear comprehension of the gradually increasing vegetal product varieties from the Table 4 and 5, it is understood that Thyme and Leaves of Lurel have also shown an increase over the years. As a consequence, this emphasizes that the natural sources of the biomass have an increasing potential.

Conclusions

The data showing the expandable capacity and available rates of use of the renewable biomass in Turkey that may be procured from the wood and non-wood products have been determined. It is necessary to determine the optimum biomass outputs of the wood and woody sources putting forward the available rich biological variety of Turkey and calculate their economic standing and carry out works for the increase of classical alternative production capacity.

The data constituting the potential sources of biomass, obtained from the cellulose and paper industry has a significantly important potential value due to the fact that it will reduce its contribution to the air pollution as a result of sera gases, released into the atmosphere and also destruction that may be caused to the environment regarding the production of bio-energy.
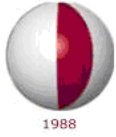
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ANALYSIS OF SOLAR RADIATION DATA INCIDENT HORIZANTAL AND TILTED SURFACE CASE STUDY FOR ISPARTA, TURKEY

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Measured monthly mean daily global radiation data for Isparta (37^0 18' and 38^0 30' N latitude) has been calculated for estimating global solar radiation incident horizontal surface and tilted surface. Hourly global, diffuse and direct solar radiations on a horizontal and tilted surface in Isparta have been determined. Taking sunshine duration values as reference, monthly average, daily average global radiation was investigated with computer simulation. Solar radiation reaching tilted surface for various agle values was investigated with computer simulation and optimum angle was determined.

Key Words: *solar radiation, optimal tilt angle, solar collectors*

INTRODUCTION

Methodologies for the estimation of the hourly global solar radiation in a day, on the horizontal, have been elaborated and proposed by many researchers, as they are reviewed in [1,2,3]. An accurate knowledge of the solar radiation data at a particular geographical location is of vital importance for the development of solar energy devices and for estimates of their performances. Unfortunately, for many developing countries, solar radiation measurements are not easily available because of not being able to afford the measuring equipments and techniques involved. Therefore, it is necessary to develop methods to estimate the solar radiation on the basis of the more readily available meteorological data. However, most solar radiation recording stations measure only the total horizontal solar intensity. Thus, it is rather important to determine the beam and diffuse components of the total radiation incident on a horizontal surface [4]. Many models have been developed to estimate the amount of total solar radiation using various climatic parameters, such as sunshine duration, cloud cover, humidity, maximum and minimum ambient temperatures etc. [5]. The studies on solar energy which takes an important place between new and renewable energy sources have been increasing during recent years. The solar energy system are preferred because of the following factors: these systems require only solar energy for their operations; they do not make any noise; and do not have harmful gas emission; they have a low maintenance and repair costs.[6] In many applications of solar energy the most important parameters that are often needed are the average global solar irradiation and its components. Unfortunately the measurements of this parameter are done only at a few places. Fort his reason there have been attempts at estimating them from theoretical models [7]. Monthly averages of the daily solar radiation incident upon a horizantal surface are available for many locations. However, radiation data on tilted surface are generally not available [8]. In this study solar radiation reaching horizantal and tilted surface was investigated with computer simulation for Isparta.

3.Monthly Average Daily Radiation And Monthly Average Hourly Radiation Incident Horizantal Surface

The monhly average of daily global, difuse and direct solar radiations on a horizontal surface are shown in Figure 1.
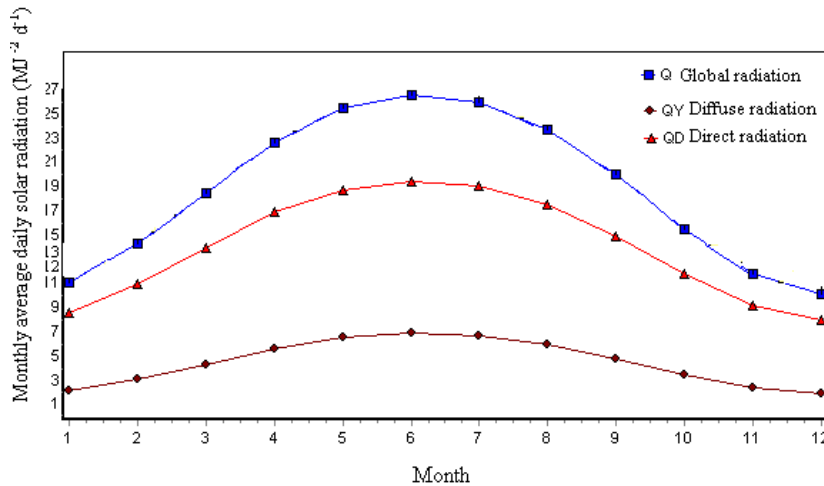
Figure 1. Monthly average of daily global, diffuse and direct solar radiation

It can be seen that the monthly daily global values range from 26,6 $MJm^{-2}d^{-1}$ in June to 11,2 7 $MJm^{-2}d^{-1}$ January, diffuse values range from 7,2 $MJm^{-2}d^{-1}$ in June to 2,8 $MJm^{-2}d^{-1}$ January, and direct values range from 19,4 $MJm^{-2}d^{-1}$ in June to 10,2 $MJm^{-2}d^{-1}$ January. The peak global radiation values and low global radiation values is calculated in July and in January, respectively. The average daily radiation on a horizantal surface, H, for each calender month can be expressed by defining K_T, the fraction of the mean daily extraterresterial radiation, H_0

$$K_T = H/H_0 \qquad\qquad (1)$$

where H_0 is the extraterresterial radiation on a horizantal surface on day n of the year which is given by

$$(H_0) = \frac{24}{\pi} I_{sc}\left[1 + 0,033\frac{360n}{365})\right] * [\cos\phi\cos\delta\sin w_s$$
$$+ (w_s 2\pi/360)\sin\phi\sin\delta \qquad\qquad (2)$$

where I_{sc} is the solar constant, n is day of the year given for each month in Table 1, Φ is the latitude, and δ is the solar declination which can be approximately expressed

$$\delta = 23{,}45^0 \sin[360(284+n)/365] \tag{3}$$

w_s is the sunset hour angle

$$\cos w_s = -\tan \Phi \tan \delta \tag{4}$$

H_0 can be conveniently estimated from eqn 3 by selecting for each month, the day of the year for which the daily extraterresterial radiation is nearly same as the monyhly mean value. Using the 16th day of each month can lead to small errors in Ho particularly for June and December. Recommended days for each mont hare given in Table 1[8] .

Table 1. Recommend average day for each month

Month	Day of the year	Date
Jan	17	17
Feb	47	16
Mar	75	16
Apr	105	15
May	135	15
June	162	11
July	198	17
Aug	228	16
Sept	258	15
Oct	288	15
Nov	318	14
Dec	344	10

Monthly hourly global, direct and diffuse radiations for January and July representing winter and summer respectively, are plotted in Fig 2.

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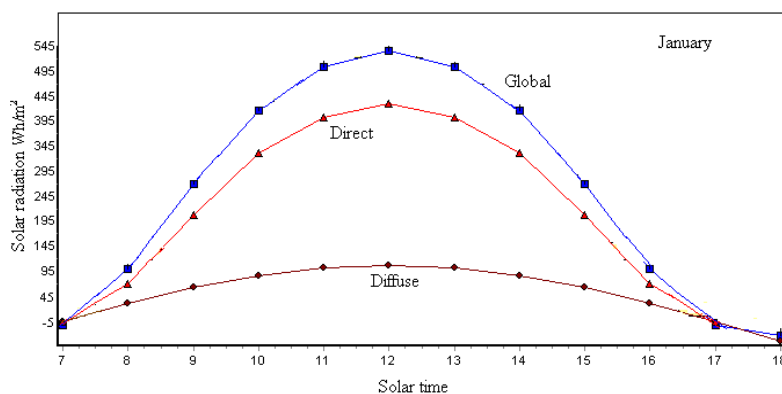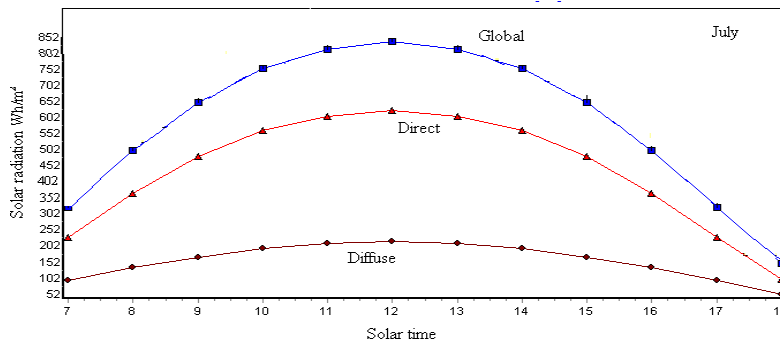
Fig2. Monthly average hourly global and diffuse radiation for January and July

4.Monthly Average Daily Radiation And Monthly Average Hourly Radiation Incident Tilted Surface

The average daily radiation on a tilted surface, H_T, can be expressed

$$H_T = R_H = RK_T H_0 \tag{5}$$

where R is defined to be the ratio of daily average radiation on a tilted surface to that on a horizantal surface for each month. R can be estimated by individually considering the beam, diffuse, and reflected componenets of the radiation incidence on the tilted surface. Assuming diffuse and reflected radiation to be isotropic.. Liu and Jordan (2) have proposed that R can be expressed

$$R = (1 - H_d/H)R_b + H_d/H(1+\cos)/2 + \rho(1-\cos))/2 \tag{6}$$

where Hd is the monthly average daily diffuse radiation, Rb is the ratio of the average beam radiation on the tilted surface to that on a horizantal surface for each month, s is the tilt of the surface from horizontal, and ρ varies from 0,2 to 0,7 depending upon the extent of snow cover. Rb is afunction of the transmittance of the atmosphere which depends upon the atmospheric cloudiness, water vapor and particulate concentration. However, Liu and Jordan suggest that Rb can be estimated to be the ratio of extraterresterial radiation on the tilted surface to that on a horizantal surface fort he month. For surfaces facing directly towards the equator.

$$R = \frac{\cos(\phi - s)\cos\delta\sin w_s' + \pi/180 w_s'\sin(\phi - s)\sin\delta}{\cos\phi\cos\delta\sin w_s + \pi/180 w_s \sin(\phi - s)\sin\delta} \tag{7}$$

where w is the hour angle which is 15^0 (hours from solar noon), afternoons, morning negative and w_s' is the sunset hour angle fort he tilted surface which is given by

$$w_s = \min[w_s, \arccos[-\tan(\Phi - s)\tan\delta]] \tag{8}$$

The monhly average of daily global, difuse and direct solar radiations incident on a tilted surface was calculated for different angle values as shown in Figure 3. It can be seen that the monthly daily highest global values at 60 degree for January.
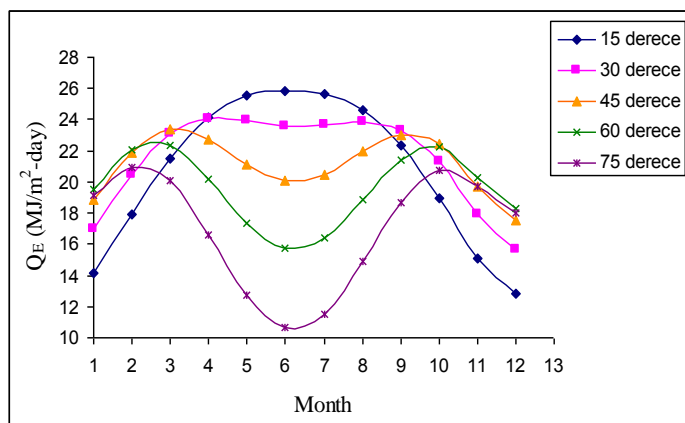
Fig 3. Monthly average global radıatıon incident tilted surface for different angle values, respectively

Monthly hourly global radiations for January and August representing winter and summer respectively, are plotted in Fig 4. As in Fig 4 optimum angle valuees are 60 degree for January and are 30 degree for August.
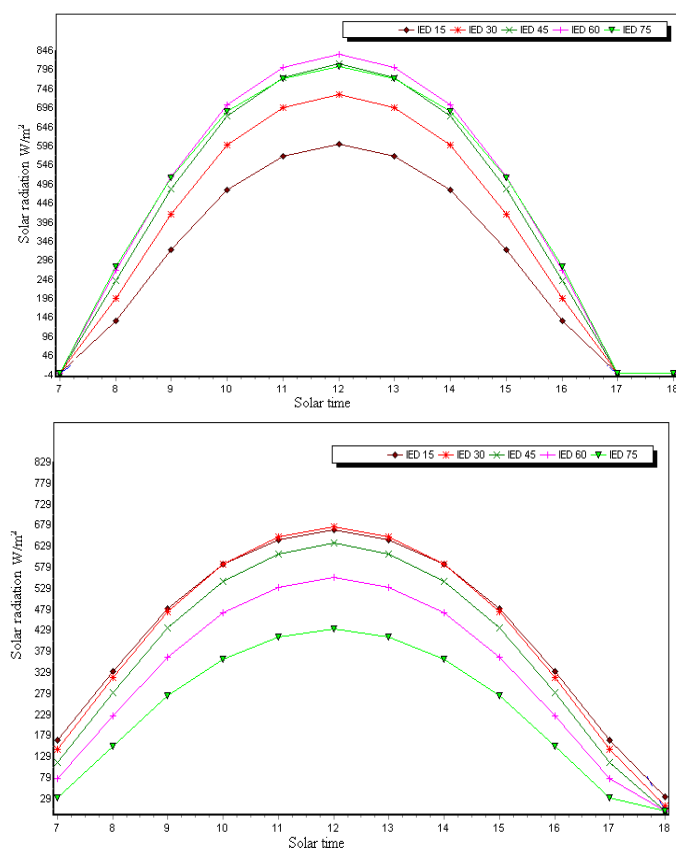
Fig 4. Monthly average hourly global radiation for January and August, respectively

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CONCLUSION

Calculations of diffuse, direct and global radiation incident horizantal and tilted surface has been made in Isparta. The annual averages of global radiation incident horizantal and tilted surface are 26,7 $MJm^{-2}d^{-1}$ and 23,6 $MJm^{-2}d^{-1}$, respectively. Solar radiation during the day tends to be more evenly distributed in summer than in winter. The values in hourly global, direct and diffuse radiation occur at solar noon. The monhly average of daily global, difuse and direct solar radiations incident on a tilted surface was calculated for different angle values. Optimum angle value are 60 degree for winter and are 30 degree for summer.

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ENERGY METABOLISM – AS A GENERAL PRINCIPLE – FOR MODELING THE TRANSFER OF CARBON AND TRITIUM ACROSS ANIMALS

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For the safe and clean future of nuclear energy robust models of environmental transfer of radionuclides are needed. Tritium and Carbon are life elements and must be treated separately from trace elements. We have analyzed available data and theories to test the hypothesis that both ^3H and ^{14}C metabolism in mammals can be accounted for by an understanding of energy metabolism. We started with a theory for how metabolic rate varies with body size and temperature, combining this with arguments from ontogenetic growth, energy consumption, zoogeographical and multilevel regulation effects on metabolism. Our hypothesis was that the loss rate of organically bound tritium and carbon from tissues can be assessed from the knowledge of specific metabolic rate and enthalpy of combustion of selected tissues. From organ mass and stable element composition, a generic model has been developed for mammals. Using a simplified milk production and a single metabolic rate for organs, the model can be applied generically across mammals with a minimum of input information. Tests of the model, without calibration, show a remarkable agreement with available experimental data. The model has been applied to humans, farm and wild animals, but it also have been exploratory used for birds.

INTRODUCTION

Nowadays challenges are climate change, environmental protection and the future and control of energy resources needed for a sustainable development of human society. Nuclear energy must be preserved in the future, including the ongoing research on fusion reactors, as it is benign, widely applicable and essentially inexhaustible electricity, while simultaneously greenhouse gas emissions must be reduced. As for today heavy water reactors, tritium and radiocarbon are key radionuclide and enhanced safety is a prerequisite for any further commercial application. More robust safety assessment models are required and, as hydrogen and carbon, are life elements, appropriate approaches are needed. Previously, for the equilibrium transfer of ^3H in farm animals, we advanced a metabolic approach [1], including both forms, tritiated water (HTO) and organically bound tritium (OBT). This last form of tritium into the environment has longer retention time and is intimately linked with organic carbon. In recent years we used the metabolic approach for the dynamic transfer modeling on both radionuclides in mammals [2]. The present paper summarizes past results but gives also a first scientific background of our approach and an extension to birds.

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ENERGY METABOLISM AND ORGANIC MATTER TURNOVER RATE

After a review of past results in modeling C&T transfer in mammals, we concluded that a common approach to all mammals is needed and this must be based on energy need and on the relation between energy and matter. In atomic and quantum physics, the link between energy and matter is well established and energy and matter turnover rate are the same. Extension to life science seems fortuitous at a first glance. We will argue in the following that this can be considered at least as a useful working hypothesis. Metabolism refers to the countless chemical processes going on continuously inside the body that allow life and normal functioning. These processes require energy from food. Consider the mammal demand for net energy in order to assure its normal life. It includes basal metabolism, thermal regulation, activity and production. The minimal net demand for mass stasis must be assured for surviving. This is the maintenance net energy demand. For mature, non gestating-lactating mammals the Field Metabolic Rate include maintenance, activity and thermoregulation. The important fact is that we are dealing with NET ENERGY DEMAND. We don't discuss the (gross) energy supply and absorption and transformation in net energy. These are fully dependent on the mammal taxon, environment supply and adaptation. For example a ruminant is using low quality food (with a large fraction of carbohydrates) but it was developed its gastrointestinal tract (GIT) in order to prepare this food with microbial help and long rumen digestion. A carnivore is using high quality food (mostly fat and protein) and consequently its GIT is adapted. For both ruminant and carnivore the NET energy demand is similar while the energy supply differs. In case of shortage in energy input, the mammal will consume its own body energy resources in order to satisfy the energy demand for maintenance. The energy content of the whole body or any organ can be assessed from the composition (lipid, protein, carbohydrates) and the combustion energy of average lipid (39.6 MJ/kg), an average protein (23.7 MJ/kg) and glycogen (as standard carbohydrate) 17.7 MJ/kg. It is now naturally to consider the *energy turnover rate* as given by the *Relative Metabolic Rate ReMR:*

$$\mathrm{Re}MR = \frac{FMR}{EBW * BED} = \frac{SMR}{BED} \qquad [1]$$

with   ReMR   the relative metabolic loss rate (d^{-1}) ; FMR   the field metabolic rate (MJ/d);

SMR   the specific metabolic rate (MJ/khfw/d) ; EBW   *Empty* body mass (kg) and

BED   body energy density (MJ/kgfw)

A recent review [3] (Rolfe and Brown 1997) has estimated that, of the oxygen consumption associated with the basal metabolic rate, at least 70% is consumed for mitochondrial ATP production used for protein synthesis, Na^+,K^+-ATPase and Ca^{2+}-ATPase activity, gluconeogenesis etc. In all above processes Carbon and Hydrogen are parts of molecules involved in various chemical reactions. Their radioactive isotopes will follows closely (disregarding the isotope effect in the reaction velocity). Outside the basal metabolism, the normal life of a mammal needs activity energy- this implies and enhanced ATP turnover – and consequently an enhanced turnover of C14 and OBT. Due to above facts we are now advancing the *working hypothesis that ReMR can be used also for the assessment of the loss rate of C14 and OBT* and, for simplicity, the proportionality factor is taken to be one. Indeed, Brown et all [4] in "Metabolic Theory of Ecology" analyzes energy flux and biomass production while in a revision of ontogenetic growth, Makarieva et all [5] uses our equation [1] for basal metabolism and notes that the inverse "gives the mean residence time of chemical elements in the living body". This is exactly our hypothesis and is supporting our approach.

The Metabolic theory [4] explains the ¾ power exponent in the mass dependence of basal metabolic rate as given by the fractal structure of network of blood vessels and that metabolic rates are supply limited. The theory, while very attractive, does not satisfy from some point of views [6]. An alternative theory, "the allometric cascading" [7] reveals that basal metabolic rates (BMR) are driven by rates of energy expenditure within internal organs and that the allometric scaling of BMR can be understood in terms of the scaling of the masses and specific metabolic rates of internal organs, which depend on many competing and cooperating processes. Indeed, BMR of ruminants, rat, [8] or humans [9] can be reconstructed from organs' metabolism. There are much experimental evidence that alteration of the level of nutrition (food restriction and realimentation) alter both basal metabolism and visceral mass [10] and this supports the role of organs mass and specific metabolic rate in animal adaptation in order to satisfy the requirements of life. Same mammal specie, when living in various environments or adapting to different diet show alteration in basal metabolism and visceral mass. Portal drained viscera and liver (central organs) have high specific metabolic rate while their share in the body mass is low (6-10 %). Contrary, peripheral organs as muscle and adipose tissue have low specific metabolic rate but share a much larger proportion on body mass. In evolutionary biology there is a debate on the role of central or peripheral organs [11] and recent findings support equilibrium between them, i.e. the capacity of central organs to supply energy has evolved to supply expenditure capacity to peripheral organs, with same safe margin at maximal metabolic rate.

If organ mass and specific metabolic rate have a direct influence of mammal metabolism it is fully justified to consider that *the turnover rate of OBT and OBC in mammal organs is given by the turnover rate of organ metabolic rate* - so we expand our initial working hypothesis from whole body to each organ. To further justify this, in connection to agree mass dependence of basal metabolic rate, we use the (in vitro) mass dependence of organ specific rate [11,12] across mammals and note that with a knowledge of organ mass across mammals and specific metabolic rate, the well known Kleiber's relation can be reconstructed [13].

We advanced above a qualitative background for a novel approach in modeling the dynamics of tritium and radiocarbon in mammals but we must recognize that our approach suffers in respect of detailed knowledge of organ specific metabolic rate across mammals of various species and ages. Non invasive, in vivo, measurements are difficult to be obtained and the basic understanding is still limited while recent findings indicate that mitochondrial membrane processes and composition are relevant [14].

MODELING THE DYNAMIC OF ^{3}H AND ^{14}C IN MAMMALS.

With our hypothesis on biomass turnover rate, we must establish now the minimum number of model compartments. We must explicitly consider muscle, as edible, and adipose tissue, as an energy storage body part. It is well known that some organs have high metabolic activity and implicitly high transfer rate of our radionuclides. We consider explicitly a "viscera" compartment for active metabolic organs, including heart. Blood (plasma and red blood cells) is the vector of metabolites transport in the body and a good bioassay media. The remainder of the empty body is mixed in a model compartment in order to assure a mass balance.

Organic contaminants enter the body through the stomach content, but are mostly absorbed from the small intestine. We introduced a simplified transfer through GIT content, in order to reproduce the delays between intake and absorption in the empty body.

Transfers from above empty body compartments to blood plasma are given by ReMR's and transfers from blood plasma to model compartments are assessed using stable radionuclide mass balance. While organic excretion in urine and milk are produced by specialised organs (kidney, mammary glands), we simply consider a direct transfer from blood plasma with a transfer rate obtained by stable radionuclide balance (blood plasma content or organic carbon or bound hydrogen and daily production of organics in urine and milk). From the direct intake of dry matter in the stomach, only the metabolisable fraction (diet and animal dependent) is transferred to blood plasma, the rest is excreted to large intestine and faeces. From this metabolisable fraction only a part is transformed in net input of energy and matter (limited maintenance and production efficiency). The rest is lost through respiration (C-14) or passed to body water (tritium). The respiration process is quite complex and produced in all organs. We oversimplify all by considering a single respiration rate from blood plasma which we can asses by mass balance of stable nuclide (org. C or OBH) and knowledge of dietary intake. The above description is the skeleton of the model, directly used in the case of C-14. For tritium we must consider the exchangeable and nonexchangeable phases. The body and organ content of OBH is taken into account now. We first add a body water compartment to account for tritium (hydrogen) in the body water and for the exchangeable organic tritium (hydrogen). While experimental data and actual metabolic understanding distinguishing between a fast and a moderate equilibration of exchangeable organic tritium with the tritiated water, we simplify again using only a fast equilibration. Consequently, the exchangeable fraction in the metabolisable diet input is directly transferred to the body water compartment. From hydrogen metabolism we know that a fraction (0.25-0.35) of OBH in the body is derived from the free (exchangeable) hydrogen, at equilibrium. Adopting a value in this range and using a mass balance for equilibrium situation, we can define a transfer rate from "body water" compartment to "blood plasma" in order to produce organically bound H (T) from the free one. From the water compartment there is also a loss rate and we can assess it by a knowledge of the intake of hydrogen in drink, food and respiration water. A full detailed technical description of the model is given elsewhere [15] as well as model limitations (e.g. ignoring the fast and slow component of organ specific metabolic rate). For laboratory and some farm animals, all model input are taken from literature on animal metabolism, nutrition and body composition and the model is "blind' tested with experiments on ^{3}H and ^{14}C transfer – without any calibration. The most complete data base is for laboratory rat, for which experiments with continuous food intake with labelled diet (organic ^{3}H and ^{14}C, and HTO) have been analysed as well as experiment with unique intake of labelled compounds which were used to reconstruct intakes of labelled rat food. Comparing direct or reconstructed experimental data with model predictions (see table 1), we observe a reasonable agreement, in absence of "best' input data or calibration.

Table 1. Average and standard deviation (in parentheses) of predicted to observed ratios in rat viscera, muscle, blood, adipose tissue and whole body (except bone and skin) for the 6 intake forms

Organ	^{14}C chronic	^{14}C acute	OBT chronic	OBT acute	HTO chronic	HTO acute
Viscera	1.12 (0.15)	0.51(0.4)	1.06(0.15)	0.67(0.56)	0.43(0.07)	0.87(0.34)
Muscle	1.25(0.14)	0.81(0.29)	1.23(0.21)	0.90(0.37)	0.40(0.09)	1.02(0.38
Adipose	1.11(0.15)	0.61(0.12)	0.97(0.2)	0.75(0.13)	0.3(0.1)	1.33(0.3)
Blood	1.12(0.27)	0.4(0.1)	0.88(0.12)	0.38(0.03)	0.37(0.09)	0.62(0.18)
Whole-body	1.18(0.08)	0.7(0.1)	1.08(0.11)	0.8(0.1)	0.36(0.08)	1.09(0.18)

Model tests (no calibration) include dynamics in cow milk under HTO or OBT intake, as well as slaughter data in meat of pig, sheep and cow after unique intake of HTO, OBT or OBC. In all cases the model gives reasonably predictions, within a factor 2 [15]. The exception is the sheep data after unique intake of labelled glucose and acetate. Here the model gives reasonably prediction for ^{14}C but under predicts by a factor 3-4 in the case of ^{3}H labelled food. This is explained by the specific of ruminant digestion of various compounds in the diet and our model limitation considering all diet components uniformly labelled. Of special interest are the predictions of ^{3}H in bioassay media (urine, blood) after various intakes as they can be used for dosimetry. Model results are close with data on OBT in blood after HTO intake but for a unique OBT intake the model mispredict in the first days. This reflects the simplified model assumption of a single, effective, metabolic rate and not details on fast and slow components.

As a conclusion of the model tests with available experimental data, our hypothesis on the link between energy and organic matter turnover rate is fully supported but inherent simplifications of the model limits the model robustness at a factor of two. For radiological assessment of food chain or biota radioprotection this is not a practical limit but for other applications more research is needed.

APPLICATION FOR HUMAN TRITIUM DOSIMETRY

Concerns of increased risk from tritium intakes by humans have been claimed recently (www.Cerrie.org). Relative to dose coefficients recommended by the International Committee for Radiation Protection (ICRP), increases up to a factor 15 for HTO intake were argued and much more for OBT intake due to increased retention of OBT, role of hydration shell around biomolecule and high relative radiobiological efficiency. A full description of our contribution to the topics is given elsewhere [16,17] but here we summarize the model application for humans and will not include all the implication for tritium dosimetry. Humans generally differs from most other mammals due to their slow maturation, large brains consuming much of daily energy needs, and consumption of high quality diets [18]. We considered Caucasian and Japanese humans with model input parameters for body mass, organ mass, basal and active metabolic rate, food and waterintake taken from recent literature [9,18-21]. Reference humans are considered for child's of 1, 5, 10 years, male and female of 15 years and male and female adults. Before any model application we tested if the basal (resting) metabolic rate can be explained by the contribution of organs and associated specific metabolic rate.

In all cases the model prediction are very close with observed or recommended values. For assessment of tritium retention in human body a probabilistic approach has been taken, as natural variability of some parameters or incomplete knowledge of others must be considered when uncertainty are analyzed. For example, diet composition varies across human habits and influences the organic hydrogen intake as well as the metabolisable fraction of the diet. Digestion influences the non-exchangeable OBT transferred to systemic circuits in a complex manner and only a range can be assessed. Distributed parameters considered in the model are given   elsewhere   [17]. In radiation protection we are interested in the integrated activity in the body, up to 50 years after intake and this implies to include growth for child. Based on the body and organ growth pattern in the reference values [19] we added a growth sub-model in order to have the correct dynamic in child until full elimination of radionuclide from the body. Model outputs include integrated tritium activity or concentration in body water or organic model compartments, which are the basic input in dose assessment.

For adult male after an OBT intake, we illustrate the model results in table 3 for the 5, 50 and 95 percentile of probability distribution. At 50 % of the probabilistic distribution we predict an integrated concentration from OBT of 39.6 with the major contribution from adipose tissue. In the simplified model of ICRP the integrated activity of HTO is 7.25 while for OBT is 28.9, less than our prediction. The enhanced retention in our model results from the better consideration of human metabolism and physiology but is essential to observe that the largest contribution to OBT retention is from adipose tissue, with a low sensitivity to radiation health effects. To consider this, when the radionuclide is not uniformly distributed in body tissue, we must use a tissue radiation factor, W_T, in order to assess the effective dose for the health effect at the level of whole body. Using agreed value for each organ and our model compartment composition we have assessed each model compartment "tissue" weighting factor (column 6 in table 2) and the contribution to the effective dose (weighted integrated concentration-column 7 in table 2)

Table 2 Integrated activity and concentration and weighted values for adult male (OBT intake)

	Integrated activity Bq*d			Total T int. conc.	W_T	Weighted int. conc.
	Percentile			Bq/kgfw		
Compartment	5	50	95			
HTO	6.5	12.6	20.7			
OBT	36.9	39.6	42.5			
OBT_adipose	22.2	23.8	25.5	1.6496	0.008	0.013197
OBT_muscle	7	7.5	8.1	0.4954	0.008	0.003963
OBT_viscera	1	1.1	1.15	0.4867	0.45	0.219047
OBT_remainder	5.7	6.1	6.5	0.4877	0.42	0.204837
OBT_RBC	0.8	0.85	0.91	0.8406	0.12	0.100876

Comparing with ICRP dose coefficients for OBT intake, our model predicts higher values if we ignore the non-uniform tritium distribution in the body (equivalent dose H) but close values when tissue weighting factors are included (effective dose E), as seen in table 3 for the case with unit radiobiological efficiency as considered by ICRP. Our model predict a significant gender difference as well as a probabilistic distribution of dose coefficient but the close agreement between ICRP values and our central (50 %) prediction for the effective dose merits further considerations.

Table 3. Equivalent (H) and effective (E) dose for reference humans after OBT intake

	ICRP	H			E		
Case		5%	50%	95%	5%	50%	95%
1 y	12	14.3	16	18	10.5	12.2	14.2
10 y	5.7	8.3	9.5	10.9	4.8	6	7.5
Adm	4.2	4.2	5	5.8	3.2	3.8	4.7
Ad-f	4.2	9.1	10.2	11.5	4.7	5.7	7.1

There are no experimental data on humans after an OBT intake but concentration of OBT in urine after an acute HTO intake were observed in the past and our model give predictions very close with experimental data. Further development for human dosimetry of tritium and radiocarbon are ongoing.

DYNAMICS IN WILD MAMMALS
In the past it was considered that protecting humans from the effect of radiation suffices but actually biota radioprotection is considered as a major task for a durable development and environmental protection. The protection of biota from ionising radiation needs reliable predictions of radionuclide dynamics in wild animals. Data for many wild animals – radionuclide combinations is lacking and a number of approaches including allometry have been proposed to address this issue. We have contributed to the European effort in this field by applying our model to selected wild mammals [22]. In contrast to laboratory of housed farm animals, wild mammals and birds are subjected to large environmental and dietary variability to which they must adapt. There are many studies demonstrating allometric (mass dependent) relations for basal metabolic rate, daily energy expenditure and organ mass [24,25]. A gap in the database for wild animals is the assessment of SMR for organs, in basal and active states. There are some measured values for laboratory and farm animals and humans, in basal or resting metabolism. We have derived allometric relationships on the basis of the available data for application to wild animals (Table 1 in [22]). Due to paucity of the available database we could expect some potential errors when using our crude allometry of specific metabolic rates of organs. For the few examples of wild animals where we have organ mass and BMR our predicted BMR values (Table 2 in [22]) are sometimes close to observed values but there are cases of 50 % discrepancies. This demonstrates that our knowledge on specific metabolic rate of organs across mammals is limited and body mass is not the only determinant factor in metabolism.
Our mammal list includes a large herbivore (reindeer), a carnivore (red fox), a small herbivore (rabbit or hare), and two rodents (chipmunk and a lemming). These are mostly in the list of representative mammals in current proposed assessment frameworks. The lemming is modelled as being in the Arctic with enhanced energy needs. Input model parameters are collected from literature and a unique intake of 1 Bq of OBT or ^{14}C is considered in assessing integrated activity in animal body (see Table 3 and 4 in [22]).

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To compare the risks from exposure to ^{14}C and ^{3}H, across mammals of various mass and diets, we have normalised the integrated whole body activity to body mass of each species and an activity concentration of 1 Bq kg^{-1} (dw) of each of the two radionuclides in the diet). This is equivalent to the concentration ratio under equilibrium conditions. We observe a low variability of the normalised values, reflecting the metabolic regulation in the transfer of these radionuclides a result compatible with our earlier work on farm animals [1]. The values in the Table 4 are however subject to inherent uncertainties. The assessment of DEE, in absence of direct measurements will be best based on data for a similar mammal-diet combination; we estimate that this may be 50% in error. Changing the DEE value in this range we will induce change of a similar order in the integrated activity. In the case of dietary tritium intake, we need to consider the variability of water flux in mammals, which is influenced by diet quality and quantity, and ambient temperature. For the same species, the water flux can vary by a factor of *circa* 2 around the mean and because the water fraction in the body is quite constant, the water halftime will differ (by *circa* 2-fold).

Consequently, the integrated HTO activity in the body will be affected; doubling the water intake, the total integrated tritium activity decrease by 20 %. All other model parameters have less influence on whole body integrated activity although mass and energy partition in organs can influence the muscle-integrated activity (by a factor less than 2). Consequently we can conclude that the values predicted are likely to vary by less than a factor five.

Wild mammals generally have a lower fat content than domestic animals and must adapt to variable environmental conditions. Body mass remains the major factor in describing the radionuclide transfer and small mammals have a fast dynamics, as seen in Figure 1 for the ^{14}C retention functions of our example animals. Environmental temperature, taxon and diet must be also considered.
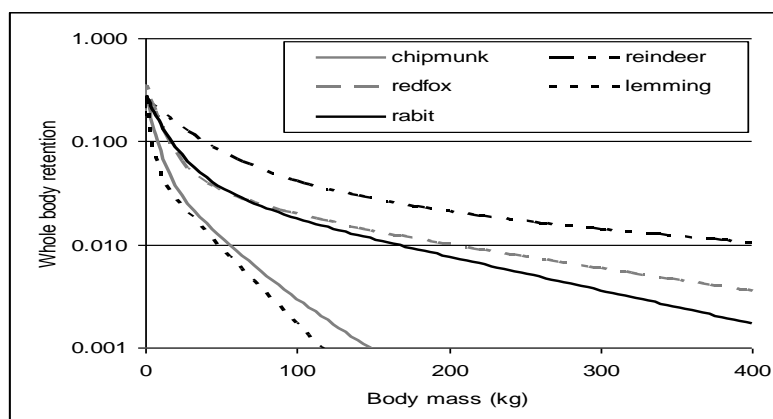
Figure 1. Retention dynamics of ^{14}C in representative mammals

Interpreting the model results in the frame of classical transfer function (see Table 4 for ^{14}C) raises some interesting observations. We distinguish a fast and a slow component with the long halftime 6-14 times larger than the short one, reflecting the various balances between internal and peripheral organs. Neither the short half-time nor the effective half-time are determined simply by mass (compare fox and rabbit). This is the result of the effects of taxon and diet. Based on these results allometric relationships have been derived (Table 4). It is interesting that the effective halftime for carbon is about 4 times longer than for Cs, a radionuclide uniformly spread in the body and the turnover of which has previously been suggested as being linked to protein turnover rate [23].

The allometric relationship over predicts the transfer coefficient for reindeer; a consequence of considering only mass as the driving parameter.

Table 4. Parameters of ^{14}C transfer in test mammals; the allometric relationships are fits to these parameters.

Species	Mass (kg)	T2 (d)	T1 (d)	F (d kg^{-1})	Tef (d)	Norm. integrated ^{14}C activity	Norm. Integrated ^{3}H activity
Lemming	0.06	18.4	2.0	38.0	5.2	0.26	0.041
Chipmunk	0.096	23.7	4.0	33.0	7.4	0.17	0.034
Rabbit	1.8	72.0	8.4	4.5	19.6	0.23	0.036
Red fox	6	95.5	6.6	1.5	17.1	0.23	0.054
Reindeer	150	153.5	19.6	0.1	47.2	0.24	0.035
Allometry		$56M^{0.21}$	$5.5M^{0.24}$	$7.9M^{-0.58}$	$13.1M^{0.25}$	N_A	N_A

EXTENSION TO BIRDS

The model developed for mammals is based on energy metabolism and body composition with the assumption that the turnover rate of organics is linked with energy turnover rate. There are no rationales to restrict the model to mammals, if the assumptions are qualitatively correct. Indeed, the allometry of basal metabolic rate of birds has close mass exponent with mammals and the higher values are mostly explained by higher body temperature. The Field Metabolic Rate also has similarity with mammals [25]. As mammals have developed from birds, we expect some similarities for the specific metabolic rates of organs, but not identity. Indeed the hepatocytes cells in birds [26] shows a mass allometric relation similar to mammals but with a different exponent. As data on the specific metabolic rates of organs in birds are missing, we will take the risk to use the mammals systematic, as in the previous chapter. This is justified for a zero order assessment, in absence of any relevant model of T&C transfer in birds.

We started with a small passerine , the tree swallows, for which some data are published [27] and the preliminary results for an unique intake of ^{14}C (1 Bq) are given in the figure 3 for the dynamics of activity in model compartments. This example reveals that passerine, comparing with mammals of same mass [22], have a more sharp transition of whole body retention from the fast turnover at the beginning to slow turnover at the end, given by adipose tissue and remainder. The effective turnover time seems to be about 2 times shorter than for mammals of same mass.
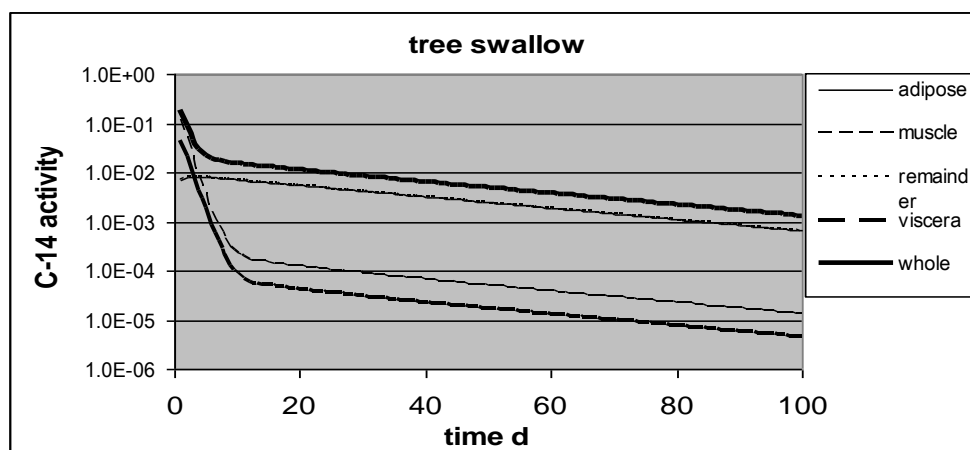
Figure 3. Dynamics of ^{14}C in tree swallows tissues after a unique intake

For food chain modeling, laying hens and broiler are of concern and there are no experimental data for egg or meat contamination with T&C. We collect available information from literature concerning growth, body composition, organ mass etc. and use the crude assumption that organ specific metabolic rate are age independent, and has the values for mature mammals in our systematic. For a fast growth broiler we consider a constant OBT concentration in food (1 Bq/kgdw) while for a laying hen we take a constant intake of OBT (1 Bq/d) and report the preliminary results in figure 4. Egg OBT concentration increases fast in the first 7 days corresponding with the duration of egg formation, and slowly after due to contribution of recycled body OBT. The dynamics of OBT in broiler muscle is close with whole body one but the decrease in late period can be an artifact of model simplicity (constant specific metabolic rate of organs).
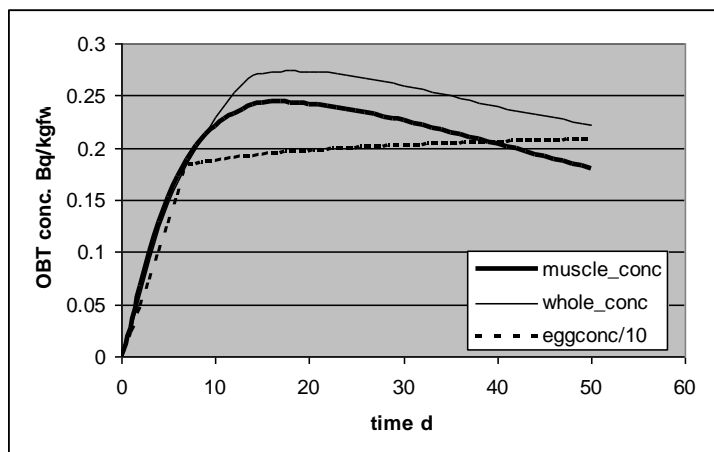
Figure 4. OBT dynamics in egg and broiler muscle and whole body after continue OBT intake

The results above are preliminary and subject to larger uncertainty than for mammals, due to paucity of data on organ metabolism in birds. In absence of any experimental data or previous modeling assessment, they give a first view on the transfer of T&C in birds.

CONCLUSIONS

A novel approach in modeling the transfer of ^{3}H and ^{14}C has been summarized here, using the energy metabolism and the link between energy and organic matter turnover rate at whole body and organ level. Despite inherent limitation, due to generic approach or limited knowledge of in vivo specific metabolic rate of organs across mammals' species, the results presented shows many practical implications for the improvement of radiological safety assessment covering food-chain modeling, biota radioprotection of human dosimetry. For better quantitative results, experimental efforts must concentrate on mass and age dependency of organs specific metabolic rate.

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HEALTH EFFECTS FROM LOW LEVEL AND ENVIRONMENTAL EXPOSURE TO CHRYSOTILE.

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The disease potential of exposure to high levels of airborne respirable chrysotile fibre is well-known although the spectrum of diseases consequent upon exposure is controversial. Exposure is known to cause asbestosis and probably, also, lung cancer, particularly in cigarette smokers, but chrysotile seems increasingly unlikely to be responsible for producing mesothelioma. This spectrum of disease results predominately from heavy occupational exposure. Exposure to low levels of chrysotile, either occupationally or environmentally and particularly exposure to the levels found in the urban environment, does not produce attributable disease within the limitations of the epidemiological method. Nor does it produce any histopathological changes in the lungs. If it were not for the fact that chrysotile is unequivocally accepted as a carcinogen then the risk associated with such low level exposure would have been assessed as insignificant. However, carcinogens are judged by regulatory authorities to have no threshold of effect. Since this hypothesis cannot be tested authorities rely on the precautionary principle in the hope that this will reduce the level of cancer in the population. However, this overly cautious approach is unlikely to have any effect on human health and may have disadvantages for society at large.

Introduction

It is probable that high exposure to any bio-persistent airborne respirable mineral fibres will have an adverse clinical effect. This is well-known in the case of the asbestos minerals although the spectrum of diseases consequent upon such exposure is to a degree controversial and undoubtedly is consequent on the degree of bio-persistence of the fibre. Chrysotile is the commonest of the asbestos minerals and it is known that high level exposure will cause the fibrotic disease asbestosis, and that symptomatology is dose-dependent [1,2]. Chrysotile may also cause lung cancer although that is probably a rare occurrence except in cigarette smokers and the dose of fibre required is more uncertain. It is known that cigarette smoke increases the penetration of asbestos fibres into airway walls [3] and inhibits asbestos clearance [4] both of which may be pertinent to the mechanism of action. It is certain that smoking increases the risk of lung cancer developing in an asbestos exposed person but the relationship is complex [5-8]. Whether the other asbestos exposure related tumour, mesothelioma, results from chrysotile exposure is problematic [9-11] and few scientists or clinicians who specialise in asbestos related diseases believe it to be other than an extremely rare event. Some have been bold enough to be absolutely prescriptive: "There has probably never been an attributable, clinically and pathologically-proven, case of mesothelioma in any manufacturing industry, e.g. cement, friction products, or textiles, amongst the many tens of thousands of workers where chrysotile alone has been used." [12]. A minority, though, holds an opposing view [13-15].

Over a century of experience has shown that high occupational exposure is the only major risk factor for chrysotile associated disease. Exposure to low levels of chrysotile, either occupationally or environmentally and particularly exposure to the levels found in the urban environment, does not produce attributable disease within the limitations of the epidemiological method. Nor apparently are any histopathological changes found in lungs that have been exposed to a fibre concentration some one or two orders of magnitude below the level which would cause discernible clinical symptoms. Attempts to model low level exposure have, similarly, failed to detect an effect. In fact a report of a WHO task group expressed reservations about the reliability of risk assessment models applied to asbestos risk (all types) [16]. They noted that variations over several orders of magnitude could occur. In the case of cancer they wrote: "In the general population the risks of mesothelioma and lung cancer attributable to asbestos cannot be quantified reliably and probably are undetectably low." [17].

It has been proposed that asbestosis is a necessary pre-requisite for lung cancer but a large number of studies on exposed cohorts still leaves several questions unresolved and the topic is controversial [18-20]. However, many pathologists have only been willing to ascribe lung cancer to asbestos exposure if asbestosis was present as well and this may have overestimated the asbestos dose needed to cause this tumour.

A major problem in attributing carcinogenic properties to chrysotile lies in the contamination of major deposits, such as those in Québec, with fibrous tremolite [21]. Fibrous tremolite is a highly carcinogenic amphibole mineral [22]. The short-fibre chrysotile deposits of California which are devoid of tremolite [23] do not produce disease in those who work them [24,25]. However, heavily exposed workers at the Asbest chrysotile mine in the Urals, which is also tremolite-free, do show a level of asbestosis and asbestos-related lung cancer [Nolan; personal communication]. A further complication is that workers were commonly exposed to other amphibole fibres, generally amosite or crocidolite which can affect the pattern of disease [26].

Although it was hypothesised at one time that exposure to low levels of chrysotile, either occupationally or even at the levels found in the urban environment, would be dangerous. Experience has shown that this is not the case. Occupational experience has shown that on average above a certain level of exposure clinical symptoms of asbestosis can occur although these levels are very much higher than those to people exposed to ambient environmental pollution [27]. Also, exposure to a fibre concentration below that which produces discernible clinical symptoms would still produce changes which could be detected histopathologically. Studies of asbestosis have concluded that there is a linear dose-response with a threshold below which no effect is experienced. The Ontario Royal Commission in 1984 [28] considered the published studies and concluded that there was a linear dose-response relationship with no clinical manifestation below a level of occupational exposure of 25 fibres/mL.years a finding which was shortly after endorsed by Doll and Peto [29]. Churg [30] looking at non-occupational exposure also found evidence of a threshold. To give an idea of the risks associated with fairly low exposure Peto et al.[31] predicted that exposure to 0.25 fibres/mL for 35 y from age 20 in chrysotile textile manufacture, arguably the most dangerous of the chrysotile industries, may result in 0.8% increased risk of lung cancer or mesothelioma. However, the fibre measurements on which this was based were in some doubt and the authors stated the prediction was of doubtful accuracy.

If chrysotile was unequivocally accepted as a non-carcinogen then the risk associated with such low level exposure would have been assessed as insignificant. The exposures found today in the chrysotile industry are maybe some 100 to 100,000 times less than they were in the past and so calculation of the risk they pose is extremely problematic. People are daily exposed to a large number of toxic, often carcinogenic, substances in very small amounts with apparently no effect [32,33]. This lack of effect is hardly surprising since adaptation is a key element of survival of the species. If the level of exposure is low the effect will be small since the basic tenet of toxicology is that while all compounds are poisons, dose is the only parameter determining overt toxicity ["All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy." (Paracelcus)] (see [34]).

Science Versus the Regulators

Unfortunately, by the edicts of regulatory authorities rather than the discoveries of science, any compound designated as a carcinogen is held not to act in the same way as a non-carcinogen. The mode of action of a carcinogen is judged to be that there is no threshold of effect.

Since the mid-1970s risk assessment of carcinogens has been based on an unsubstantiated belief in such a 'linear no threshold' (LNT) model [35]. This model continues to be used in spite of the fact that there is very limited scientific evidence to support it. The model assumes a linear relationship which goes through the origin although this is generally qualified by inclusion of terms such as 'multistage' and by ignoring the fact that even at the zero point conventional use of a 95% confidence interval can give a positive figure for carcinogenicity. The model is not mechanism-based and makes no distinction between compounds that are genotoxic and those that are non-genotoxic or acting through an epigenetic mechanism. The origin of this way of thinking is the US EPA and their overall view has been well reviewed [36]. It is unfortunate that the views of the EPA have become global opinion but it is comforting that today the best criticism of this way of thinking is coming from America [37] and some of the critics are in the EPA. A major problem is that by exaggerating risks of the effects of low doses leads to undue amounts of societal resources being used to reduce human exposure. There are considerable cost and other adverse implications for this at all levels of society [38]. Applying the LNT model gives a result that is contrary to experience and has the consequence that it generates any number of 'asbestos myths' such as the infamous and ludicrous claim that 'one fibre can kill' [39]. Since life in a large city may mean inhaling about one chrysotile fibre with every breath the validity of the statement must be in doubt. The 'myths', unfortunately, raise public concern even if this is unwarranted and not based in reality. Whether or not the LNT model should be scrapped depends upon the toxic agent under consideration. The evidence is good that it should be for chrysotile but the case is more arguable for radiation [40].

Environmental Exposure to Chrysotile

Chrysotile is a ubiquitous component of all air samples taken indoors or out. Most of the fibres are the results of decades of mining but there is a background derived from natural sources. There are several sources of chrysotile in urban outdoor air, from motor vehicle brakes, weathered or friable building materials, as releases from industrial operations and from clearance and disposal operations. The use of chrysotile asbestos for brakes has decreased considerably in recent years in Western countries and the result has not always been positive. It is arguable that more people have died from accidents consequent on this decision than would ever have suffered an asbestos related disease had we continued to use chrysotile. Spurny [41] demonstrated that fibres are released into the air in the vicinity of weathered asbestos cement products. Air near buildings containing such weathered products could contain between 0.2 and 1.2 $f.L^{-1}$ from this source. In addition, there was also the contribution from industries working with asbestos minerals. While Marconi et al. [42] studying the concentrations of airborne fibre in the vicinity of an asbestos cement plant in 1989, found peak levels of up to 19 $f.L^{-1}$ at 0.4 km from the plant today it would be considered a serious breach of occupational hygiene if levels exceeded those of an urban background..

Human Exposure

What levels are chrysotile are we exposed to today? Spot measurements of ambient levels have their uses but give little or no indication of long-term levels, nor long-term dose to those exposed, because of variations in point or local sources. It is better for the purposes of argument to use the figures of the World Health Organisation which has concluded [17] that, allowing for the great variations in fibre counts and counting techniques, levels of asbestos in outdoor ambient air are usually less than 1 $f.L^{-1}$ in rural areas and up to 10 $f.L^{-1}$ in towns. Low-level occupational exposure could be 10 to 100 times this value. Other inorganic fibres can be found at 10 times these levels.

Air sampling can define the maximum possible exposure but only if it is personal air sampling. Static sampling can wrongly estimate personal dose by perhaps two orders of magnitude. Regardless of how exposure is measured the dose that can enter the body is limited by the daily inhalation volume which is about 10 m^3 or more of air. If the WHO figures are used that corresponds to 10,000 to 100,000 chrysotile fibres per day and perhaps one tenth that amount of amphibole fibres. At this level of exposure the chrysotile fibres are largely cleared while the amphibole fibres are retained [43]. Extending this calculation over a lifetime gives a maximum dose that is far less than the 10^5 to 10^6 fibers/g. (dry weight) of lung tissue found post mortem in non-occupationally exposed people. In fact levels up to 3 x 10^6 /g (dry weight) of lung tissue in non-occupationally exposed people have been measured [27]. Clearly environmental monitoring and lung measurements do not give the same type of information: air samples give the concentration at the time of sampling whereas the retained lung dose reflects historical levels of exposure confounded by clearance and by losses during preparation. The actual human exposure to fibres has to be assessed by the surrogates of either examining fibres in autopsy lung samples or measuring the levels in broncho-alveolar fluid (BAL). Post-mortem studies of lung burden give an integrated measure of lifetime exposure whereas BAL studies show more recent exposure [44].

Autopsy samples can only show exposure to durable materials and chrysotile is not particularly durable *in vivo*. Examination of the lungs of Canadian chrysotile miners shows that tremolite rather than chrysotile constitutes the bulk of the fibre burden in their lungs [45,46].

Risk Analysis
All good data regarding the development of disease following exposure to chrysotile comes from people who have experienced heavy occupational exposures. To relate this to low-level exposures the question becomes whether heavy occupational exposure is a paradigm for non-occupational urban exposure or indeed the low-level occupational exposure now found in the Western world [47]. Also, it is important to establish whether urban non-occupational exposure (continuous) is a paradigm for low-level occupational exposure (intermittent but at a higher exposure level)? If the first of these relationships were to hold it would be tantamount to saying that a linear dose-response model for chrysotile exposure is acceptable. However, as discussed above I do not believe that the evidence we have today sufficiently supports such a paradigm but the reasons for rejecting the LNT should be explored. The estimate for lung cancer risk from low level chrysotile exposure exceeds the one in one million which some people have suggested as the limit for an "acceptable risk". But, it must be stated that there is insufficient evidence to give much support to this figure, or other, more quantitative estimates of risk for the environmental effect of the fibre [48]. Chrysotile is not a potent carcinogen for rodents or humans [49]. Experiments on animals exposed to pure short fibre chrysotile have shown that they do not develop tumours even at any of the 'high' doses tested [12], only long fibre chrysotile produces a carcinogenic response [50, 51] and that towards the end of the (healthy, specific pathogen free (SPF)) animals normal lifespan. Before the development of SPF animals carcinogenicity could not be demonstrated due to the comparatively short lifetime of 'dirty' animals.

In human studies those heavily exposed may be compared with a cohort exposed to environmental levels or low occupational levels. This is an acceptable model in which the difference in the levels of exposure between the two groups maybe several orders of magnitude. However, when the object of the experiment is to determine the effects of environmental levels on people there is a problem since the difference in exposure level between cohorts with high environmental, or low occupational, exposure and low environmental exposure is too small for any pathological or epidemiological method to differentiate between them. Since there is no scientific way to study low level exposure and so measure risk, the best that can be achieved is to calculate it. The classic paper by Hughes and Weill [52] and discussion that has arisen from this [53] and similar work [54] illustrates the problem. To take one example; from a cohort of one million people without <u>any</u> asbestos exposure 32,000 would be expected to die from lung cancer. Extrapolation from studies of people with heavy occupational exposure show that if this cohort had been exposed to 1 $f.L^{-1}$ of chrysotile (over 6 years - a school population was modelled) an additional 0.6 lung cancers would be expected. The relative risk at this exposure is therefore 32,000.6/32,000 = 1.000019. To test this by a prospective study to show whether the <u>observed</u> risk is this high would require two cohorts which would have to number in total nearly 1,000 times the population of the Earth.

In the light of this it is not surprising that animal experiments show no effect at low levels of exposure (similar numbers of animal would be required for a positive result) and so such experiments, if they are done and with necessarily modest numbers of animals, produce 'negative results' and are very rarely reported (resulting in publication bias). Consequently no human relevance from such studies will ever become clear. This is unfortunate since there would be an objective if such studies could be done which would be to validate existing control measures and demonstrate their safety.

Mechanism of Action

Mechanistic studies on the development of cancer suggest that it develops by one of two main pathways. Either the compound is genotoxic and directly interacts with DNA or its action involves an epigenetic mechanism where it is normally described as non-genotoxic. One problem is therefore to decide which of these two mechanisms best describes the case of chrysotile. The problem is confounded by the fact that the mineral chrysotile *per se* is not carcinogenic [12, 55]. Only chrysotile fibres exceeding a certain length have been associated with a carcinogenic response. The evidence for this from animal experiments and human epidemiology is compelling (see refs. in [55]). Carcinogenicity has only been elicited by longer fibres (> 8 μm say) while fibres shorter than 5 μm seem, from the evidence we have available, to be neither carcinogenic nor fibrogenic [56]. Therefore, in spite of many proposals for a genetic mechanism it seems most likely that chrysotile exerts its carcinogenic effects by a non-genotoxic mechanism. In support of this it is widely accepted that in the case of lung cancer chrysotile acts as a promoter of carcinogenesis. If this is so there is no need for it to have a direct effect on DNA.

There is still the question of whether the carcinogenic mechanism is dependent on dose and what is the dose-response relationship. High exposures may have a different mechanism of action compared to low exposures although evidence is lacking for chrysotile. It has long been known, as noted above, that the development of the various asbestos-related diseases is related to dose. Also, the type of malignancy is apparently dose-dependent. Lung cancer is found only where exposure has been high and may be consequent upon the development of asbestosis although whether it is a sequela or a separate development is unknown (see above). Any effect of dose seems limited to whether or not the disease occurs which is *de facto* admission that there is a threshold. This is heretical thinking with regard to current regulatory practice but there is overwhelming evidence of a threshold for many carcinogens [57].

Because chrysotile has so many uses there has been long-term(at least 50 years) low-level exposure of the populations in most, if not all, major cities. The number of people exposed is many millions. If there is no threshold, with this size of population, one would have expected excess rates lung cancer in the various groups of outdoor workers of both sexes in the cities. This does not seem to be the case. Where there have been increases in levels of disease this can be attributed to levels of occupational exposure but within Europe, at least, the only increased risk seems to have occurred in the UK [58].

Conclusions

An important principle governing regulatory agencies, particularly the EPA, is that by regulating the levels of environmental carcinogens a considerable health benefit would be gained. It was perceived that treatment of cancer was largely ineffectual; there was good evidence that there were a lot of carcinogens in the environment; geography seemed more important than ethnicity; and perhaps as many as 90% of all human cancers had an environmental origin [36]. It was thought that reducing carcinogens in the environment would considerably reduce the level of cancer in the population. Unfortunately, underpinning these ideas with hard science was impossible. There are no observable data for individual materials at low levels of exposure and the only recourse is to rely on a mathematical model. Such data as are available, almost always resulting from high levels of exposure, have to be extrapolated to low levels. Early on this was a simple straight line through the origin, a model that has been modified with time to a multi-stage linearised (LNT) model that is equivalent to a series of straight lines which finally go through the origin. The reason for such a model is the belief that there is no threshold of effect: no dose is too small. The implication of this approach is that mammals have no defence against events that damage DNA which, in the light of what is known about DNA repair, does not seem credible [59]. Even at higher doses, where definite effects can be elicited, experiments have shown that whereas at one dose tumours may be produced in a large number of the animals tested, dosing at even half that amount may produce no tumours at all. More than that it seems that low doses may even be protective and beneficial, which is the phenomenon known as hormesis.

There is at present little evidence that ambient levels of mineral fibres pose a real risk to human health. The intense and costly effort to clear asbestos from buildings to reduce further this immeasurably small risk may cause more human exposure to mineral fibres and not less [60,61]. Vigilance will be necessary to ensure that these abatement related exposures do not become a real hazard. We have already found that they have become a serious financial burden [62].

It is well established that exposure to low levels of chrysotile have no detectable carcinogenic effect in experimental animals. Also, no reliable epidemiological data exist for low doses in humans. However, the absence of a significant increase in the incidence of cancer in the populations studied cannot exclude an effect, even if this is undetectably small and even if a very large population is studied. But - should the general public worry about such very small effects? Can they afford to? The Ontario Royal Commission [28] considered a "worst case" scenario and estimated that even then, in 1984, it would cost $80,000,000 spent on asbestos removal to save one life.

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ENVIRONMENTAL HEALTH ASSESSMENT OF A PRIMARY SCHOOL IN ANKARA, TURKEY

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BACKGROUND

Healthy school environment is essential for healthy students. School environment provides healthy, safe and friendly environment for all who live, learn and work in schools and affects students' behaviours, attitudes and important for efficient learning and studying. [1-4] Researches on school environmental health are limited in number in Turkey. [5]

The research was conducted to determine the existing environmental situation of a primary school in Ankara, to measure the electromagnetic field (EMF) levels, to measure the amount of illumination in the classrooms and also to evaluate the microbiological analysis of the toilet faucets, lavatory faucets and door handles, chemical and microbiological analysis of water samples and measure some indoor air pollutants.

METHODS

This descriptive survey's data was collected in April 2006, by an information form prepared, considering the School Environmental Health Standards 12014 and Turkish Standards 9518. EMF is measured by triaxial gaussmeter. Air pollutants were measured by MIRAN 205B portable Ambient Analyzer. Water samples were collected in sterile, 200cc bottles, filtrated with membrane filtration device and plated in Endo agar.

RESULTS

The school was not placed on a highway, therefore it was more than 200m. away from the traffic corridor. There were no places which should possibly affect the students, such as discos, jails, taverns, or pubs. The school garden area was 8733 m^2 and the area per student was 16,4 m². In the school garden there were one ballpark, one football field and two school buildings.

Table 1. Characteristics of the School (Ankara, 2006)

Characteristics	n
Students	1054
Teachers	39
Classrooms	15
Average number of students/classroom	35.6

There were 1054 students who were educated half-day, 39 teachers and 15 classrooms in the school (Table 1). Distribution of school units is given in Table 2.

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Table 2. Distribution of School Units (Ankara, 2006)

School units			1st building	2nd building
Classrooms			5	10
Toilets	Students'	Male	1	2
		Female	1	1
	Teachers'		-	2
Administrative units			2	1
Laboratories and workrooms			-	1

The average number of students in the classrooms were 35,6. The average classroom area per student was 1,26 m² and the average classroom volume per student was 3,65 m³ (Table 3).

Table 3. Classroom Compatibility for Students (Ankara, 2006)

In classrooms		Standard
The average number of students	35,60	<35
The average classroom area per student (m²)	1.26	≥1,20 m²
The average classroom volume per student (m³)	3,65	≥6,00 m³

In all of the classes, the oilpaint's and windows' height from the floor were below the standard values. Hundred percent of the garbage pails in the classes were without lids (Table 4).

Table 4. Some Characteristics of Classrooms and Stairs in the School (Ankara, 2006)

Characteristics	n	%
Classrooms (N=15)		
Oilpaint's height from the floor		
<1,50 m	15	100.0
≥1,50 m*	-	-
Floor type		
Mozaic*	14	93.4
Carpet	1	6.6
Garbage pail		
Lidless	15	100.0
Having a lid*	-	-
Windows' height from the floor		
<1,2 m	15	100.0
>1,2 m*	-	-
Width of doors		
<0,9 m	1	6.6
≥0,9 m*		93.4
Opening direction		
Inwards	1	6.6
Outwards*	14	93.4
Blackboard		
Chalk	14	93.4
Showboard*	-	-

Table 4. Cont.

None	1	6.6
Distance to the first desk		
<2 m	5	35.0
≥2 m*	9	65.0
Stairs (N=6)		
Width (m)		
<2	6	100.0
≥ 2*	-	-
Handrails		
None	-	-
Double-sided*	6	100.0

*Recommended standard values

In the toilets, the number of cabins and lavatories per female student was 43 and 32, respectively while it was 30 and 22 for males.

The average illumination level was 672,2 + 228 lux in 15 of the classrooms, and 135 lux in the library (Table 5). Of the desks nearest to the door, 20% the average lighting level was below 200 lux.

Table 5. Amount of Illumination in School Units (Ankara, 2006)

	Mean ± Sd (Lux)	Min (Lux)	Max (Lux)
Classrooms	672,2 ± 228	69	1914
Laboratory*	373,7	273	584
Administrative units	499,3 ± 30	293	869
Corridor*	126,2	144	100
Library*	135,0	98	197
Gymnasium*	306,0	207	486
Teachers' room*	548,0	373	735

 *Only five measurements are taken, Sd is not calculated.

The average electromagnetic field level for the school was below the standards (2 mG) except the library (Table 6).

Table 6. EMF Levels in School Units (Ankara, 2006)

	Mean + Sd (mG)	Min (mG)	Max (mG)
Classrooms	1 ± 0,2	0,6	1,5
Laboratory*	1,0	0,5	1,8
Administrative rooms	1 ± 0,2	0,8	1,3
Corridor*	1,0	0,8	1,2
Library*	3,4	2,7	4,4
Gymnasium*	0,9	0,6	1,2

*Only five measurements are taken, Sd is not calculated.

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Samples were taken to evaluate the microbiological analysis of the toilet faucets, lavatory faucets and door handles. Distribution of the samples which growth was seen is given in Table 7.

Table 7. Distribution of Samples which Growth Was Seen (Ankara, 2006)

Samples	Units which growth was seen	%*
Washbasin faucets (n=7)	4	57.1
Cabinet faucets (n=6)	2	33.3
Door handles (n=6)	4	66.7
Handrails (n=1)	-	-

* Percentages of row is given

Growth was seen in ten of twenty samples. There were less than 69 CFU/plaque in these samples. Therefore these were not plated in Endo agar.

Bacteriological growth was not seen in water samples. Physical and chemical characteristics of water samples are given in Table 8.

Table 8. Physical and Chemical Characteristics of Water Samples (Ankara, 2006)

Characteristics	Result	Reference value
Turbidity	0,600	<5 JTU
Colour	-	<10 Pt/Co
Chlorine	0,200	0,1–0,5 ppm
Nitrit	0,010	<0,05 mg/lt
Nitrate	1,400	50 mg/lt
Hardness	13	18 FD
Cadmium	0,062	< 0,005 mg/lt
Lead	0,100	<0,01 mg/lt

Chlorine was 0,2 ppm, and cadmium (0,062 mg/lt) was over the reference value (< 0,005 mg/lt). The lead concentration of water (0,1 mg/lt) was above the limit level (Table 8).

Indoor air pollutants (Carbomonoxide, Formaldehyde, Methylene chloride) were measured in the gymnasium and classrooms. CO_2 and methylene chloride levels were below whereas formaldehyde was above the reference level (Table 9).

Table 9. Levels of Some Indoor Air Pollutants (Ankara, 2006)

	Gymnasium	Class (1A/1C)	Class (2A/2C)	Class (4A/5A)	Class (6A/6C)	Preschool class	Reference value
CO2 (ppm)	31,00	135,00	46,00	16,00	151,00	255,00	<5000ppm
Formaldehyde (ppm)	1,32	0,50	0,55	0,20	0,39	0,47	<0,065ppm
Methylene chloride (ppm)	3,20	3,90	8,40	1,80	1,30	0,70	<25 ppm

DISCUSSION

In this school half day education was given and there were 1054 students in the half of the day, and there were 39 teachers and 15 classrooms in the school (Table 1). Average number of students per class was found to be over the standard values. [6,7] In a study conducted by Muzaç et all. it was found that in all of the schools in the region of a health center in Batıkent, Ankara, the average number of students per class were also above the standard values. [8] Kara and et all. also found similar results. [9] Future needs should be considered when building the schools and if needed new schools should be built. According to standards, the average classroom area per students must be above 1.2 m^2 and and the average classroom volume per student must be at least 6 m^3. All of these values were found to be below the standards in this school (Table 3). This affects the air quality in classes and may cause indoor air pollution and consequentially health problems.

Classrooms should be improved, since toilets, garbage pails, oilpaint and windows fail to comply with standards. Also the number of toilets is inadequate for students. [6,7]
According to the standards, there must be at least one cabin per 20 female and 25 male students and one lavatory per 80 female and 50 male students. In the toilets, the number of cabins and lavatories per student was less than the recommended. This may cause hygienic and health problems like infectious diseases in school. Crowded places like schools should have safe and clean water, and sanitation should be improved. [10]

Adequate illumination is essential for providing maximum vision speed, vision acuity and effective learning and to avoid eye restrain. [11] Average illumination levels seem to be higher than the standard values (Table 5) but measurements taken in different places (desks near the door, at the back) in some of the classrooms and the library were less than 200 lux. EMF levels were below 2 mG in all of the school units except library (Table 6).

National Council on Radiation Protection and Measurements recommends an EMF safety limit of 2 Mg. [12] There are studies on EMF showing that EMF exposure is associated with cancers and EMF affects immune response to some of the antigenes. [13-18] Growth was seen in 10 samples taken from the lavatory faucets, door handles (Table 7). General hygienic measures to reduce contagiousness and avoid illness should be taken and these places should be cleaned regularly as they have risk for infectious diseases.

Physical and chemical analysis of water samples showed that colour, turbidity, nitrit and nitrate levels were below the standards but cadmium and lead was found to be high (Table 8). Cadmium is a naturally occurring metallic element, one of the components in the earth's crust, and present everywhere in our environment. There are many resources for cadmium including mining, metal processing operations, burning fuels, phosphate fertilizers, and disposing of metal products. [9] High level of cadmium in water samples in this school is an health risk for children. Water analysis should be repeated, and sources of cadmium should be found and decreased. Chlorine levels should be monitored and samples should be taken from other places. Precautions should be taken if the levels are found to be low.

High lead concentration in water might be due to the lead pipes as the building was constructed in 1982. High lead levels may cause chronic toxication in children. [9] Researches should be planned and conducted to find the source of lead and reanalyze. Formaldehyde, an indoor air pollutant is formed naturally in the troposphere during the oxidation of hydrocarbons. The major sources affecting humans are in the indoor environment. Products containing formaldehyde, such as resins, glues, insulating materials, chipboard, plywood and fabrics, are common. Other sources are cigarette smoke, heating and cooking The possible routes of exposure to formaldehyde are ingestion, inhalation, dermal absorption and, rarely, blood exchange as in dialysis. The major route of exposure to formaldehyde is inhalation. Predominant symptoms of formaldehyde exposure in humans are irritation of the eyes, nose and throat, together with concentration-dependent discomfort, lachrymation, sneezing, coughing, nausea, dyspnoea and death. It also may cause some types of cancers. [19-21] As we found high formaldehyde levels in air in all of the school units, levels of all indoor air pollutants should be monitored and possible sources should be found and reduced in the school to provide appropriate air quality (Table 9).

CONCLUSIONS
It was determined that some of the standards in the school didn't conform to the school environmental health standards. Precautions those have to be taken in school are stated to the school directorate. The environmental health problems in the school should be eliminated and when building new schools, the international standards have to be applied considering the school environmental health standards.

KEY WORDS: School Environmental Health, Illumination level, Electromagnetic Field, TS 9518, Toilet, Samples, Water analysis, Lead, Formaldehyde, Methylene chloride, Cadmium

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PAIN KILLERS FROM CONUS SPECIES

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A curiosity led investigation by Baldomoro Olivera in 1970s started a chain of events and investigations that eventually led to the development of a painkiller from the sea snail *Conus magus* venom that it uses to hunt its prey. Medical Science is desperately short of new types of painkillers. Opiates are more than 2000 years old and aspirin is nearly 200.

The new painkiller known as Prialt is injected directly into the spinal cord by an implanted pump. It is found to work best in its original form. The vast numbers of related chemicals in the Conus species are also being tested for a variety of clinical purposes.

It is however important to consider another aspect of the phenomenon. If such useful chemicals exist in sea snails, one must imagine what other chemicals with a wide range of uses may exist in other plants and animals that are currently unknown to us and therefore not exploited. Since plant and animal species are disappearing at an alarming rate, mostly as a result of human activity, their disappearance must be seen as a grave loss for the human race besides being an ecological disaster for the globe.

Keywords: Conus magus, venom, painkillers, loss of species.

PAIN KILLERS FROM CONUS SPECIES
Introduction

For many centuries now, plants, animals even sea organisms have been used as sources of drugs which are beneficial to human being. All the drugs of every day life are described as antibiotics, painkillers, hormones, anti-cancers, and heart drugs, antidepressants, and sleeping pills [1]. People suffering from chronic pain have used Aspirin, Vioxx, Celebrex (last two had negative reports and their production has been stopped) like anti-inflamatories and opiates for treatment. Beside this, plants like mistletoe, castor been, foxglove and animals like tree frogs, desert scorpions, spiders and cone snails have been used as sources of drugs with different purposes of treatment.

Early 1970s Baldomero Olivera, a Phillipino completed some post doctoral work on DNA (ligase) at Stanford University and returned home. He could not continue with DNA work because of lack of equipment. He wondered about the effect of snail toxins as painkillers because some snake venom used in Taiwan for this purpose.

A few years later Baldomero Olivera got a job at the University of Utah. He worked on his original DNA but an undergraduate did some work on wire with cone snail toxins under his supervision. Some very original results have been obtained at that time. As a result Olivera decided to concentrate on the toxins. His publications got the interest of George Miljanich of University of South California who was working on Calcium Channels at Synapse transmissions. He managed to isolate some toxin and was offered a job at a company called Neurex set up by two Standford Professors. After many trials the original chemical structure was kept and has since been demonstrated to be a suitable painkiller. [2]

Up to now, hundreds of compounds were derived from members the phylum Mollusca . Nowadays Prialt, a new drug from the venom of cone snails is being tested against chronic pain. Making drugs from the toxin of cone snails, the way it works on humans, precautions and some recommendations for future development are included in this essay. The main reason for elaborating this topic is because it is one of the first marine pharmaceuticals and I believe Prialt has the potential to be used worldwide in the future, after sufficient trails [1 -3].

Cone Snail Species
Cone snails also known as cone shells are marine animals that inhabit primarily coral reefs in warm, shallow tropical waters. For example; there are some in the waters of Victoria, Australia. There are more than 500 known cone snail species and each is able to produce more than a hundred unique toxins which are being investigated by scientists as their chemical constitutions. [4-7].

Cone snails use their harpoon-tipped proboscis to capture their preys by paralysing them with the toxin called conotoxin (Fig. 1) [8-9]. Despite a few reported cases of fatality following evenomation, normally they are not harmful to humans. The venoms of Conus geographus and Conus magus are the most scientifically interesting species because their venoms contain substances called conotoxins which are going to be considered [10].
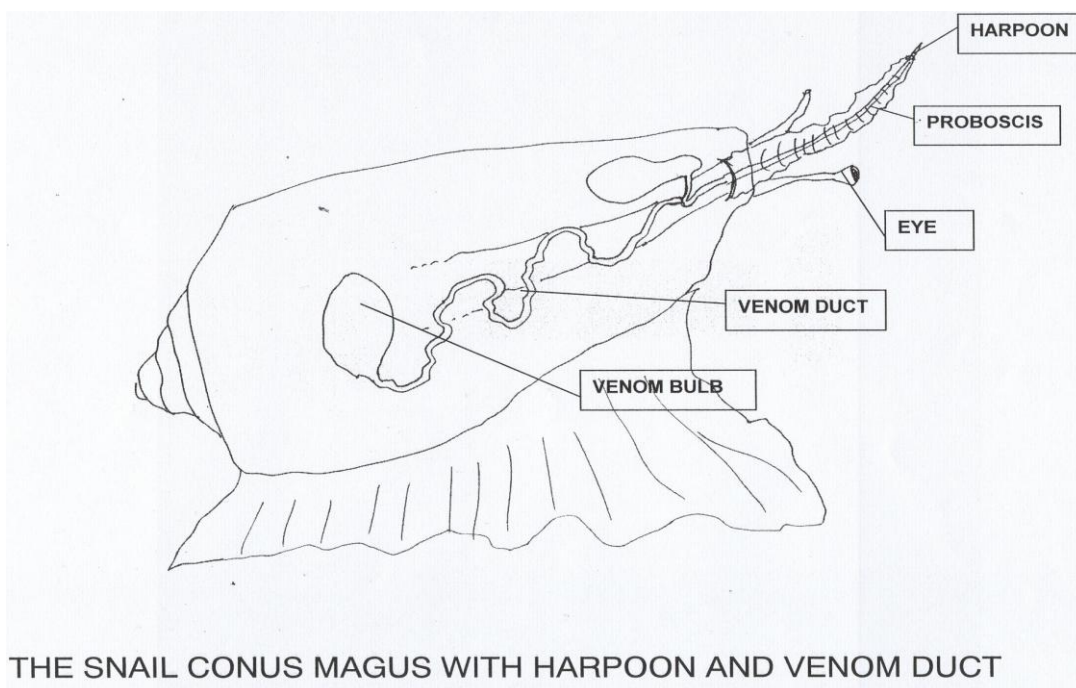
THE SNAIL CONUS MAGUS WITH HARPOON AND VENOM DUCT

Figure 1 Cone Snail with its harpoon-tipped proboscis to kill its prey [9].

How do the cone snails hunt?
Harpoons derived from modified radular teeth. Each harpoon consists of a hollow, chitinous tube with a sharply barbed tip. A number of these are stored in the dart sac from which they move, one at a time, into proboscis and become attached to the salivary gland which has been modified to produce a venomous stew for subduing their prey. When a prospective victim has been located with the aid of the siphon, which is armed with large numbers of chemosensory cells, the harpoon is fired into it and the venom injected into its tissues. [11].

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What makes the toxin special and how it works?

The venom has an N-type calcium channel blocker and the analgesic property makes it special in the area of pain killing. People suffering from intractable pain either terminal cancer or terminal AIDS often use morphine which has the side effect of addiction. Studies showed SNX-111 has the same analgesic properties with morphine and is 100-1000 times more powerful than morphine and does not cause addiction [12].

The painkiller is injected through a special pump into the spinal fluid. When the Prialt is implanted, the electric signal moves along the peripheral nerve e.g. from finger to the spinal cord and when it comes to a synapse, the change in voltage causes calcium channels to open and allow an influx of calcium ions. This action initiates a series of molecular events that cause neurotransmitters to be released immediately from vesicles in the peripheral neuron. When the neurotransmitters cross the synapse they find receptors that trigger a signal up the spinal cord to the brain. The drug Prialt blocks the Calcium channels and thus the release of the neurotransmitters that convey the pain signal (Fig. 3), [2 & 5].
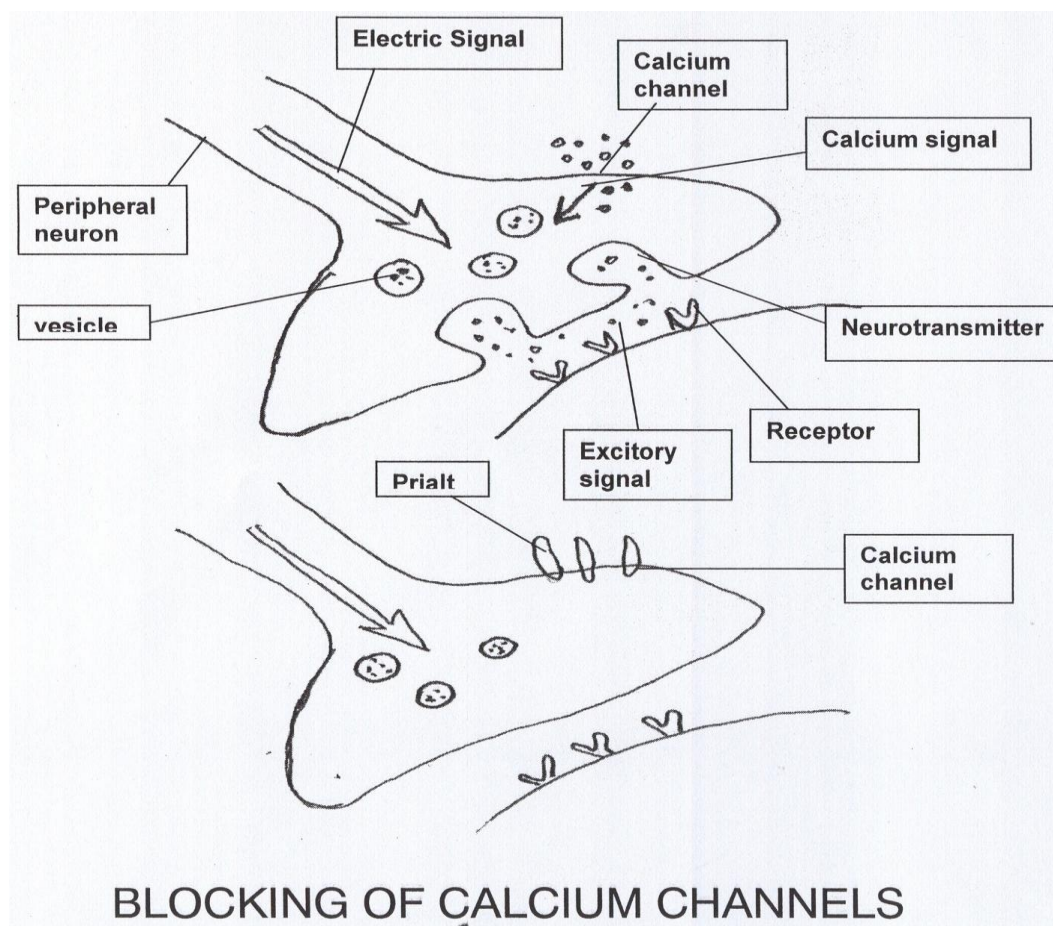
Figure 3: The N-type blocker calcium channel [2].

Breeding them for examination in laboratory conditions

If these species can be bred in the laboratory and examined in laboratory conditions, more effective results can be obtained and unknown properties of marine animals also can be found. However according to Dr. Bruce Livett, University of Melbourne, Australia, "It is very difficult to breed them because they develop as veligers[1] and these tiny little veligers will float out and go around the tank and be lost in the filtration system and they also require a number of different types of plankton to develop and survive into adulthood and it is not easy to provide that environment in the laboratory setting" [6].

Veliger[1]: Any larval gastropod or bivalve mollusc in the state when it is furnished with one or two ciliated membranes for swimming.

Conclusion and Recommendations

Chronic pain is a worldwide common problem and both from the point of view of pharmaceutical companies and patients; it is desirable to search for new effective drugs. Hopefully, cone snails can be a milestone in neuropharmacology by being an alternative to aspirin and other painkillers which have been used for a long time. Properties of Prialt indicate a new pain relieving drug in neuropharmaceutical field.

Scientists are saying that the Prialt can be a cure not for only chronic pain but also to epilepsy and neurological disorders, for instance Alzheimer's.

The cone snails have to be observed in more details under laboratory conditions so alternative ways to breed them should be found. The ways of breeding them in laboratory conditions will be useful. Deep in the endless oceans there may be unknown species waiting for investigations and those can be cure for other illnesses as well.

Unfortunately, according to Dr. Bruce Livett, University of Melbourne, Australia, it is difficult to breed them in laboratory conditions so more effective and alternative ways of breeding them in the laboratory conditions have to be found to examine those animals more deeply. Other serious problem is the animals are now under intense pressure from habitat loss and because their beautiful shells, are the highly prized targets for collectors. Moreover, Eric Chivian, the founder and director of the Center for Health and the Global Environment at the Harvard Medical School in Cambridge, Massachusetts, noted, "Some 26 percent of the world's reefs are damaged beyond repair, and another 30 to 50 percent are severely degraded".

To solve those problems, new techniques have to be improved to use the cone snails more efficiently without damaging and polluting the environment. All people on the Earth have to protect the environment from damaging and polluting especially the seas and oceans that contain millions of known and unknown species which may be the cure of the future's known and unknown diseases.

In conclusion, we can say that a simple investigation based upon the question of "what is there" by Baldomero Olivera has opened up a vast field of a new pain killer in addition to the few already at the disposal of humans. Should we let so many species of plants and animals go extinct in the wanton way that we are at the moment, any stretch of imagination would tell us how much we are losing for ourselves.

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Station 3RRR Melbourne, Australia 102.7 FM ©
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HEALTHCARE WASTE MANAGEMENT IN SAUDI ARABIA.
A CASE STUDY

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Saudi Arabia generates more than 25,000 tons of healthcare waste per year, where a Saudi patient in generates an average 1.3 kg/bed/day of healthcare waste, which is the norm for developing countries as per the World Health Organization (WHO) rates. Until recently, most Saudi government hospitals and some private medical facilities treated healthcare waste as municipal waste, disposing it in municipal open dumps or landfills. Currently, all healthcare wastes are being disposed and treated through specialized companies, which should be licensed by the Presidency of Meteorology and Environment (PME) of Saudi Arabia. This was due to the Saudi government directive to shut down all on-site treatment plants at Saudi hospitals and compel Saudi healthcare establishments to enlist the services of a private company. In 1998, the Ministry of Health of Saudi Arabia promulgated regulations on healthcare waste definition, handling, segregation, disposal, and treatment. The Saudi regulations apply to all categories of hazardous healthcare waste except for body parts and pressurized containers. Also, as Saudi Arabia is one of the Gulf countries, recent Gulf Cooperation Council (GCC) issued guidelines in (1999) required that each medical facility establish a comprehensive waste management plan. The Saudi Ministry of Health (MOH), Ministry of Municipalities and Rural Affairs, and most importantly, the Presidency of Meteorology and Environment (PME) will not allow land disposal and incineration, except with special emission-cleaning equipment. Currently, there are seven companies that offer healthcare waste handling and treatment in various parts of Saudi Arabia. Only one of these establishments is applying the incineration method of waste disposal, while other companies are using the microwave and autoclave treatment methods. More companies are expected to get a license from PME in the near future; approximately 15 companies have submitted a request for a license.

Keywords: *Healthcare waste; Treatment methods; Disposal methods; Saudi regulations.*

Introduction

Healthcare waste can be defined as the total waste stream that is generated from healthcare establishments, health related research facilities, laboratories and emergency relief donations (WHO, 2000). The waste generation depends on numerous factors such as waste management methods, type of healthcare establishment, specializations of the establishment, ratio of reusable items in use, and proportion of patients treated on a day basis (Suwannee, 2002). Waste generated from healthcare activities can be broadly categorized as general waste and hazardous waste. The major portion of waste generated in healthcare activities (80%) is comprised of general waste that can be treated in the same way as domestic waste.

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This, however, remains true only when proper segregation and separation of waste is practiced according to type at the source. There are different estimates regarding the share of hazardous and non-hazardous constituents of healthcare waste. The percentage of 10-25% of health-care waste is regarded as hazardous (medical waste) and may create a variety of health risks. While the pathological and infectious waste represent 15%, sharps and chemical or pharmaceutical waste represent 1% and 3% of the waste, respectively. Less than 1% is a special waste, such as radioactive or cytotoxic waste, pressurized containers or broken thermometers and used batteries (Prüss et al., 1999; Sharma, 2002; Tietjen et al., 2003).

The mismanagement of healthcare waste can pose risks to people and the environment, healthcare workers, patients, waste handlers, waste pickers, and the general public are exposed to their health risks from infectious waste (particularly sharps), chemicals, and hazardous waste (Paranan, 1997). It is therefore, proper management of healthcare waste can minimize the risks both within and outside healthcare facilities. Generally, there are four key steps of healthcare waste management: 1) segregation into various components, including reusable and safe storage in appropriate containers; 2) transportation to waste treatment and disposal sites; 3) treatment methods; 4) final disposition (Pruess and Townend, 1998). In addition, the Ministry of Health (MOH) and the Presidency of Meteorology and Environment (PME) issued a legal circular in 1998 on the health care institutions to streamline the process of proper handling of hospital waste such as segregation, disposal, collection, and treatment. On the regional scale, the council of Arabian Gulf countries (GCC), which includes Saudi Arabia, Kuwait, Oman, Qatar, Bahrain, and the United Arab Emirates, endorsed a Unified Code for the Management and Disposal of healthcare waste in the GCC. The present study is designed to give a full picture of the healthcare waste management system in Saudi Arabia.

Current Status of Healthcare Waste Management

Waste Generation

The World Health Organization (WHO) estimated the total medical waste per person per year is anywhere to be from 0.50 to 3.00 kg/bed/day in developing and less developed countries. According to data compiled from the Health Statistical Year Book (2003), issued by the Saudi Ministry of Health, the estimated amount of all healthcare waste generated in the Kingdom of Saudi Arabia is 50,552,5 tons/year (table 1). Also, the estimated total amounts of waste generated from governmental and private healthcare establishments are 39967,500 and 10585,000 tons/year, respectively. These estimations are calculated on the basis that the mean healthcare waste rate of generation and of 1.13 kg/bed/day and 0.08 kg/visitor/day (Al-Zahrani et al., 2000). However, this estimated number for the total healthcare waste generated in Saudi Arabia exceeds that estimated by El-Zahrani et al. (2000) of 25,207 tons/year. This could be due to the increase of healthcare establishments and number of hospital beds in both governmental and private sectors and higher growth rate of population in Saudi Arabia (3.28%), which is considered one of the fastest population growth rates in the world.

Table (1): Healthcare waste generated from Saudi governmental and private healthcare establishments.

Establishment type	Ministry of Health	Other Governmental Sectors	Private Sector	Total
Hospitals (ton/day)	32,500	11,600	11,500	55,600
Health clinics (ton/day)	46,400	19,000	17,500	82,900
Total (ton/ day)	78,900	30,600	29,000	138,500
Total (ton/year)	28798,500	11169,000	10585,000	50552,500
Total per Sector (ton/year)	39967,500		10585,000	50552,500

Source: Health Statistical Year Book, Ministry of Health, Saudi Arabia, 2003.

Waste Segregation

Since costs for the safe treatment and disposal of hazardous healthcare waste are typically more than (10) times higher than those for general waste, the three-bin system is established in most healthcare establishments, where all waste should be separated by the medical staff into three categories: 1) general healthcare waste, usually put into black bags; 2) potentially infectious healthcare waste (also known as hazardous health care waste), usually put into yellow bags; 3) used sharps put into rigid yellow containers (WHO, 2000 a & b). In this regard, no healthcare waste other than sharps are deposited in sharps containers, as these containers are more expensive than the bags used for other infectious waste. When a disposable syringes are used, the packaging are placed in the general waste bin and the used syringes in the yellow sharps containers in most circumstances, the needles should not be removed from the syringe because of the risk of injury. In all cases, waste are collected daily (or as frequently as required) and transported to the designated central storage site. Measures of this sort helped to minimize the costs of healthcare waste collection and treatment in many Saudi hospitals. The infectious waste was reduced by a total of 65% in Dhahran Health Center operated by the Saudi Arabian Oil Company (Saudi Aramco), after a waste segregation program was implemented (Hagen et al., 2201). Infectious waste from inpatient, surgical, and obstetric areas was also reduced (a reduction of 70%). Consequently, incineration operation was reduced from daily to three days per week, with a corresponding reduction in incinerator emission. A plan designed and used by the hospital waste management committee in King Fahd Hospital of the University (KFHU), Alkhobar (Aljabre, 2002) to upgrade the management of hospital waste. This plan which was efficient, cost-effective and that required no extra human resources could also be used in other hospitals. However, Aljabre et al. (2002) found a lack of awareness, ignorance of policy and procedure on the handling of healthcare waste among healthcare staff in the study, and stated that there is a need for a plan to improve the awareness of healthcare workers about hospital generated waste and its proper handling.

Waste Treatment and Disposal

 Until recently, most Saudi government hospitals and some private medical facilities treated their healthcare waste as general waste, disposing it in municipal open dumps. The MOH mandated the operation and maintenance of their hospitals to private contractors to handle and dispose of general hospital waste including medical waste. In addition, legislation was enacted in December 1999, enforcing all private medical facilities to implement a health care waste management system, which among other things, engage the services of a competent and qualified company, and authorized by PME.

The final disposal of the healthcare waste is implemented through different private companies using different types of waste disposal. One of these companies is using the microwave irradiation process at their facilities in Riyadh and Jeddah, and an Autoclave system at Taif. Another two companies in Riyadh city and Jubail use incinerators with emission controls that are compliant with PME and EPA. In addition, a company located in the Easter province operates a sanitary landfill system for waste disposal approved by PME. In addition, some private hospitals are still treating their wastes on-site in spite of government regulations. Recently, a large medical facility in the Eastern Province installed a wet thermal autoclave method at their facility. In addition, Saudi Aramco, the national oil company, bought two similar systems for their hospital and health centers.

National Laws and Regulations

According to informed industry sources, Saudi Arabia's municipal landfills have, for the most part, reached their design capacity and environmental contamination is widespread. In September 1998, the Ministry of Health working with the Presidency of Meteorology and Environment issued a circular on acceptable standards for the proper handling, treatment and disposal of medical waste. In addition, another legislation was enacted in December 1999, asking all private medical facilities to implement a health care waste management system, which among other things, entailed the provision of either an on-site medical treatment plant or engage the services of a competent and qualified company. In either case, the Presidency of Meteorology and Environment must provide its seal of approval. The latest Saudi government guidelines, issued on February 2001, stipulated that all on-site treatment plants have to shut down and sub-contract the process to specialized companies that are licensed by PME. Currently, there are seven companies that offer medical waste handling and treatment in various parts of Saudi Arabia. More companies are expected to get a license from PME in the near future.

On the regional and international scales, the Arabian Gulf states (GCC), which includes Saudi Arabia, Kuwait, Oman, Qatar, Bahrain, and the United Arab Emirates, endorsed a Unified Code for the management and disposal of medical waste in 1999, adopted in 2005. The regulation imposes restrictions on the generation, transport, handling, storage, treatment, disposal of healthcare waste. Some of the recommendations in this regulation are: 1) the private sector will be encouraged to invest and assume a vital and increasing role in the safe treatment and disposal of infectious waste; 2) all existing incinerators at various on-site medical facilities in the GCC should be decommissioned by 2004;

3) both the government and the private sector have to provide training and conduct workshops and seminars to educate health care staff on the proper and safe handling, packaging, transporting, and disposal of infectious waste. In addition, the government of Saudi Arabia was one of the parties that signed the "Basal Convention, 1989", coordinated by the United Nations Environment Program (UNEP). This convention concerns transboundary movements of hazardous wastes and is also applicable to hazardous healthcare waste.

Acknowledgement

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BIOPIRACY AND SENSITIVE ISSUES OF ENVIRONMENTAL ETHICS AND INDIGENOUS MECHANISM OF BIODIVERSITY CONSERVATION IN TRIBAL VILLAGES OF BASTAR: AN ANTHROPOLOGICAL PROPOSAL

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The biological resources in the indigenous territories of Chhattisgarh consist of various natural sources of agricultural, medicinal, ecological, veterinary and cosmological potencies which ensure equilibrium between local environment and social health of the tribal communities inhabiting in the forest villages. The forest dwelling tribes interact with plant and animal diversity in a natural supportive way. The biological resources influence the customary practices, cultural resources and local knowledge systems not only among Gond and Halba communities but also among other indigenous communities. The above cultural practices, both customary and non-customary, prevalent among Gond and Halba tribes of Chhattisgarh are not only inherited territorially but also continue to evolve under influence of individual innovations and local environment. The deficiencies in careful customization of these cultural practices restrict opportunities for innovation and reproduction of these practices. The circulation and reproduction of natural and social environment and local system of production are followed by these cultural practices which constitute potential substrates of local cultural resources. The process of globalisation has threatened not only protection of intellectual property rights (IPR) of these tribal innovators but also protection of cultural and biological resources of these indigenous communities. The reproduction of the cultural knowledge and practices for commercial application has not been appropriately explored. Because they need to be synthesized, reduced, standardized and miniaturized for mass reproduction and distribution based on scientific research and integration of local knowledge in mainstream of scientific exploration. The limitations have provided vast opportunities to big players for hijacking the intellectual property rights (IPR) of community over cultural and biological resources of this nascent State. The biopiracy activities by corporate houses spreads like wild fire. The intellectual and cultural property rights of these tribal healers and innovators have been violated adversely. Very often the development planners overlook rules, roles of these communities as regard to identification of plants and habitat of plants, methods of planting and extracting medicinal components guided by traditional knowledge system.

Introduction:

Chhattisgarh, a nascent tribal state of India has been carved out of Madhya Pradesh on November 01, 2000. This State lies in eastern part of India between 17° 46' N and 24.06.'N latitude and 80.15' E and 84°. 51E longitude. Forest covers 44 percent of total geographic area of the State. Kurandi Forest, Kurchel valley, Kanger Reserve, Bailadilla Hills and Abhujmar constitute medicinal plant hotspots of the State. The issues of environmental governance as correlated with sustainable livelihood in forest villages in and around Abhujmar, Bailadilla medicinal plant hotspots in Bastar are numerous and complex.

These issues are deep rooted in cultural, social and natural life support systems of communities living in this region.

The biological resources in these indigenous territories of Chhattisgarh consists of natural sources of agricultural, medicinal, ecological, veterinary and cosmological utility which ensure equilibrium between local environment and social health of the tribal communities inhabiting in these forest villages. These biological resources influence the cultural practices, resources and local knowledge systems not only among Gond and Halba communities but also among other indigenous communities. The cultural practices both customary and non-customary, prevalent among Gond and Halba tribes of Chhattisgarh are not only inherited territorially but also continue to evolve under influence of individual innovations and local environment. The deficiencies in careful customization of these cultural practices restrict opportunities for innovation and reproduction of these practices. The circulation and reproduction of natural and social environment and local system of production are followed by these cultural practices, which are potential substrates of local cultural resources. The process of globalisation has threatened not only protection of intellectual property rights of these tribal innovators but also protection of cultural and biological resources of these indigenous territories. The reproduction of these cultural knowledge and practices for commercial application has not been appropriately explored. Because, they need to be synthesized, reduced, standardized and miniaturized for mass reproduction and distribution based on scientific research and integration of local knowledge in mainstream of scientific exploration. These limitations have provided vast opportunities to big players for hijacking the intellectual property rights of community over cultural and biological resources of this nascent State. The web of unique relationship between animal genetic resources and cultural practices (i.e. magic, rituals, medicine divisions, symptoms) prevalent among tribal communities of Chhattisgarh need to be explored through appropriate research initiative towards protection of the intellectual property rights of local communities and expanding access to rich biological resources in these indigenous territories. A little attempt has been made to protect the intellectual property rights and medicine components of animal species administered by these herbalists, Shamans and folk healers through awareness generation and action research interventions. The government and Civil societies in these indigenous territories have not been adequately sensitized on these issues. Appropriate interventions on dissemination of knowledge on traditional medicine, expansion of scope of utilization of this system, identification and elimination of harmful traditional health care practices, enhancement of information sharing on traditional medicine, increasing collaboration between traditional healers and other health practitioners are required to be planned and coordinated. The autonomy of any tribal community is not only manifested through the existence and operation of subsistence economy but also through Ethno-medicinal practices adapted appropriately to their cultural framework. This healing system preserves the web of network of interrelationships of man with nature, flora and fauna. The administration of natural components and exploration of human interrelationships with invisible supernatural forces through magico-religious practices revolving around the stratum of folk medicine and traditional healing practices are prevalent among tribal communities in India. The community's confidence on rationality and effectiveness of traditional healing practices and the healers has been compounded by the traditional values and taboos regulating ethno-healing practices among tribal communities.

The tribal foster their own traditional knowledge and belief prioritizing the origin and causes of and indigenously recommended treatment for diseases, which may be rejected as irrational, superstitious and non-scientific by modern medical practitioners. The modern medical practitioners very often fail to touch the raw cord in the heart of tribal patients. Any intervention without responding to sentiment, belief and health seeking behaviour of tribal appropriately will certainly fail to bring them to center of health planning in any part of our country. No doubt the 'Baiga', 'Gayata', the traditional healers among tribal of Chhatisgarh have adequate knowledge and answers to cure permanently many respiratory, reproductive and digestive ailments which modern medical practitioners have failed. The traditional healers with traditional wisdom and expertise on herbal as well as medicinal extracts from various organic components of animals are referred to as "Baiga" or "Sirha" or "Vadde" or "Baidya". The traditional healers among tribal communities of Bastar have been graded as "Gayata" or "Pujari", "Sirha" and "Gunia" on the strength of their expertise, therapeutic skill and job responsibilities. "Gayata" or "Pujari" and "Sirha" among Muria tribe of Bastar have acquired the art of inviting holy spirits from supernatural world as occultists upon themselves and get possessed through performing specific magico-religious rituals. They infuse healing forces awarded by the possessed super natural spirits into patient's body for eliminating ailments through healing touch. Gunia always works as assistant to "Sirha" in performing magico religious rituals and worship of holy spirits in the forests. Spiritual component emphasizing on faith healing contributes significantly towards ensuring balances between mental health and physical health. "Perma" the elderly peer of the village takes lead in organizing ceremonies and rituals at community level. "Panjiya" is the astrologer who has expertise of forecasting the fate, crop yield, climate and well being of persons and communities. These different types of folk healers have expertise and potentialities to serve as appropriate community level health care providers, health counselors, peer educators through their capacity building interventions. This unexplored human resource base need to be fruitfully utilized for transforming health scenario of State. The bio technology policy formulated by Government of Chhattisgarh has provisions for upgrading the capacity of people to exploit natural, cultural and knowledge heritage of the State. These traditional healers upholding the existence of the thousands years old culture of ethno-medicinal practices perpetuated through traditional wisdom provide vast opportunity to Government and corporate bodies towards promotion of medical tourism in Chhattisgarh. These persons can be motivated to form Peer Group at village level to identify, plan and prioritise the cultivation of medicinal plants and appropriately involved in the task of promoting Bio-Villages in the nascent state of Chhattisgarh.

The traditional healing practices of tribes are more or less based on stimulation of self healing efforts of body guided by Observance of Laws of the nature. The therapies under traditional healing practices among tribe have been influenced by the sets of interrelationship among human world, supernatural forces and nature. Nature is treated as the microcosm and Universe as macrocosm crowned with spiritual and supernatural forces. Nature is consisted of minerals, vegetation and animal kingdom the ingredients of which have been derived from the Universe. Human Body contains all the ingredients, which both Universe and nature possess. The basic rationale of traditional healing therapies among tribal is deep rooted in the understanding of human relationship with nature and Universe. The ingredients from human world, animal kingdom, mineral resources and green vegetation along with unseen forces drawn from supernatural world influence significantly these traditional healing therapies. The principles of these therapies are directed to generate forces for stimulating human happiness, community consciousness and harmony apart from igniting the process of self healing within the human biological system. These days thousands of patients all over the world have developed a fascinating choice for a trial with treatment by folk healers for their chronic ailments and test the efficacy of alternative herbal or ethno-medical health care system practiced by Indian traditional healers.

Research Design :

The present paper is based on anthropological study of indigenous knowledge system of ethno-medicinal practices prevalent among Halba and Raj Gond, Muria tribal communities living in twelve forest based mountain villages of Antagarh Block in Kanker district, Bastar region of Chhattisgarh. A team of two social anthropologists and one ethno-botanist camped in these villages for nine weeks during November-December 2002. The study focused on in-depth interview with 21 tribal herbalists (Baiga) and 18 Shamans (Gayata) and 35 community elites spread over these twelve forest villages adopted as samples under the study. The author administered Focus Group Discussion with Lineage elders, herbalists, herbal plant merchants, expecting mothers, traditional birth attendants (TBAs), and Shamans separately. More emphasis was given on analysis of data elicited from oral tradition, oral histories, and participant observation on rituals governing collection and use of biological resources. The village based resource maps covering habitat of herbal species were developed involving these informants with administration of appropriate tools of Participatory Rural Appraisal (PRA). The field investigation was carried with administration of both qualitative and quantitative tools such as interview guide, focus group discussion (FGD), in-depth personal interview and anthropological case studies. Some tribal herbalists were engaged as field guide to accompany the team for identifying the habitat of herbs in the forest.

Indigenous Model of Health Care and Conservation of Biodiversity

The indigenous model of cultivation of medicinal plants like Safed Moosali (Chlorophytum-arundinaceum) for expanding commercialization opportunities on experimental basis in some parts of the state has provided unexpected encouraging response to the farmers. The cultivation of medicinal plants like Terminalia-arjuna (Arjuna), Melia-composita (Garood), Samilex perfolia (Phosar), Withania-Somnifera (Ashwagandha), Piper nigrum (Kalimirch), Madhuca-indica (Sarpogandha),Terminalia-belirica (Behada), Terminalia-Chebula (Harra), Plumbago-zeylanica (Chitawar), Curculigo archiolis (Kali Moosali), Azadiracle-indica (Neem) hold a bright future for upholding economic prosperity of the State.

The globalisation process has facilitated the linkage with vast marketing network for commercialization of these rare herbs, which must be appropriately tapped. The results of such experimentation are urged to be disseminated through duplication in a larger scale operation, which will not only respond to community efforts in eradication of poverty but also compound Government efforts in transforming the State of Chhattisgarh into a herbal State of India at bigger stride. In absence of enactment of a sui generis law for protection of traditional knowledge from being bio-pirated by multinational companies inspired by the growing trends of globalisation and privatization, the rich cultural heritage shall be faded away. Different multinational companies have been acquiring the traditional knowledge on ethno-medicine and commercializing these herbal medicines with their own patent. Lack of research and documentation of ethno-medicine, lack of awarding rewards to efforts to integrate these folk healthers in country's main stream of development have provided enough scope to bio-piracy of traditional knowledge, art-craft, commercial use of valuable rare herbs supporting the rich cultural heritage of Chhattisgarh. The issues of protection Intellectual Property rights of folk healers have not been appropriately addressed at DOHA and incorporated in the TRIPS (Trade Related Intellectual Property Rights) agreement. The marketing of pure medicinal and aromatic plants along with provision of consultation by traditional healers capsuled in a package deal and handled by a federation of grass-root CBOs like Vana Suraskhya Samity or State level apex body of Stakeholders cooperative societies dealings with minor forest produce would pave a prosperous pathways for fruitful exploration of ethno-medicine system in Chhattisgarh.

The success stories of the experimentation initiated by the Tanga AID Working Group (TAWG) of Tanzania in addressing the problems of HIV / AIDS patients through appropriate collaboration with traditional healers provide examples of eye opening interventions. Under this project, the traditional healers have been trained to work as HIV/AIDS counselors, peer educators, better health-care providers and condom distributors. The treatment of at least 2000 AIDS patients by traditional remedies have proved effective in elimination of skin problems, increase in appetite, improvement of quality of life and enhancement of longevity of life in these patients.

Issues of Intellectual Property Rights ; Need for Sui Generis Legislation

The Government of India has enacted Biological Diversity Act in 2002, which seeks protection and regulation of country's natural resources and traditional knowledge. This initiative has been stimulated by resolutions of International Convention on Biological Diversity to which India was one of the signatories. This Act has prescribed three tiered systems of regulation ranging from national level to grass root level. National Biodiversity Authority (NBA) has been created at apex level to coordinate the activities of State level Biodiversity Board (SBB) and local level Biodiversity Management Committee (BMC). The Government of India have drafted the rules of Biodiversity Act (BA) in 2004, which entrusted NBA to take appropriate steps for creating database and documentation system for biological resources through biological registers and electronic data bank. The Ministry of Environment and Forest, Government of India convened a series of workshops for preparing detail manuals for People's Biodiversity Registry (PBR). It has been visualized that each Gram Panchayat of the country would be encouraged to promote Biodiversity Information System (BIS) and Peoples Biodiversity Registry (PBR).

This would serve as a storehouse of all biodiversity related information and be used as tool towards gaining access to forest produce. People will be sensitized to know biodiversity around them and curtail its use and plan ecological conservation accordingly. At the initial stage, Centre for Ecological Sciences (CES), Bangalore has been entrusted by Government of India to prepare manuals for PBR to be launched at least in three hundred Gram Panchayats of the country, which would promote Intellectual Property Right (IPR) region and ensure conservation of bio-wealth.

Government of India have taken praiseworthy stand at international circle and denied IPRs on life forms at World Trade Organisation (WTO) level. But, the flaws in domestic legislative provisions have not been prioritized and rectified so far. Government of India has allowed IPRs on plant varieties. No policy has been enacted to empower the stakeholders in prevention of biopiracy in terms of obtaining prior informed consent (PIC) directly from the communities. Biodiversity Rules, 2004 enacted by Government of India have entrusted power to National Biodiversity Authority (NBA) to grant permission to foreigners seeking access to biological resources and traditional knowledge without taking prior informed consent (PIC) from local Biodiversity Management Committee. The representation of community at State and National Level Biodiversity Boards has been ignored. The role of local Biodiversity Management Committee has been confined to documentation of traditional knowledge and developing peoples biodiversity registry only. Besides, the provisions for equitable benefits sharing by stakeholders from commercial use of bio wealth and indigenous knowledge have not been well defined in the Biodiversity Rules. The district administration has been authorized to receive the benefit on behalf of the community. The principles of consent and benefit sharing need to be revised and restructured incorporating rooms for empowerment of stakeholders as well as local Biodiversity Management Committee in terms granting prior informed consent (PIC) to users and availing benefits sharing directly without involvement of any bureaucratic hurdles.

Conclusions:

The challenges before us today are not to challenge the efficacy and rationality of traditional ethno-healing practices but the challenges to bridge the gap between traditional and modern biomedicine, reclamation and exploring core essence of ethno-healing practices in terms of their contribution to humanity and science. The knowledge base of ethno-healing system may be significantly explored towards supplementing the existing modern bio-medical practices. The challenging tasks ahead of State Government today are exploration of indigenous knowledge system and promotion of an appropriate database, incorporation of field tested concepts on indigenous knowledge into academic as well as development policies of the Government, promotion of national linkage between researchers and organizations involved in ethno-medicine initiatives, promotion of IK Resource Centre at State level for documentation, acquisition and dissemination of IK related information in the nascent State of Chhattisgarh. Without appropriate research initiatives towards documentation of traditional knowledge relating to medicinal plants preserved by elderly peers, the indigenous knowledge base is on the verge of erosion and elimination in absence of promotional efforts by younger generations to acquire, promote and sustain this stream of knowledge gainfully. Some magico-religious practices prevalent among abujhmaria and Baiga have tremendous impact on delaying child birth as experienced by some educated couples of the cities of Chhattisgarh.

The Ministry of Culture, Government of India has set up National Manuscript Mission (NMM) and another appropriate Mission to conserve country's intangible heritage, formulate appropriate policy and overarch legislative framework. This will not only prevent erosion and unauthorized exploitation of traditions but also stimulate innovation and creativity as well as protection of transmission of traditional knowledge honouring the dignity and moral rights of innovators in this globalising era.

The globalisation has opened spectrum of accessibility by overpowering multinational companies to procure, market and own intellectual property right over herbal medicinal resources technology and processing of the natural ingredients of herbal medical system preserved by indigenous communities. In absence of enactment of appropriate policy and legislation to protect the intellectual and cultural property rights of traditional folk healers and adequate exploration and documentation of intangible culture and oral tradition covering folklore, mythology, ritual, proverbs etc, the tangible and intangible assets of age old folk healing system have been taken over, owned and put for greater commercial use through process of privatization. These are highly sensitive issues, which are to be dealt with by appropriate legislation and policy formulation with back up support through appropriate research interventions in growing state of Chhattisgarh.

The tribal sustain the preservation of rare medicinal plants in common productive resources (CPR) in indigenous territories of this State. The contradictions between Government's perceptions and rules of revenue and forest department over ownership and property right on these common productive resources on one hand and tribal beliefs and practices concerning resource management on the other have posed serious threat not only to preservation of biodiversity resources but also to sustenance of ethno-medicinal practices. These issues have taken for debate on various national and international forums. The 'Principle of Self – determination' upholding home – rule and autonomy of tribal communities as recommended in the International Conference on Conflict resolution, Peace Building, Sustainable Development and Indigenous People, 6-8 December 2000, Manila (Philippines) may be explored as guiding principle incorporated in the strategy for resolution of insurgencies and conflicts over tribal people's land and resources in this State. The deficiencies and vacuum in promoting capacities of tribal people to uphold and defend their rights are deep rooted in their inability to undertake research and documentation and dissemination of information world wide. They fail to promote appropriate global, regional and local networks and collaboration in campaign; policy understanding on these issues of tribal people of this State is very poor.

There is an urgent need for promotion of appropriate public understanding in this regard through media advocacy with involvement of academicians, NGOs and Civil society organizations of the State. There is an urgent need for promotion of Tribal and Indigenous People Global network with a mission to promote and defend their rights and capacities to expose the abuses of their tradition. The agenda of public awareness must focus on issues of peace keeping in indigenous territories, social protection, partnerships, mobilization of resources, national and international cooperation for social protection, preservation and protection of bio-diversity resources with appropriate participation of tribals of the State.

India is treated as treasure house of indigenous knowledge and numerous rare medicinal herbs. India preserves 7% of world's biodiversity. National Biotech Policy (NBP) of India is still at a rudimentary stage, which has not provided any consultation, sharing of success stories with stakeholders and civil society. No precautionary principle has been defined to initiate any precaution when the environment is exposed to threats. The rice exporters of India have bitter experience of economic threat posed to them by Taxas based Firm, Rice Tech, who could manage to hijack patent on Basamati Rice of India in 1997. Ultimately Rice Tech was forced to withdraw the claim for patent when challenged by Government of India. Similarly, two US based Indians have acquired patent for use of turmeric in wound healing. Government of India have challenged this patent and forced to revoke it. There are numerous cases where intellectual property rights of tribal innovators have been hijacked without their knowledge. There is an urgent need to promote national consensus regarding protection of Intellectual Property Right on indigenous knowledge relating to medicinal and aromatic herbs. The issues of intellectual property right need to be published and discussed by a broad audience of stake holders. The policy on protection of intellectual property right needs to be based on informed public opinion and process of public engagement eliciting broad range of public opinions on these issues. The herbalists and folk healers upholding local health tradition need to be engaged with monetary and non-monetary incentives so that they would be encouraged to safeguard and share their knowledge for greater public cause. More focus is urged on research, documentation and publication of local health tradition (LHT). Conservation Assessment and Management Plan (CAMP) workshops need to be organised for assessing commercially harvested medicinal plants in different forest regions of the state. The establishment of medicinal plants germ plasm Banks would create safety net for protection of intellectual property right on use of the medicinal herbs. The civil society organizations have a major role in promoting a platform for debate and information sharing between policy makers and stakeholders. The Government of India has promoted a network of four GeneBank to conserve the rare endangered commercially important medicinal and aromatic plants on experimentally basis. The success stories of this experimentation need to be disseminated among stakeholders of different regions of the country.

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INVESTIGATION OF THE CONTAMINANTS IN DRINKING WATER DISTRIBUTION SYSTEM OF IZMIT

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In this study, we present the state and characteristics of the storage tanks and networks of the main pipe system of İzmit. Tap samples of drinking water distribution system of Izmit from 4 different localizations (Zabıtan storage tank DMA5/1, Zeytinlik Mosque A5K2, Aydınlar Street DMA5/2 and İnkılap High School DMA5/3) on the same line were analyzed and evaluated for quality control parameters. Quality control parameters were turbidity, pH, hardness, aluminum, iron, manganese, free chlorine, coliform bacteria, E. coli, counted colony, nitrite. Results of the analysis (between 01/2004-04/2005) were compared with the limit values of the "Regulation of Water Intended for Human Consumption". For two samples collected on 05/2004 and 02/2005, only the mean aluminum and turbidity levels were above the limits of "Regulation of Water Intended for Human Consumption".

Keywords: Distribution system, Drinking water, İzmit, Water quality.

Introduction

The water used and drank in the daily living of human beings is called potable and available water. The aim of water distribution system is to reach the water to the consumer. A well-planed distribution system should be able to reach the water to the consumer in a way that is enough in quantity/quality and convenient pressure. Treated water with the standards of potable water has the risk of re-contamination during the transportation within the distribution system. The main contamination sources are reaction with water within the type-dependant pipe, sewage, reaction of chlorine in the distribution system, etc.

Chlorinization of potable waters for disinfection is widespread in the world and in our country. Residue chlorine should be left in the distribution system in order to prevent re-growth of microorganisms in the disinfected potable water. It has been observed that chlorine reacts with the natural organic matters in the water and forms carcinogen trihalomethanes (THMs).

The equation of THMs and the other halogenous disinfection by-products is as follows: $HOCl + Br^{-1} + DOM \rightarrow$ THMs and the other halogenous disinfection by-products As it is shown above THMs are one of the parts of chlorinized by-products. Formation of THMs in the distribution system and storage tank continues in the presence of organic matters and chlorine .[1]

It has been reported that although the concentration of bacteria at the effluent of treatment plant has been at low values, it may be observed at high levels in the distribution system. Growth of bacteria in the distribution system is due to; re-growth of bacteria in the distribution system originating from the dominant and resistant forms within the treated water, growth of planktonic bacteria in the water and avulsion of biofilms .[2-3-4] Microorganisms have been localized densely in the surface of pipelines. Biofilms are mixed with corrosion products and inorganic sediments. Drinking water distribution systems have been continuously confronted by bio-degradable organic matters which forms 20-30% of the total dissolved organic matters. Also, there have been microbial contamination risks during the maintenance of the network .[5]

The main purpose of this study was to determine the quality of drinking water in İzmit distribution system.

Material and Method

Water demand of İzmit city has been supplied by İzmit Domestic and Industrial Water Supply Project. Kirazdere River which originates from the southern mounts of İzmit feeds the Yuvacık Dam. The dam waters have been conveniently treated and distributed to Kocaeli by a 4375 km of a total pipeline. The drinking water distribution system in İzmit has also a length of 976 km. Distribution system of İzmit, the name and the localization of the storage tanks are given in Fig.1. There have been 24 storage tanks (main and vice) in İzmit.[6] In this study, we investigated the quality changes of treated water in the distribution system from the 4 different points on the same line during January 2004-April 2005. The results of samples analyzed at 42 Evler Drinking Water Laboratory were also evaluated. Investigated parameters were turbidity, pH, hardness, aluminum, iron, manganese, free chlorine, coliform bacteria, E. coli, counted colony and nitrite. Contractual limits of drinking water treatment plant are shown in Table 1.

ISU SCADA SYSTEM - RESERVOIR OVERVIEW

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1988
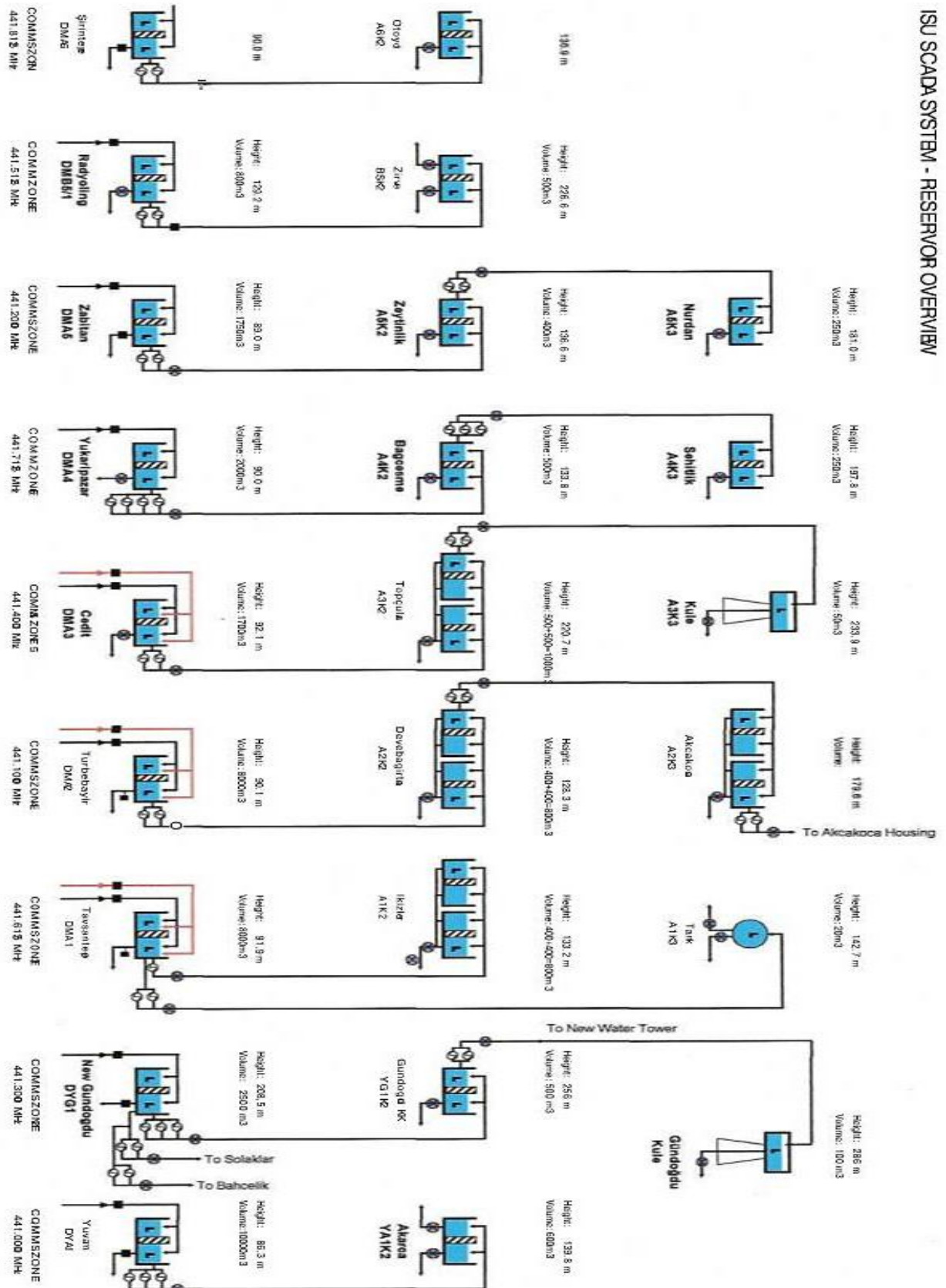
Table 1. Treated Water Analysis

Parameter	Limit Values
pH	7,8 – 8,5
Free Chlorine	> 0,1 mg/L
Total Chlorine	> 0,1 mg/L
Turbidity	< 1,0 NTU
Color	<10.0 µg/L Pt-Co
Aluminum	<0,1 mg/L
Iron	< 0,1 mg/L
Manganese	< 0,05 mg/L
E.Coli	0 MPN / 100mL
Total Coliform	**0 MPN / 100mL**
Plate Count	< 50 N_0/mL

Results and Discussion

Changes of quality parameters versus time in the water distribution system are shown in Fig 2-10.
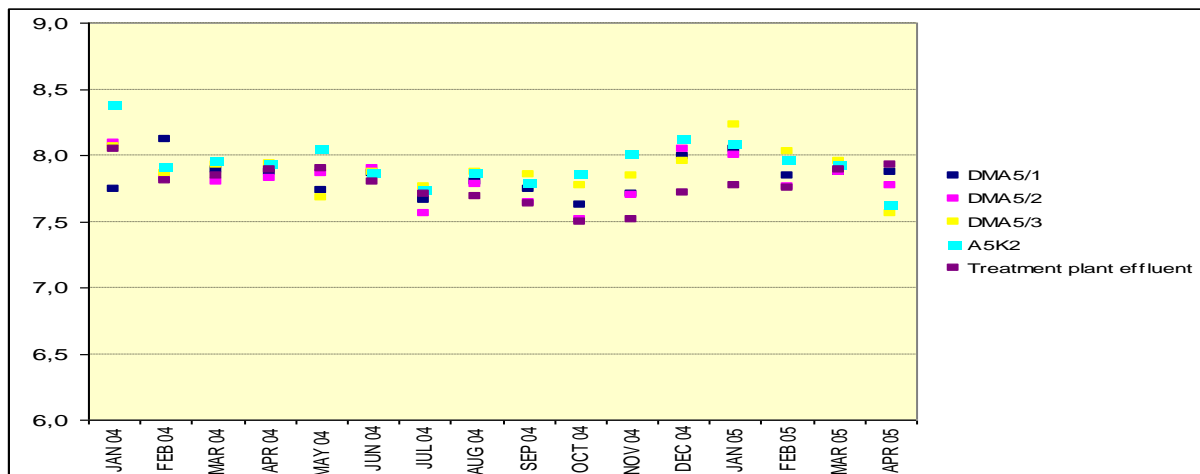
Figure 2. The variation of pH values versus time.
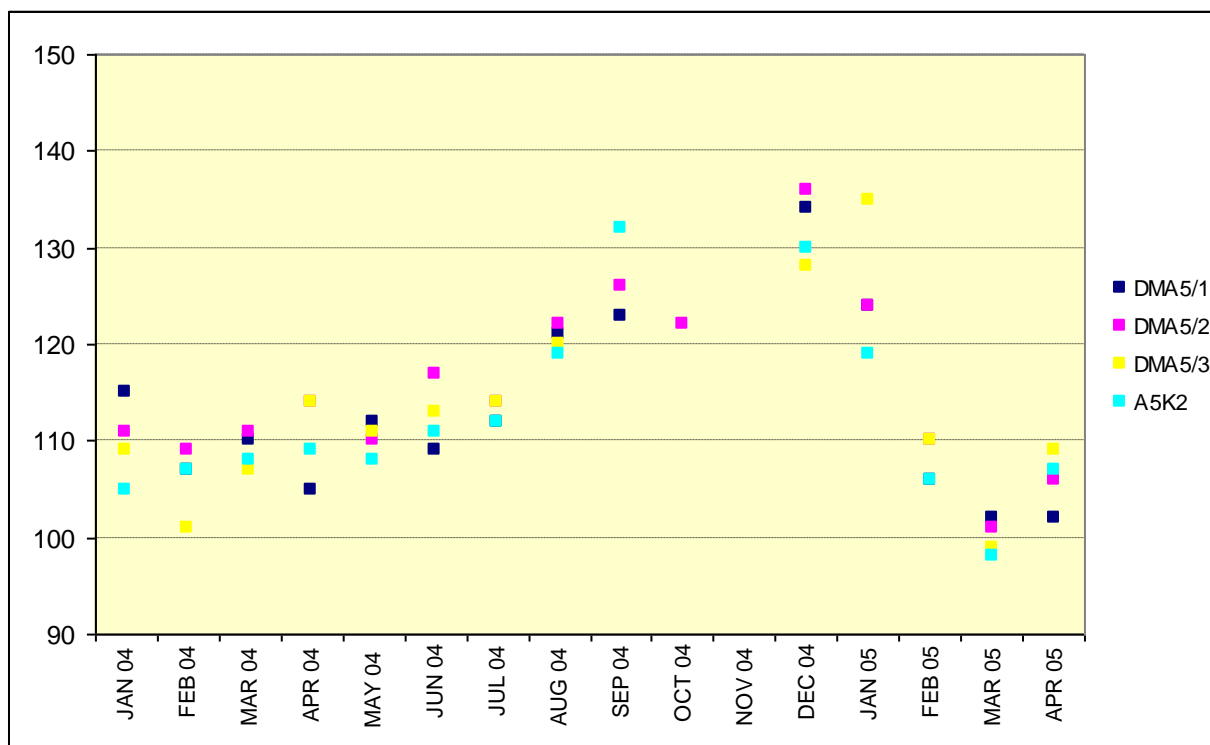
Figure 3. The variation of hardness values versus time.
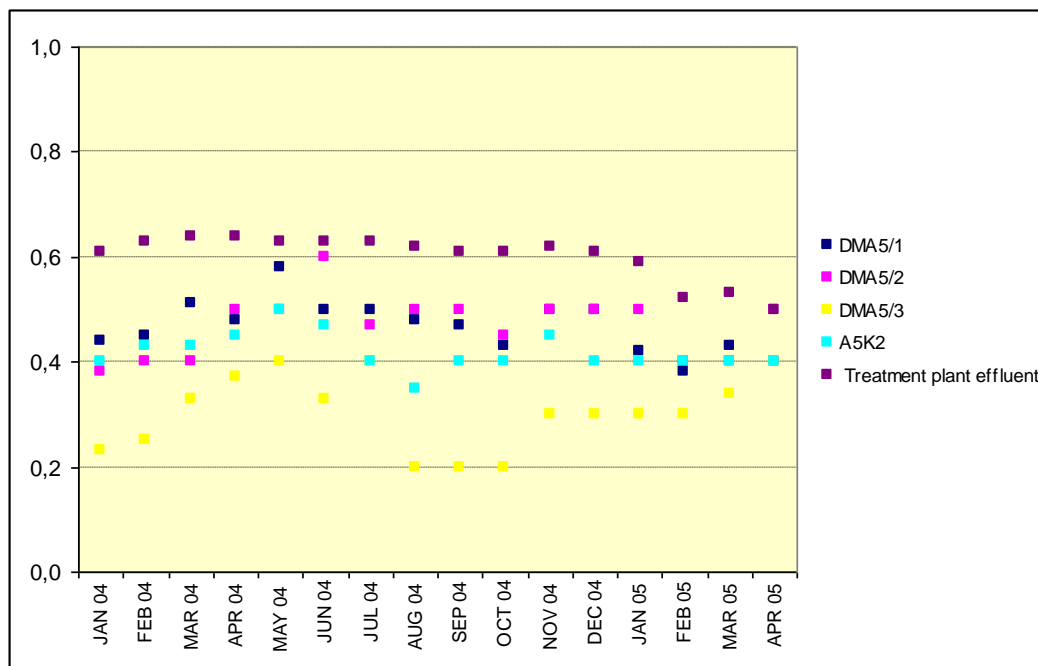
Figure 4. The variation of free chlorine versus time.
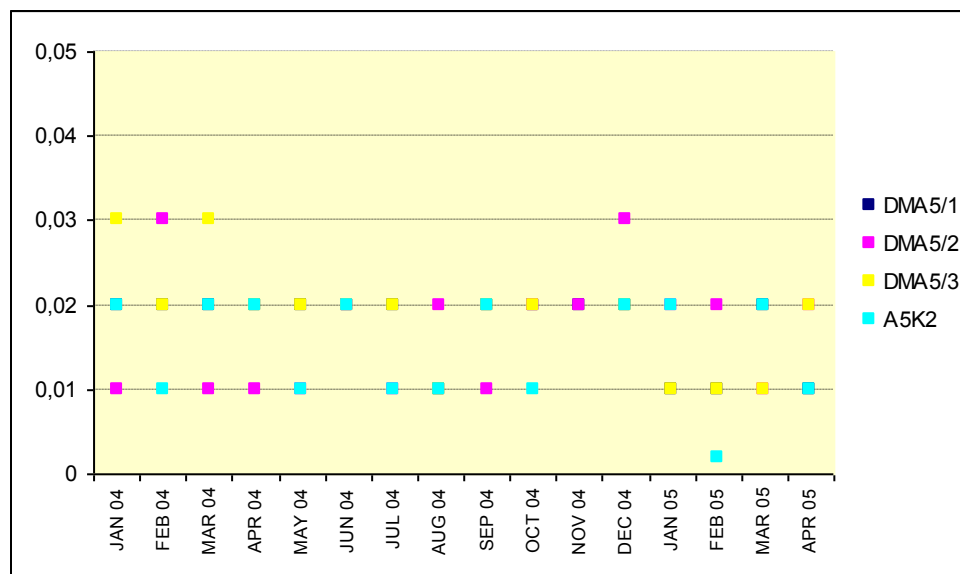
Figure 5. The variation of nitrite parameter versus time.
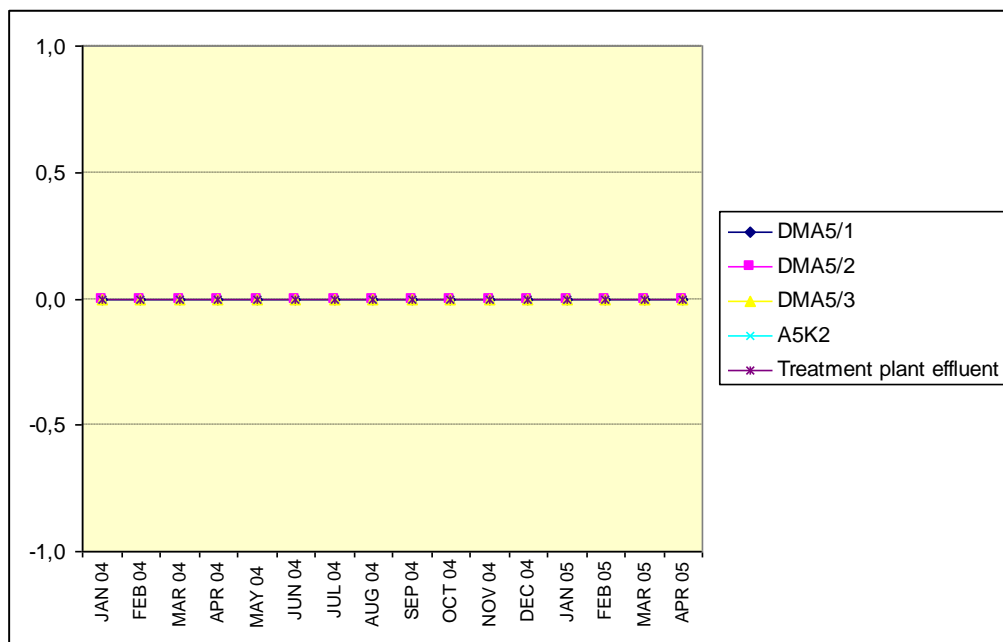
Figure 6. The variation of total coliform parameter versus time.
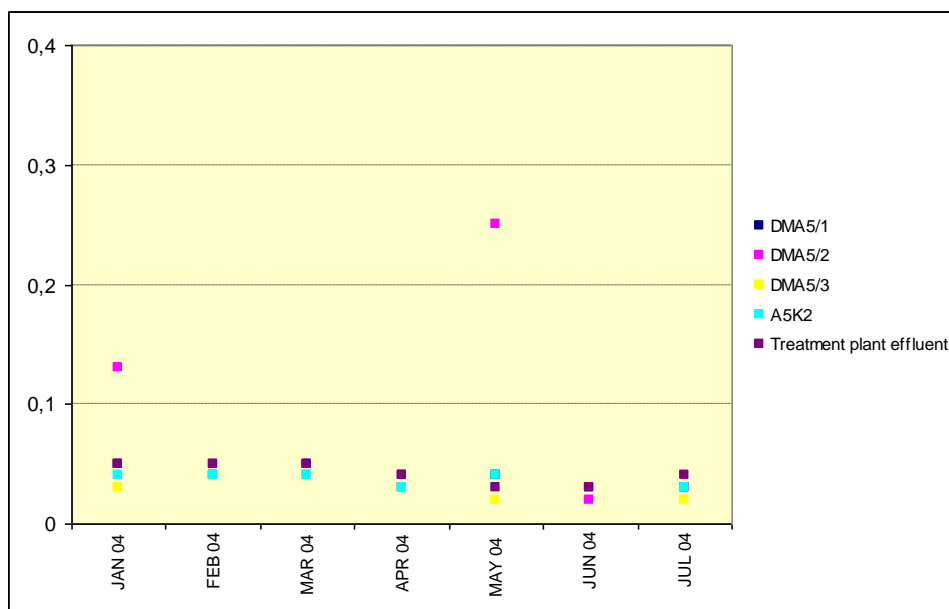
Figure 7. The variation of aluminum parameter versus time.
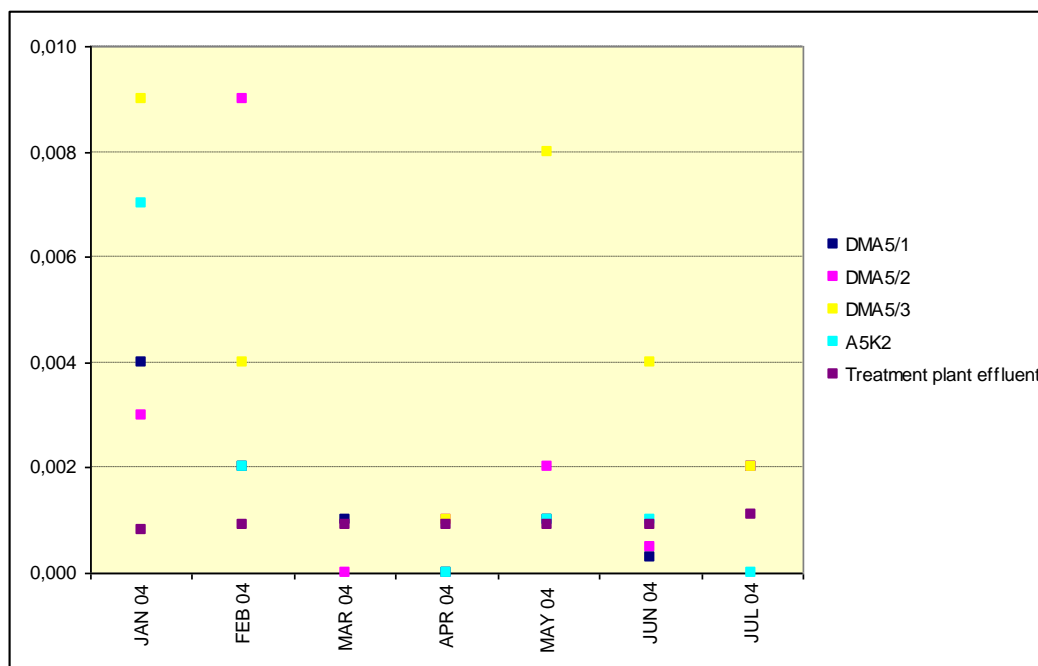
Figure 8. The variation of manganese parameter versus time.
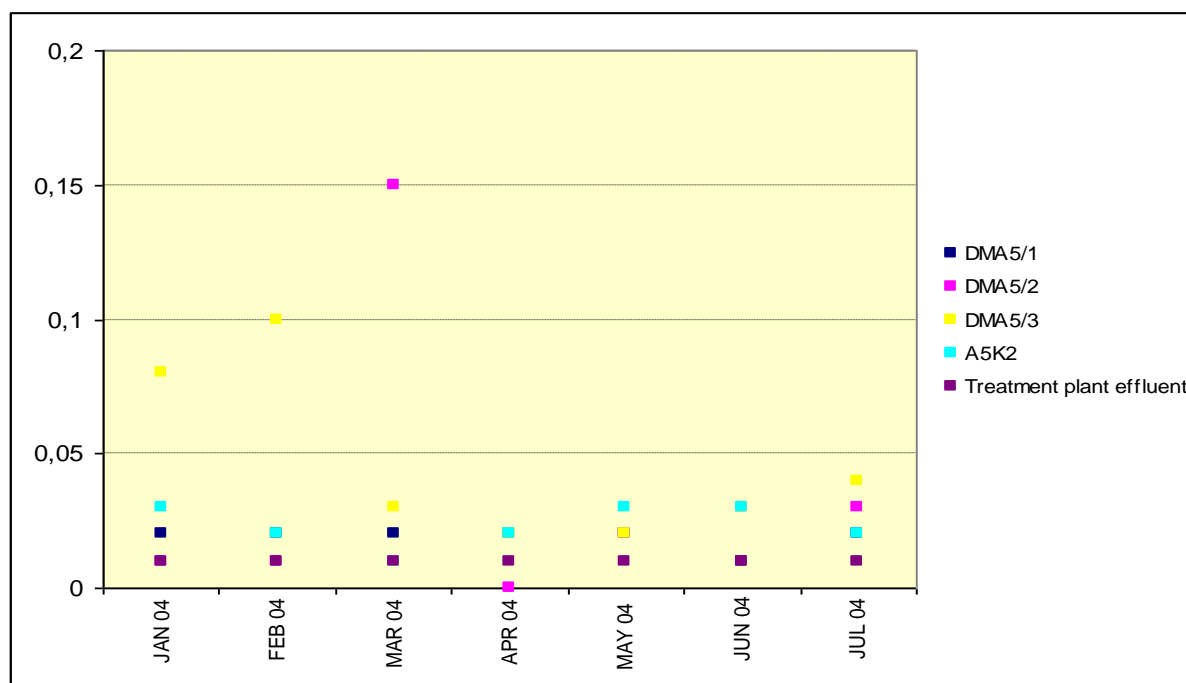
Figure 9. The variation of iron parameter versus time.
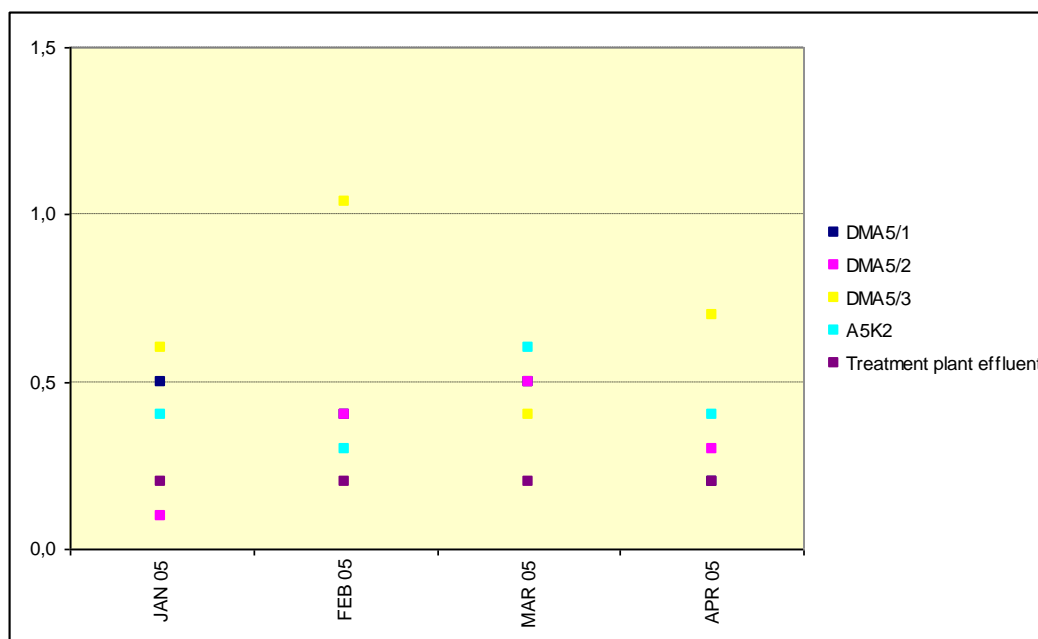
Figure 10. The variation of turbidity parameter versus time.

Changes of water quality parameters are evaluated with the reference values of treatment plant effluent (Table 2).

16-month mean values ranged as: pH 7,56-8,38, hardness 99,4-136 mg $CaCO_3/L$, free chlorine concentration 0,2-0,58 mg/L and total coliform 0,0-0,0. Turbidity parameter was 0.14-1.04 NTU according to the 4-month mean values. According to the Table 2, the quality of drinking water in the distribution system of Izmit has not been significantly different from the treated water. In one of the sample, the turbidity and aluminum parameters were slightly above the limit values. Aluminum has a low toxicity profile and it may cause color when its concentration exceed 0,1 mg/L in water. Hence, USEPA considered aluminum in the National Secondary Drinking Water Regulations (2002). High levels of manganese and iron cause the growth of ferrous bacteria and color problems in the water distribution system. Thus, obstruction and contraction of the water pipelines may ensue, but we could not identify that problem in our study. Coliform parameter was above the limit of "Regulation of Water Intended for Human Consumption" (1 MPN/100 mL) in one of the sample (DMA 5/2, March 2005) either due to microbial contamination from the soil or laboratory contamination. Tokmak et al. [7] investigated THMs and associated potential cancer risks in the water supply in Ankara and proved the existence of high levels of chloroform.

Conclusions

In our study, we could not observed a significant difference in the water quality at the 14 km of pipeline of İzmit. İzmit drinking water is potable according to the water quality parameters. This study may spread to the whole Kocaeli and more water quality parameters (lead, cadmium, THM) may be enrolled. Especially, erosion of the old cement pipelines having asbestos has to be taken into consideration. THM parameter should be included in the routine analysis parameters. Also, THM presence and levels should be determined due to chlorination of drinking water of Kocaeli.

Parameters	DMA5/1			DMA5/2			DMA5/3			A5K2			Effluent values of treatment plant (*)	
	#Samples	Range	Average	#Samples	Range	Average	#Samples	Range	Average	#Samples	Range	Average	Range	Average
pH	66	7.00-8.77	7.86	34	7,60-8,42	7,81	41	7,52-8,51	7,88	33	7,56-8,38	7,93	7,54-8,06	7,79
Turbidity, NTU	15	0,16-0,88	0,42	9	0,14-0,81	0,40	9	0,22-1,16	0,59	8	0,29-0,87	0,48	0,10-0,29	0,20
Hardness, mg CaCO₃/L	62	98-132	111	32	95-136	112	34	96-135	110	29	94-132	110	96-100	99
Aluminum, mg/L	32	0,017-0,062	0,038	15	0,017-0,47	0,09	16	0,019-0,047	0,03	13	0,019-0,049	0,035	0,027-0,048	0,038
Manganese, mg/L	25	0,00-0,007	0,002	14	0,0-0,017	0,003	15	0,000-0,015	0,005	11	0,000-0,007	0,0015	0,0-0,002	0,001
Iron, mg/L	38	0,00-0,07	0,017	17	0,00-0,41	0,04	20	0,00-0,24	0,05	16	0,00-0,05	0,018	0,00-0,01	0,008
F. Chlorine, mg/L	64	0,2-0,8	0,47	34	0,2-0,7	0,45	39	0,0-0,4	0,3	32	0,3-0,6	0,44	0,44-0,66	0,52
Nitrite, mg/L	62	0,007-0,032	0,017	32	0,005-0,033	0,016	37	0,005-0,056	0,018	29	0,00-0,033	0,016	0,013-0,017	0,015
T. Coliform Bacteria, MPN/100mL	66	0,0-0,0	0	34	0,0-1,0	0,03	41	0,0-0,0	0	33	0,0-0,0	0	0-0	0

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TRENDS AND CURRENT LEVELS OF ORGANOCHLORINE POLLUTANTS IN HUMANS AND ENVIRONMENT IN TURKEY

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During the twentieth century, production and use of toxic chemicals has increased rapidly thousands of chemicals have been introduced into the environment. Among them, Persistent Organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs) are the more important groups of Persistent Organic Pollutants (POPs) and many of these compounds have been or continue to be used in large quantities and, due to their environmental persistence, have the ability to bioaccumulate and biomagnify. Exposure to these chemicals, either acute or chronic, can be associated with a wide range of adverse health effects such as body weight loss, thymic atropy, chloracne, impairment of immune responses, carcinogenesis and adverse reproductive effects to wildlife as well as laboratory animals. OCPs were produced in large number in the 1940-1950s and global production increased year by year. In Turkey, OCPs have been started to used against to pests in 1945, large quantities of these chemicals were used during 1960s and 1970s, and since 1983 usage of these chemicals, excluding Endosulfan, have been severely restricted. OCP residues have been monitored in the Turkish population by carrying out regional surveys at given time intervals since 1976 in Turkey . PCBs were first manufactured commercially in 1929 and concern about the presence of PCBs in environment began in the 1960s. Because of the bioaccumulation and toxicity, usage of these chemicals for different purposes has been restricted or banned in most countries, since the beginning of the 1970's. PCBs are restricted for use in closed systems and banned after 1996 in Turkey. There are very limited data of PCB contamination levels both in humans and environment in Turkey The presenting study aims to determine the changes of OCP levels from 1970s to present and current levels of PCBs in humans and environment in Turkey. The results have been discussed in terms of regions and OCPs and PCBs in which analyses had been made.

INTRODUCTION
"The Stockholm Convention on Persistent Organic Pollutants (POPs) was adopted by 125 countries including Turkey, on 22 and 23 May 2001. The convention addresses the production, use, import, release of by-products, stockpile management and disposal of an initial 12 POPs, the so called "Dirty Dozen". POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. Some of the organochlorine Pesticides (OCPs), Polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and polychlorinated biphenyles (PCBs) are the 12 UNEP internationally recognized POPs. Exposure to these chemicals, either acute or chronic, can be associated with a wide range of adverse health effects such as body weight loss, thymic atropy, chloracne, impairment of immune responses, carcinogenesis and adverse reproductive effects to wildlife as well as laboratory animals.

OCPs were produced in large number in the 1940-1950s and global production increased year by year. In Turkey, OCPs have been started to used against to pests in 1945, large quantities of these chemicals were used during 1960s and 1970s, and since 1983 usage of these chemicals, excluding Endosulfan, have been severely restricted. OCP residues have been monitored in the Turkish population by carrying out regional surveys at given time intervals since 1976 in Turkey. PCBs were first manufactured commercially in 1929 and concern about the presence of PCBs in environment began in the 1960s. Because of the bioaccumulation and toxicity, usage of these chemicals for different purposes has been restricted or banned in most countries, since the beginning of the 1970's. PCBs are restricted for use in closed systems and banned after 1996 in Turkey. There are very limited data of PCB contamination levels both in humans and environment in Turkey. The presenting study aims to determine the changes of OCP levels from past to present and current levels of PCBs in humans and environment in Turkey. The results have been discussed in terms of regions and OCPs and PCBs in which analyses had been made. Also first results about PCDD and PCDF levels from human are presented. Results obtained from humans and environment are evaluated as graphs in the present study.

RESULTS
OCP levels in Human Adipose Tissue

	1976-1977 (Ankara)	1984-1985 (Ankara)	1991-1992 (Ankara)	1991996 (Manisa)	2005 (Ankara/Kontrol)
α-BHC	0	0,19	0,16	0,1	0,51
β-BHC	0	1,52	1,52	0,37	2,13
γ-BHC	4,2	0	0,017	0,043	0
HCB	0	0	0,16	0,033	0,99
H.E	0	0	0,062	0,121	0
p-p' DDE	10,2	5,83	3,72	1,83	4,72
p-p' DDT	3,2	0,62	0,27	0,09	0,71
ΣDDT	14,6	7,12	4,42	2,13	5,56
DDE/DDT	3,19	9,4	13,53	20,81	6,65

2017

Time Trend for Concentrations of BHCs, DDT and Ratio of DDE/DDT in Turkish Human Adipose Tissue Samples Between 1983 and 2003.

OCP levels in Human Breast Milk

	1983 (sivas)	1984-1985 (Ankara)	1985 (Adana)	1985 (Kocaeli)	1988 (Diyarbakır)	1989 (Kayseri)	1995-1996 (Van)	1995-1996 (Manisa)	2002 (Ankara)	2003 (K,maraş)	2003 (Afyon)
n	18	61	52	50	30	51	41	63	101	37	80
α-BHC	0,26	0,135	0,037	0,026	0,545	0,096	0,05	0,067	0,05	0	0,027
β-BHC	0,9	1,3	1,65	0,66	1,41	0,522	0,417	0,355	0,49	0,149	0,285
γ-BHC	0,3	0,022	0,037	0,12	0,43	0,156	0,016	0,017	0,01	0,003	0,014
HCB	0,08	0	0	0	0,349	0,084	0,058	0,044	0,15	0,02	0,073
H,E	0	0	0	0	0	0,011	0,078	0,069	0,06	0	0,061
p-p' DDE	0	3,28	1,57	3,37	4,09	2,39	2,26	1,851	2,28	1,522	2,1
p-p' DDT	0	0,73	9,69	0,45	0,42	0,41	0,14	0,07	0,13	0,065	0,065
ΣDDT	13,97	4,39	12,37	4,19	5,12	3,16	2,67	2,15	2,66	1,595	2,56
ΣBHC	0	1,45	1,73	0,81	1,71	0,775	0,483	0,441	0,55	0,151	0,34
DDE/DDT	0	4,5	6,17	7,49	9,74	5,83	14,74	17,45	17,67	0	19,09

2019

Time Trend for Concentrations of BHCs, DDT and Ratio of DDE/DDT in Turkish Human Milk Samples Between 1983 and 2003.
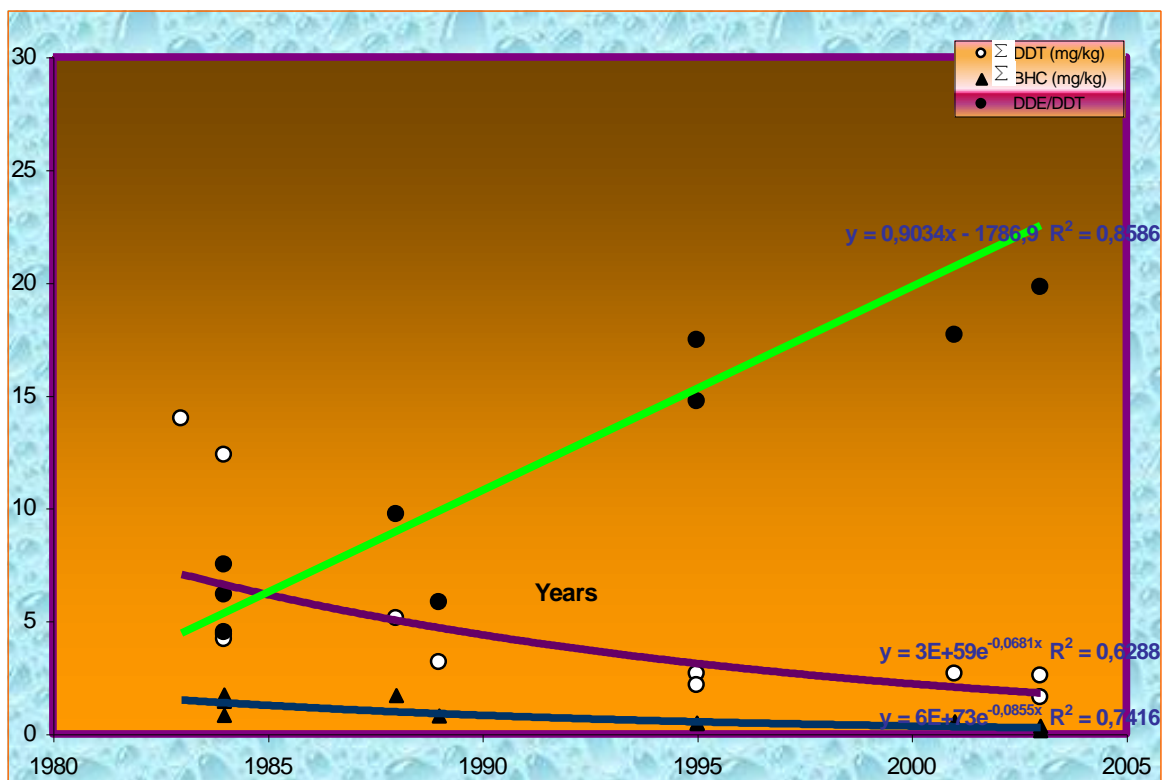
PCB levels in Human Adipose Tissue and Breast Milk

	1999-2000 (milk)	1999-2000 (adipose tissue)	2005 (adipose tissue)	2005 (adipose tissue inf.)
28	5,7	5	23,14	16,48
52	10,3	11,4	24,16	72,14
101	6,6	10,4	49,1	57,9
118	18,9	40,7	68,56	21,74
138	54,3	82,3	68,31	64,59
153	110	141,7	58,23	55,24
180	59,8	91,8	23,5	94,12
∑ PCB	265,6	383,3	351,01	382,23
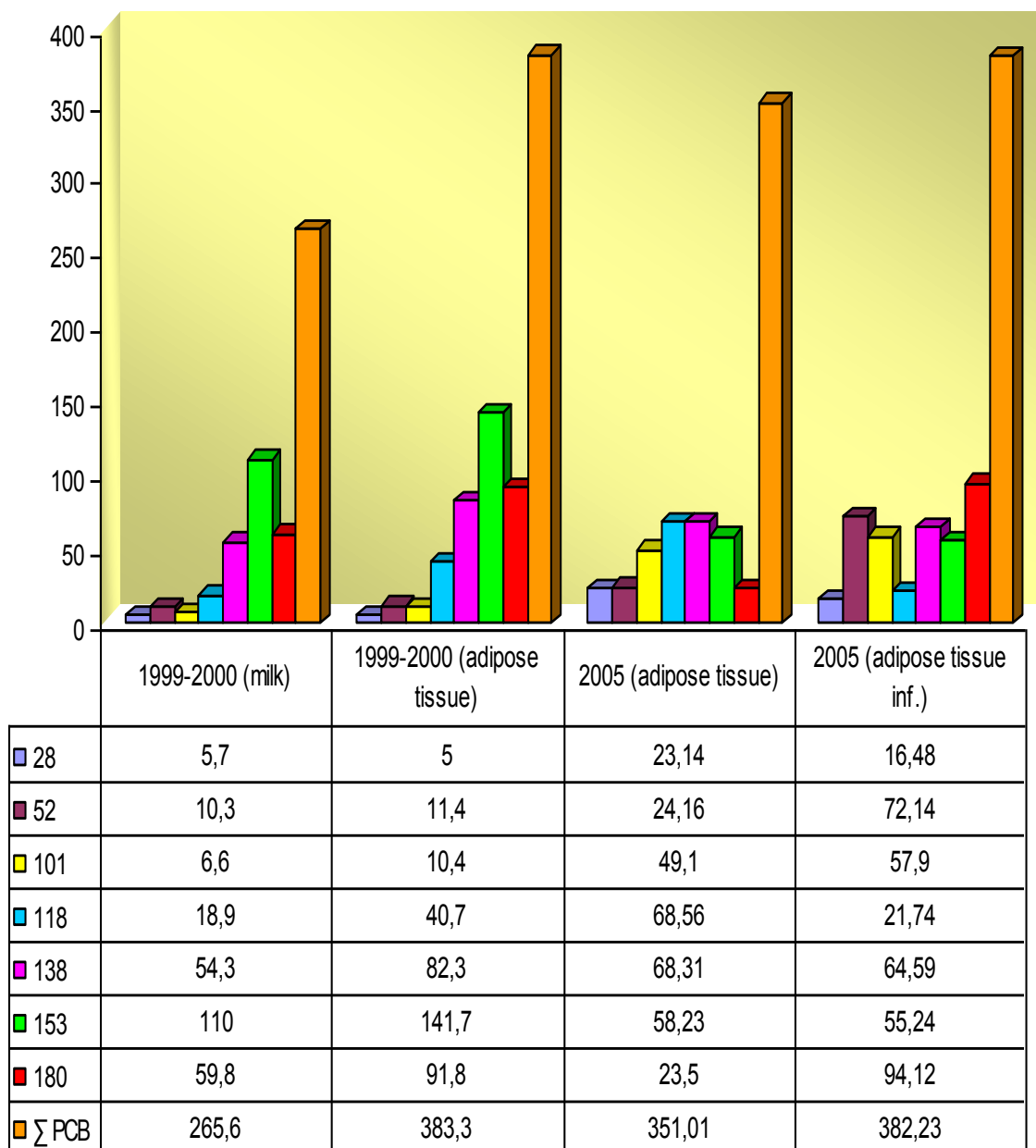
Congener levels of PCDDs and PCDFs in adipose tissue from men[6]
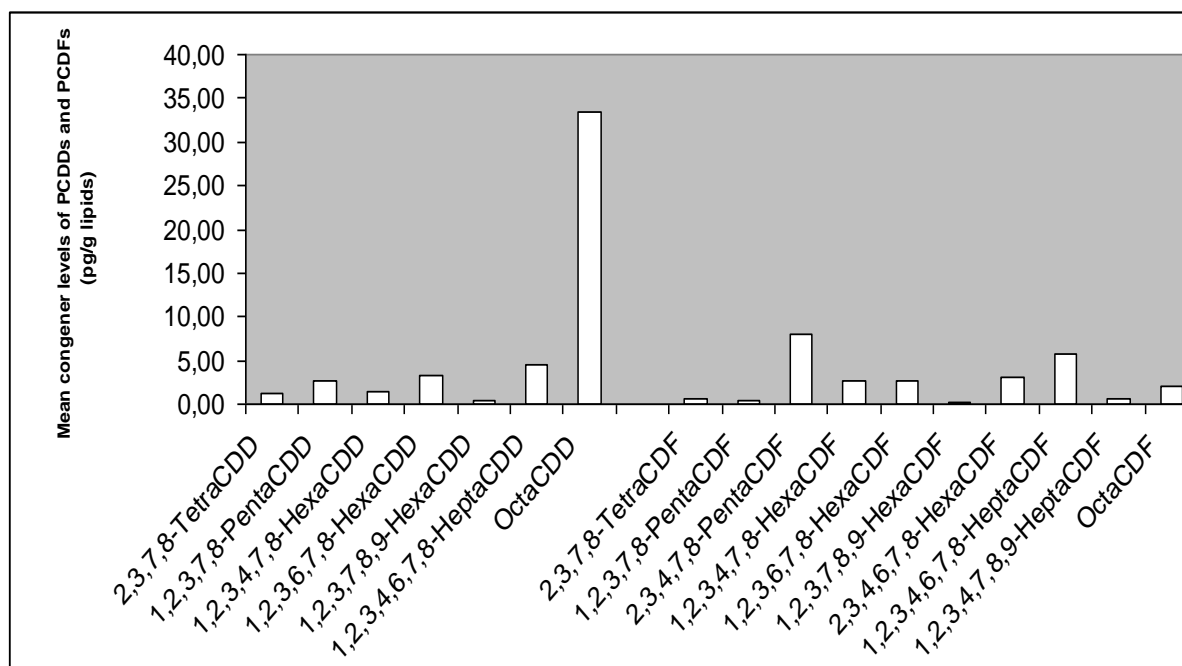
OCP levels in Surface Water

μg/ml

	Göksu	Sakarya	Tuz	Hirfanli	Eşmekaya	Tersakan	Bolluk	Kulu	Kozanli	Samsam	Çöl	Uyuz	Allbey	Terkos	B.çekmece
Alpha-BHC	0,058	0,226	0,525	0	0,345	0	0,246	0	0	0	0	0	0,662	0,908	0,679
Beta-BHC	0,006	0,298	0	0,229	0	0	0	0	0	0	0	0	0	0	0
Lindan	0,007	0,183	0,02	0	0	0	0	0	0	0	0	0	0	0	0,067
Aldrin	0,049	0,239	0	0,123	0	0	0	0	0,325	0	0	0	0	0	0
Dieldrin	0,036	1,346	0,562	0	0,398	0,36	0,011	0,751	0,392	0	0	0,216	0	0	0
Endrin	0,021	2,738	0,188	0	0	0	0	0,285	0,037	0	0,067	0,349	0	0	0
Heptachlor	0,015	2,555	0	0	0	0	0	0	0	0	0	0	0	0	0
Heptachlor epoxide	0,019	0,441	0,25	0	0	0	0,026	0	0,758	0	0	0	0	0	0
o,p'-DDT	0,05	1,013	0	0	0,284	0	0,026	0	0	0	0	0,324	0	0	0
p,p'-DDT	0,024	1,879	0,831	0,098	0,633	0,226	0,08	0,303	1,039	0	0,254	0,53	0	0	0
o,p'-DDE	0,046	1,765	1,236	0,793	0,391	0,193	0	0,08	0,75	0,154	0	0,289	0	0	0
p,p'-DDD	0,057	1,676	0,682	0,132	0,273	0,29	0	0	0	0,587	0	0,195	0	0	0
p,p'-DDE	0,025	0,825	0,283	0,212	0,881	0,265	0	0	0	0	0	0,519	0	0	0

OCP levels in Sediments

Compound	Gök su/19	Tuz	Hirfanlı	Eşmekaya	Tersakan	Bolluk	Kulu
Alpha-BHC	0,687	0,797	0	1,246	0,634	1,386	0,224
Beta-BHC	0,063	1,674	2,328	1,678	1,476	1,968	0,341
Lindan	0,164	1,79	0	2,586	1,642	0	0
Aldrin	0,79	0,524	2,218	2,298	0	1,459	0
Dieldrin	0,044	0,71	0	0	0	0	0
Endrin	0,033	0,64	0,09	0,451	0,366	0	0,864
Heptachlor	1,377	0	0	0,215	1,031	0	0
Heptachlor epoxide	0,244	1,144	1,385	0,617	0,961	0,95	0
o,p'-DDT	0,041	2,224	0	0,251	0	0	0
p,p'-DDT	0,553	1,307	0,254	0,55	0,37	0,384	0,826
o,p'-DDE	0,22	0,527	1,389	0	0	0,07	1,15
p,p'-DDD	0,195	0,969	0,296	0,47	0,152	0,037	0,147
p,p'-DDE	0,579	1,421	0,677	0,11	0	0	0,282

OCP levels in Different Fish Species

RESULTS & CONCLUSION

Over the past few decades, levels of the organochlorine compounds have declined in breast milk, adipose tissue, in countries where these chemicals have been banned or otherwise regulated. The results of this study seem to support this inclination in Turkey. HCB is the most striking one among OCPs that have been analyzed in human milk and adipose tissue. The values trend to be consistent over the years that have been expected to decrease. Experimental and epidemioligical studies show that DDE/DDT ratio increases with time after exposure or after the limitation or restriction of DDT usage. In the last study which held with human milk from Afyon city in 2003, DDE/DDT ratio has been found as 19.09 underlining the continous downward trend in mean concentration since the first study in 1984-85 (DDE/DDT = 4.5) ($p<0.001$). When we consider DDE/DDT ratios, it is seen that limitation and legislation for OCPs in Turkey has been effective and exposure to these compounds trends to decrease in time.

We have presented OCPs levels in different compartments such as water, sediment and some fish samples from different studies. Addition to presented studies there are very limited data about OCP contamination levels obtained from wild life such as bird and bird eggs. As an example in coots, different OC residues were detected in liver, adipose tissue and eggs, by Ayas and coworkers.[11] (mean concentrations ranging from 0.075 ppm o,p'-DDT in eggs to 2.147 ppm beta-BHC in adipose tissues).

PCBs are restricted for use in closed systems and banned after 1996 in Turkey. There are very few data about PCB contaminations from different environment compartments in Turkey. Indicator PCBs (UIPAC $\neq$ 28, 62, 101, 118,138, 163 and 180) have been detected in human milk and adipose tissue. On the other hand Telli-Karakoç and coworkers have measured dioxin-like PCBs in sea water samples and mussels from different area of İzmit Bay. The dominant congeners of PCBs have been found from tetra to hexachlorobiphenyls.[19] Also PCB concentrations in fish muscle and liver samples have been determined by Erdogrul and coworkers in Sir Dam Lake. They have found that median levels of sum PCBs in kalaspha, carp, nose-carp and wels muscle samples were 3, 0.94, 0.39, 3.4 ng/g, respectively. According the results of this study, obtained PCB levels have been found as much lower than reported studies for similar species from other worldwide locations.[20]

Although there were no available data regarding levels of PCDDs/Fs from compartments such as soil and water, the only data obtained from humans showed almost similar levels with those obtained from industrialized countries [6] (PCDD/F concentrations ranged between 3.2 and 19,7 pg WHO-TEQ/g fat -5.34 and 42.7 WHO-TEQ/g fat, respectively, including dioxin-like PCBs-. The mean concentrations of $WHO_{PCDD/F}$-TEQ and WHO_{PCB}-TEQ were 9.2 and 6.67 pg/g on a lipid basis, respectively)

The presence and persistence of POPs worldwide are still problems of great relevance to public health. Further research needs to be conducted in highly industrialized and polluted areas in Turkey and should focus on the toxicological implications (for instance, the effects on fertility) on humans and wild life.

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FATTY ACID COMPONENTS and ANTIMICROBIAL ACTIVITY of SEEDS of *Acanthus hirsutus* Boiss.

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ABSTRACT - Methylated methyl esters of hexane extract of *Acanthus hirsutus* Boiss. (Acanthaceae) seeds were chemically and microbiologically analysed. Fatty acids methyl esters and their percentages were detected as 0.16 % myristic, , 16.20 % lauric, 12.09 % palmitic, 12.99 % linoleic, 53.02 % oleic, 2.20 % stearic and 0.45 % eicosanoic acid methyl esters, addition to 1.41 % ionol, 0.30 % cyclohexadecane, 0.36 % stearyl alcohol and 0.25 % palmitic acid by CG-Mass comparing with Nist and Wiley library data. MIC results examined using different types of microorganisms against to Gentamicin.

Keywords: *Acanthus hirsutus* Boiss, GC-Mass, fatty acids methyl esters, MIC, antimicrobial activity

INTRODUCTION

The Acanthaceae is a large flowering plant family that comprises *c* 230–350 genera, with between 2500 and 4300 species (Meyer and Lavergne, 2004). *Acanthus* L. is one of the member of this family which is an Old World genus of about 30 species; most species occur in Africa but a few ranges into southern Europe and one extends through south Asia and Malesia to Australasia (Kanchanapoom *et. al.*, 2006). *Acanthus* leaves have a long history of use as a decorative motif in architecture of the Mediterranean countries. So, they are economically important in these areas (Bhattacharyya and Johri, 1998). In Turkey 8 species, 6 of them endemic, are distributed in Tekirdağ, Ankara, Tokat, Sivas, Çanakkale, Kütahya, Konya, Kırşehir, Malatya, Muğla, Isparta, İçel, Adana (Hossain, 1983). *Acanthus hirsutus* Boiss. (Figure 1) is one of the endemic species of this genus and it is generally called as "Ayıpençesi" (Zeybek and Zeybek, 2002). Some *Acanthus* species have been widely used as folk medicine in different countries as a purgative and an antiinflamatory tonic pills for longevity, skin deseases, hepatosplenomegaly, hepatitis, lymphoma, asthma for many years (*A. ebracteatus* Vahl. and *A. ilicifolius* L.) (Phisalaphong and Thu Ha, 2006; Hokputsa *et. al.*, 2004; Kanchanapoom *et. al.*, 2001b).

According to literature, some species have antioxidant, antimicrobial, antifeedant, analgesic, anticarcinogenic and antitumour activities (Babu *et. al.*, 2001; Babu *et. al.*, 2002; Adeyemi *et. al.*, 2004; Bravo *et. al.*, 2004). The chemical constituents of this genus had generally been reported as triterpenoid, benzoxazonone, acanthicifoline, benzoxazinoid, phenylethanoid, lignan, flavonoid and aliphatic alcohol glycosides (Wu *et. al.*, 2004. Wu *et. al.*, 2003; Huo *et. al.*, 2005a; Huo *et. al.*, 2005b; Wolf, 1985; Kanchanapoom *et. al.*, 2001a ; Wu *et. al.*, 2003) GC-Mass studies on this genus were rarely existed on some species (Goswami *et. al.*, 2004).

In this study, the methylated methyl esters of hexane extract of *A. hirsutus*'s seeds (Figure 2) were chemically (by GC-Mass) and microbiologically (by MIC) studied for the first time. The following fatty acids' methyl esters and their percentages were detected as 0.16 % myristic, 16.20 % lauric, 12.09 % palmitic, 12.99 % linoleic, 53.02 % oleic, 2.20 % stearic and 0.45 % eicosanoic acid methyl esters, addition to 1.41 % ionol, 0.30 % cyclohexadecane, 0.36 % stearyl alcohol and 0.25 % palmitic acid by CG-Mass comparing with Nist and Wiley library data. MIC results examined using different types of microorganisms against to standart antibiotic.

MATERIALS and METHODS

Plant Material: Plant material and seeds of it was collected east of Anatolia about 1000 m. height around Demirci, Manisa, Turkey in June and July 2006, respectively. Voucher specimens were botanically established according to Hossain (1983) and it was deposited in the Herbarium Research and Application Center of Ege University with a number EGE 40735.

Extraction: Dried and powdered plant seeds were extracted with hexane using a soxhlet apparatus (70^0C, 6 h.) to remove the fatty acids and apolar components. During extraction procedures Merck Hexane (%95, No. 1.04368) was used. Then the extracts were concentrated by rotary evaporator under vacuum at 40 ^{0}C.

Methylation of Hexane Extract: After removing hexane, the oily mixture was derived to their methyl esters by International Olive Oil Council (IOOC) and IUPAC reports using trans esterification prosess. In this process, dried hexane extract was dissolved in hexane and extracted with 2M methanolic KOH at the room temperature for 30 seconds. The upper phase was analysed by GC-Mass spectrometer (David *et. al.*, 2003). GC and GC-Mass peaks were examined by comparing with the means of mass peaks and the retention times of metylated standard mixture of fatty acids library data.

Analysis Programme: Methyl esters of fatty acids analysis were carried out using GC-6890 Agilent, MSD-5973 Mert Agilent with HP-5 MS apolar column (0,25 mm x 30 m x 0,25 μm), max. column temp. 350˚C, flow of Helium;1,3 mL/min.. Oven temp.was 70˚C (2 min waiting), rising 25˚C/min to 150˚C, 150-200˚C (3˚C/min waiting), 200-210˚C (1˚C/min waiting), 210-290˚C (5˚C/min waiting).

Antimicrobial Analysis: The antibacterial activity of the *Acanthus hirsutus* was evaluated using the minimum inhibitory concentration (MIC) measurements. The MIC values were determined for the bacterial strains which were sensitive to *A. hirsutus* by microdilution assay according to procedures developed by the National Committee of Clinical Laboratory Standards (Atlas *et.al.,* 1995; NCCLS 2003).

In vitro antimicrobial studies were carried out against three gram negative (*Escherichia coli* ATCC 23999, *Pseudomonas aeroginosa* ATCC 27853 and *Salmonella typhimurium* CCM 5445) and five gram positive (*Staphylococcus aureus* ATCC 6538/P, *Staphylococcus epidermidis* ATCC 12228, *Enterobacter aerogenes* ATCC 13048, *Streptococcus faecalis* ATCC 8043 and *Bacillus subtilis* ATCC 6633) bacteria strains which were obtained from the Microbiology Department Culture Collection of Ege University, Faculty of Science. The bacteria strains were inoculated on Mueller-Hinton broth (Difco) and incubated for 24 h at $37° \pm 0.1$ °C. The inocula of the bacterial strains were prepared from 24 h broth cultures and suspensions were adjusted to 0.5 McFarland standard turbidity.

A series of test tubes containing from 0.5 to 40 mg/ml extract were prepared. The 96-well plates were prepared by dispensing into each well of broth and the inoculums (1×10^8 CFU/ ml). Extract prepared at the concentration of 40 mg/ml was added into the first wells. Then, their serial dilutions were transferred into consecutive wells. The last well containing Mueller-Hinton broth without compound and the inoculums on each strip was used as negative control. The plate was covered with a sterile plate sealer. The MIC was defined as the lowest concentration of the compounds to inhibit the growth of microorganisms. Gentamisin (Sigma) was used as positive control. The plates were incubated at 37 ºC for 24 h. The MIC was defined as the lowest concentration that showed clear against a blank background (no visible growth). All of the assays were performed in triplicate.

RESULTS AND DISCUSION

Compounds	Retention time	%	M+	Mass Spectral data
Ionol	9.17	1.41	220	205(100), 189(5), 177(6), 161(8), 145(15), 121(8), 115(8), 105(10), 91(12), 77(6), 69(8), 57(20)
Mrystic acid ME	13.46	0.16	242	213(4), 199(12), 185(10), 143(26), 88(75), 74(100), 55(30)
Lauric acid ME	18.05	16.20	214	194(14), 152(12), 123(10), 110(16), 96(34), 83(40), 69(62), 55(100)
Palmitic acid ME	18.65	12.09	270	239(5), 227(10), 185(4), 143(15), 129(6), 97(8), 87(60), 74(100), 55(30)
Cyclohexadecane	19.01	0.30	224	205(12), 193(14), 152(18), 97(44), 83(36), 69(100), 55(54),
Palmitic acid	19.57	0.25	256	213(28), 205(48), 170(24), 157(26), 129(25), 111(38), 97(58), 69(74), 55(100)
Linoleic Acid ME	23.34	12.99	294	263(8), 178(4), 164(6), 150(8), 123(12), 109(24), 95(52), 81(77), 67(100), 55(66)
Oleic Acid ME	23.59	53.02	296	264(20), 222(15), 180(10), 152(5), 123(15), 111(18), 97(40), 83(46), 69(64), 55(100)

Stearic Acid ME	24.47	2.20	298	267(4), 255(10), 199(8), 143(15), 129(6), 97(10), 87(68), 74(100), 65(4), 55(28)
Stearyl alcohol	24.73	0.36	270	205(34),172(40), 119(52), 106(42), 97(34), 91(62), 81(100), 67(88), 57(32), 51(48)
Eicosanoic acid ME	32.28	0.45	326	283(12), 241(8), 227(12), 207(15), 143(18), 128(12), 97(12), 87(58), 74(100), 55(38)

Every peak in Gas Chromatogram was examined on mass by comparing the means of mass peaks with the peaks of methyleted standart mixture of library (Wiley and Nist) data. Lauric, palmitic, linoleic, oleic, stearic acid methyl esters were observed with a higher amount than the other components. One of the most important components was eicosanoic acid methyl ester between last six components (Table 1). The MIC results of hexane extract of the plant seeds had weak antimicrobial activity against tested microorganisms (Table 2).

Table 1. Derivated hexane extract of *A. hirsutus* seeds

Table 2. Antimicrobial activity results of hexane extract of *A. hirsutus* seeds

Microorganisms	MIC (mg/ml)	Gentamisin MIC (µg/ml)
Staphylococcus aureus ATCC 6538/P	17.5	1.0
Staphylococcus epidermidis ATCC 12228	30.0	1.0
Salmonella typhimurium CCM 5445	30.0	1.0
Escherichia coli ATCC 29998	12.5	1.0
Bacillus subtilis ATCC 6633	12.5	4.0
Pseudomonas aeroginosa ATCC 27853	> 40	2.0
Streptococcus faecalis ATCC 8043	> 40	16.0
Enterobacter aerogenes ATCC 13048	30.0	2.0

It is known that fatty acids especially the unsaturated ones are important molecules. Some of them were not synthesized by human being. For that reason people must take them by a diet. In connecting with these sentences, linoleic and eicosanoic acids are belonging to this category. According to literature there is a clear correlation between the lowest intake of linoleic acid and the highest incidence of breast cancer for human being. It has an important role for reducing cholesterol level and the treatment of cardiovascular diseases. In connection with this knowledge Mediterranean diet, which is the well-known diet in the world by its reach unsaturated fatty acid content, takes an important place for preventing the coronary

events in a 70% and the deaths 80% (Huertas *et.al.*, 2003; Eynard *et.al.*, 2003; Kang and Leaf, 2000).

As a conclusion, because of its weakly antimicrobial active feature and essential fatty acids methyl esters contents similarity to the above knowledge, the hexane extract of *A. hirsutus* seeds will have a special importance in literature and in chemotaxonomic significance.

Figure 1. *Acanthus hirsutus* Boiss.
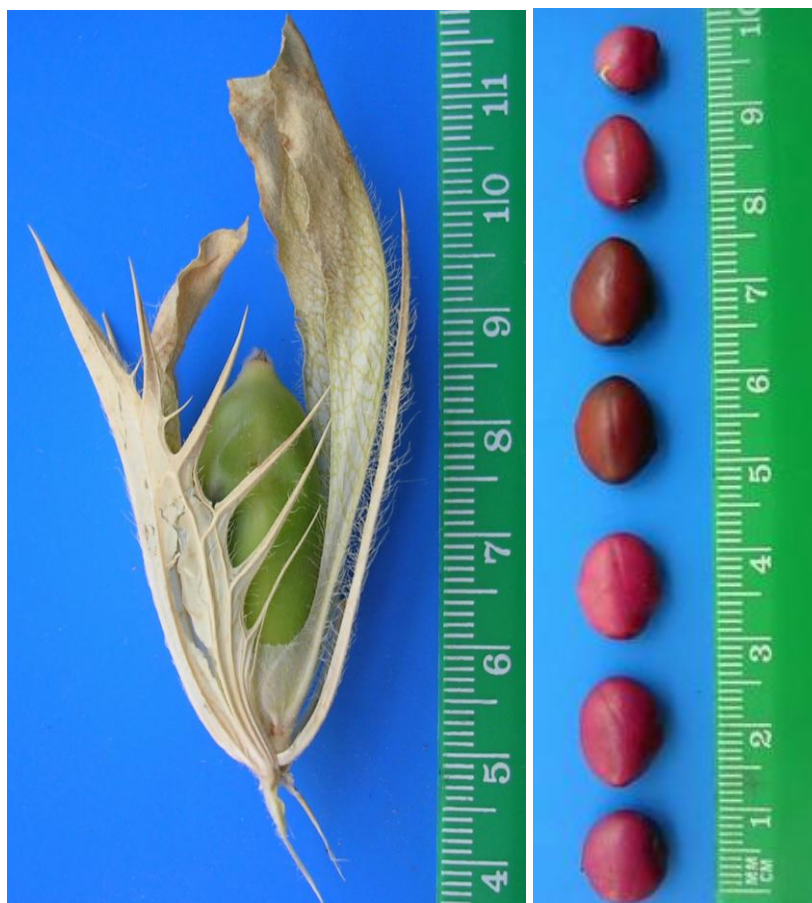
Figure 2. *Acanthus hirsutus* fruit and seeds

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MATERNAL CARE AMONG REPRODUCTIVE WOMEN IN SLUMS IN GREATER MUMBAI

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This paper examines utilization of antenatal and delivery care in the Mumbai slums on the basis of standard of living index constructed from household amenities, housing quality, sources of drinking water, electricity and toilet facilities. The study uses primary data, collected using cluster sampling of sample size of 433 reproductive women who have given at least one live birth prior to the survey, on frequency of antenatal check-ups, iron folic supplementation, receiving two doses of tetanus toxoid injection and skill of delivery attendant from the Rafi Nagar slum. The findings using logistic regression reveals unimaginable low level of maternal care among illiterate women in this slum. Besides that there is evidence of concentration of women without adequate maternal care amongst the poorest of economic stratum. The need for maternal care services is suggested for illiterate and low SLI category women.

Keywords: *Maternal care; Health seeking behavior; Utilization; Mumbai Slum.*

Introduction

The World Health Organization (1996a) estimated that 585000 maternal deaths occur globally every year, with the majority of this burden experienced in developing countries. Thaddeus and Maine (1994) suggested that 75 percent of these are due to direct obstetric causes and could be avoided with quality care at the appropriate time. Antenatal care provides a preventive service that monitors women during pregnancy, with the potential to identify obvious complications and risk factors at an early stage in pregnancy, to arrange for appropriate maternal and child health care and to reduce maternal morbidity and mortality if delivered effectively. However, the success that it has in achieving this aim is related to the quality of service that is provided, the number of visits that a women receives during pregnancy, the timing of those visits and the existence of and accessibility of professional delivery care when necessary (World Health Organization, 1996b). Promotion of maternal and child health has been one of the most important objective of the Family Welfare Programme in India. Antenatal care (ANC) refers to pregnancy-related health care provided by Doctors or a health worker in a medical facility or at home. The safe motherhood initiative proclaims that all pregnant women must receive a basic, professional antenatal care (Harrison, 1990). Ideally, antenatal care should monitor a pregnancy for signs of complications, detect and treat pre-existing and concurrent problems of pregnancy, and provide advice and counseling on preventive care, diet during pregnancy, delivery care, postnatal care and related issues. In 1996, safe motherhood and child health services were incorporated in to the Reproductive and Child Health (RCH) Programme by govt. of India. This program recommends that as part of antenatal care, women receive two doses of tetanus toxoid vaccine, adequate amounts of iron and folic acid tablets or syrup to prevent and treat anaemia, and at least three antenatal check-ups that include blood pressure checks and other procedures to detect pregnancy complications (Ministry of Health and Family Welfare, 1997; 1998b).

The accessibility of health services to the urban poor living in different cities of varying population sciences reveals that even slum people seek medical help from nearby private sources for minor ailments and for chronic, acute diseases, maternal and child health and family planning, they seek government services. It also gives an idea about how much health care accounts for the total expenditure at the household level in a month. The community development program implemented (Demet Gural, 1996) since nine years, in the big cities' slums, executed in three different cities of Turkey, namely Istanbul (in the west) and, Gaziantep and Kilis (in the southeast) as well as in Nakhcevan autonomous region of Azerbijan and Almaty city of Kazakstan where the migration rates are high shows that the women who receive their first information from the community workers continue to receive their services from the public health centers in their neighbourood or start seeking for more information and services.

There are various factors that influence the individual's health seeking behaviour towards their illness. The factors could be personal, environmental or social and in a way, reflect the health behavior utilization of people. Among women the morbidity and mortality due to reproductive tract infections/sexually transmitted infections are relatively very high compared to other health problems and many a time these are under reported. Similarly diarrhoeal diseases contribute significantly to childhood morbidity and mortality in urban slums because of the delay in seeking appropriate treatment.

Louise et al. (2005) have tried to assess the quality of maternal health services in urban India. The study was done in a slum area of Mumbai and data was collected from municipal and private hospitals. The various components in their framework were – Human and physical resources, Referral system, Maternity information system, use of appropriate technologies, Management of emergencies, Respect, dignity and equity and emotional support. All above components were measured in terms of certain percentages. Phanindra and Prakasam (1998) have tried to assess the quality of health care in rural Gujarat by using NFHS data. They have defined quality as utilization of services by different providers (Public and Private).

In general, women in slum remain unaware of their own reproductive health problems such as menstruation, sexuality, concept of menstrual hygiene and family planning methods. Further risk involved in repeated pregnancies and proper utilization of antenatal and postnatal care. Hence it is necessary to impart knowledge about these reproductive health problems. Women in the urban slums are unaware of the existing health facilities and even if available it has been adequately utilized.

Research study carried out in Delhi slums (Anita K. et al. 2003) revealed that the extent of utilization of health care services for RTIs/ STIs diseases found to be 32.9% among reproductive women and their health seeking behaviour found to be poor. Another study carried out in slums in Greater Mumbai (Yasudian 1990) revealed that most of the slum population was visiting private health facilities.

Study carried out in Dhaka slum (Rashid, 2004) regarding the reproductive health needs of married adolescent women reveals an insight into the situations in which adolescent women take decisions surrounding marriage, fertility, childbearing etc, within the socio-economic constraints that surround them and the larger structural conditions which govern their lives.

Research study to examine the effects of demographic and social factors on the positive trends in institution based use of antenatal and delivery care with medically trained professionals in Honduras and Guatemala from the late 1980's through the late 1990's was carried out (Stanton, 2004). The differential use of these maternal health services by urban/rural residence, parity, age, women's education, women's employment and Socio-economic status is similar across country and time period, and resembles patterns of use reported worldwide. The results show that all of these factors exert strong, unchanging and significant efforts on use of antenatal care.

Research reviews by Nag (1983), Srinivasan (2002), Duggal and Amin (1989), Mumiyandi (1997), Gandotra & Narayan Das (1983), Basu (1990) revealed that the studies have not focused on antenatal, post natal health awareness of women in slums in Greater Mumbai. Also, the limitations of this study were the variation in scope as well as coverage of important aspects such as the type of health sources availed, physical distance to the source, expenditure incurred for treatment etc.

Keeping in view of above research work an attempt is made to evolve a suitable strategy for knowing the health seeking behavior of the study women, utilization of antenatal and delivery care services and the health facilities available to women in the reproductive age group in slum area of Greater Mumbai, this study has been initiated.

Background of the study area

The state of Maharashtra situated in the western part of India, came in to existence on 1st May, 1960 with the merging of territories of Bombay state, Madhya Pradesh and Andhra Pradesh. It has a land area of 3, 07,713 sq. km. which is about one-tenth of the total land area of the country. As per the 2001 Census of India, the total population of the state is 96.8 million, which is 9.4 percent of the total population of India.

The city of Mumbai is originally a cluster of seven islands having an area of 603 sq. km. It has grown at a tremendous pace over the years. Between 1941 and 1961 the population grew 2.5 times and between 1961 and 1981 was of two times. Between 1981 and 2001 the population increased from 82 lacs to 120 lacs. Thus the overall population density of Greater Mumbai works out to be 19000 persons per sq. km. where Maharashtra's only 314. This high density of population coupled with dearth of housing has lead to the development of degrading slums.

Mumbai being the capital of Maharashtra and also the metropolitan city has many features to attract people, it generate job opportunities and then people finds the solution to stay where ever possible as per their earning capacity. It has organized industrial sectors, high literacy rate among workers, well planed transportation facility, good drinking water facility, and underground sewage system, basic education provided by Municipal corporation schools and even private schools and free education to girls is also provided by Govt. of Maharashtra, India. Many Anganwadies located in slums are imparting education to slum children and also to adults so called 'adult education'. Therefore on the large scale, the migration takes place from the most of the parts of India to Mumbai.

Fig-1: Arial view of study area: Slum in Mumbai.

According to Census of India 2001, about 49 percent of population of Mumbai lives in slums. About 28 percent and 21 percent of total population is male and female respectively who lives in slums. These slums household people have low income. These people consists even recent migrants who do odd jobs and cannot afford to pay any rent nor can they leave the city for fear of losing what ever source of income they have. Such people have occupied a space where ever they could find a place even in the face of stringent laws of encroachment. These slums have no basic health facilities like safe drinking water, toilets etc., in fact they have open drainage. They have strong impact of religion and culture and practices of doing early marriages.

According to 2001, Census of India, the slum sex ratio of Mumbai is 929 and slum literacy rate is 83.13 where as slum female literacy rate is 75.17 and slum male literacy rate is 89.08. This rate is above the national level.

The present study is an attempt to know, health seeking behavior of the study women towards maternal care to examine the safe motherhood practice of such women in the study area and to know the effects of Socio-economic conditions on the safe motherhood practice.

Materials and Methods

Measuring household standard of living
In the absence of data on income and consumption measures, household standard of living indices are often constructed using three set of information, namely source of drinking water, Toilet facility, type of house and ownership of selected consumer durables (Montgomery et al., 2000). Index scores for the present study ranges from 1-6 for a low SLI to 7-9 for a medium SLI and >=10 for a high SLI (Appendix). There are three other approaches in the construction of living of standard indices differing in the manner in which different household amenities, quality of housing materials, and assets are weighted.

Data
For the present investigation, two stage sampling procedure has been adopted. In the first stage, the slums in the Greater Mumbai according to their population size were listed using the "Directory of Slums" published by office of the additional collector (ENC), Mumbai & Mumbai Sub. Dist. (see ref.). Two lists were prepared, one for plain area slums and other for hilly area slums. From each list, one slum was selected at random. Hence one slum from plain area and another slum from the hilly area were obtained. plain area slum was Rafi Nagar slum located at Deonar and hilly area slum was Ramabai Nagar slum at Bhandup(w). The populations of these slums (study area) are 5500 and 3500 respectively.

In the second stage of sampling, from the selected two slum areas, using cluster sampling, two clusters were selected at random from each slum area. From these two clusters of Rafi Nagar slum area 433 households and from two clusters of Ramabai Nagar slum area 349 households were selected and then were interviewed using structured schedule. In all, this study covers 782 reproductive women in two slums representing slum population in Greater Mumbai. This survey was conducted from June to August, 2005.

The Rafi Nagar slum on plain area in Deonar is considered as the study area for the present study. This area come under M/East ward of Brihan Mumbai Municipal Corporation, situated near Govandi (west) railway station, a suburb in the eastern part of Mumbai.

The slum sex ratio of M/East ward is 785 where as the slum sex ratio of Mumbai is 929. The sex ratio of M/East ward is less compared with the sex ratio of Mumbai; it clearly indicates that there are migrants in this study area. The female literacy rate of this area is 67.49 compared to male literacy rate of 82.9. This ward spread over 34.38 sq. km. and has density of 13,730 (1991 Census) population per sq. km. respectively. Deonar is at the third rank position as far as population of slums in Mumbai is concern. In Deonar out of 6.72 lacs of population, 5.22 lacs of people stay in slum area (population density – 19,546 per sq. km.), according to Census of India, 2001, Maharashtra population data with data on slum population in urban units.

Fig-2: Environmental condition in study area.

In order to know health seeking behaviour and to measure the safe motherhood practice in terms of antenatal care, and post natal care, the children born to mothers during the last three years prior to survey were considered. Such numbers were 433.

Method of analysis
Logistic regression analysis was used to assess the effect of socio-economic determinant variables on safe motherhood practice controlling for other variables included in the model. For the logistic regression analysis purpose, the births born to mothers in the last three years prior to survey were considered.

Results and discussion
Antenatal care
Women not receiving antenatal check-ups tend to be disproportionately older women, women of high parity, women from scheduled Tribes, illiterate women and women from households with low standard of living. Antenatal care is essential for ensuring safe motherhood. During antenatal period, women are likely to face health problems of reproductive nature and there will be a package of measures available for expectant mothers, which ensures safe motherhood. The study women who have given birth during the last three years prior to survey in the study area were considered to analyze the differentials in pregnancy problems experienced by mothers and the extent of utilization of antenatal care services. Table no.1.2 indicates that the 83 percent of study women received at least one antenatal check-ups, only 52 percent received three or more antenatal check-ups and 76 percent have consumed any iron and Folic acid tablets or syrup where as 17 percent of study women did not go for antenatal check-ups.

Fig-3: Housing condition in the study area.

Reproductive Health problems during pregnancy
About 45 percent of the women in the study area reported that they had at least one problem during pregnancy. Table no 1.1 shows the problems during pregnancy reported by study women. The major antenatal problem reported were excessive fatigue 45 percent (NFHS-2: 49.1 percent), followed by white discharge 41 percent, pain in abdomen 39 percent, swelling of the legs 25 percent (NFHS-2: 35.9 percent), blurred vision 19 percent (NFHS-2: 12.1 percent), any vaginal bleeding 14 percent (NFHS-2: 3.5 percent), convulsion not from fever 13 percent (NFHS-2: 10.5 percent), night blindness 25 percent (NFHS-2 and RCH: 6.3 percent), and anemia 2.8 percent (NFHS-2: 16.1 percent). The percentage of these pregnancy problems remains almost same as compared to the problems specially shown as Mumbai slum data in NFHS-2 for Maharashtra state where survey was taken in 1998-99. This indicates that even after a long period of 7 years, the reproductive health condition of study women living in slum on hill remains poor, probably these women are not utilizing the medical facilities available in that area.

Components of antenatal care programmes and antenatal care advice

Data on various components of antenatal check-ups underwent by women in Table no 1.3 shows positive behavior pattern of women in utilizing antenatal care services in the study area, about 71 percent. Data on antenatal care advice in Table no 1.4 reveals that the proportion of pregnant women in the study area received proper advice on delivery care and new born care is just 55 percent followed by special diet, 53 percent and family planning is about 49 percent where as 11 percent of study women were alert about danger sign for pregnancy. Hence the study reveals good antenatal care seeking behaviour of women towards antenatal measurements but moderate towards antenatal advice.

Table 1.1 : Utilization of Antenatal care services showing problems during pregnancy in Rafi Nagar slum, Deonar, Mumbai.

Particulars	Total cases		Percentage of cases	
Problems during pregnancy:	**Yes**	**No**	**Yes**	**No**
Night blindness	106	327	24.5	75.5
Blurred vision	80	353	18.5	81.5
Convulsions Not from fever	57	376	13.2	86.8
Swelling of the legs,body or face	107	326	24.7	75.3
Excessive fatigue	196	237	45.3	54.7
Anaemia	12	421	2.8	97.2
Any vaginal bleeding	59	374	13.6	86.4
White discharge	179	254	41.3	58.7
Abdomen pain	169	264	39.0	61.0
Excessive bleeding	57	376	13.2	86.8
Excessive omitting	95	338	21.9	78.1
Number of Births	573		-	

Table 1.2 : Utilization of Antenatal care services showing Antenatal care indicators in Rafi Nagar slum, Deonar, Mumbai.

Antenatal care indicators:	Total cases	Percent of cases
Percentage that received at least one antenatal check-up	360	83.1
Percentage that received three or more antenatal check-up	226	52.2
Percentage given any iron and Folic acid tablets or syrup	331	76.4
Tablets received/purchased		
1-40	131	30.3
41-70	155	35.8
70+	45	10.4
Median number of check-ups(for those who received at least one antenatal check-up)	1	
No antenatal check-ups	73	16.9

Table 1.3 : Utilization of Antenatal care services showing components of Antenatal check-ups in Rafi Nagar slum, Deonar, Mumbai.

Components of Antenatal check-ups: Antenatal measurements / tests	Total cases		Percent of cases	
	Yes	No	Yes	No
Weight measured	265	95	61.2	21.9
Height measured	196	164	45.3	37.9
Blood pressure checkup	310	50	71.6	11.5
Blood test	338	22	78.1	5.1
Urine test	326	34	75.3	7.9
Abdomen Examined	308	52	71.1	12.0
X-Ray	79	281	18.2	64.9
Sonogram/Ultras	276	84	63.7	19.4
Any other test	79	281	18.2	64.9
Number of Births	573		-	

Table 1.4 : Utilization of Antenatal care services showing Antenatal advice in Rafi Nagar slum, Deonar, Mumbai.

Antenatal advice:	Total cases		Percent of cases	
	Yes	No	Yes	No
Special diet	231	129	53.3	29.8
Danger sign for pregnancy	46	314	10.6	72.5
Delivery care	240	120	55.4	27.7
New born care	237	123	54.7	28.4
Family planning	212	148	49.0	34.2
Use of any form of tobacco	128	232	29.6	53.6
Walking exercise	255	105	58.9	24.2
Number of births for which the mother received at least one antenatal checkup	573		-	

Socio-economic correlates

Table no. 2 shows the influence of the socio-economic characteristics of study women on the utilization of antenatal care services in the study area. It is clearly seen from the table that the utilization of antenatal care services increase with rise in the position of women with respect to each of the socio-economic factors. The utilization of antenatal care services decreases with rise in the birth order of children and decreases as mother's age increases where as it increases with improvement in the position of women with respect to education and shows moderate increase with respect to standard of living in medium and high category. The utilization of antenatal care services decreases in the case of Muslims category women with respect to Hindu women and in case of general category women with respect to SC, ST and Others category women.

Table No 2: Percentage Received Antenatal Care by Selected background
Characteristics in Rafi Nagar slum, Deonar, Mumbai.

Background characteristics	Received antenatal checkup		Number of Births
Mother's age	Yes	Percent	
15-24	131	86.2	199
25-29	115	81.6	193
30-49	114	81.4	181
Total			573
Birth order			
1	55	87.3	64
2	71	85.5	105
3	75	85.2	123
4+	159	79.9	281
Mother's education			
Illiterate	224	78.6	394
Literate, <middle school complete(1-6)	64	88.9	88
Middle school complete(7+)	72	94.7	91
Religion			
Hindu and Others	23	88.5	33
Muslims	337	82.8	540
Caste			
SC, ST and Others	35	85.4	52
General	325	82.9	521
Standard of living			
Low	131	86.2	206
Medium	149	81.0	242
High	80	82.5	125
Total	360		573

Multivariate Analysis

Logistic Regression
The above discussion gives an idea of the relationship between utilization of antenatal care services and the socio-economic predictor variables. However it does not control for the influence of other variables in the analysis and therefore is inadequate. Thus to see the effect of each of the socio-economic predictor variables independent of the other variables, the results of logistic regression are presented. Table No. 3 shows the odds ratios from logistic regression examining the effect of selected socio-economic variables on utilization of antenatal care services. The odds ratio indicates the effect of each of the socio-economic factors on the utilization of antenatal care services in the study area, controlling for other variables included in the model.

Fig-4: Lane in the study area.

The odds ratio increases consistently with improvement in the position of the study women in respect of mother's education. The odds ratio differed highly significantly by educational attainment. For example, the respondents who completed middle school (1-6) are 2 times more likely to utilize antenatal care services than those who are illiterates and also those who have completed Middle school and above (7+) are 5 times more likely to utilize antenatal care services than those who are illiterates. Thus with increasing levels of education, the likelihood of utilizing antenatal care services increases. The odds ratio in the case of Religion, Caste and standard of living category is not significant. Thus we can conclude that there is a strong impact of increase in the level of education on the utilization of antenatal care services in the Rafi Nagar slum area.

Table No. 3: Odds ratios from logistic regression examining the effect of selected Socio-economic variables on Utilization of prenatal care services in Rafi Nagar Slum, Deonar, Mumbai.

Socio-economic determinants	Sig.	Odds ratio
Religion		
Hindu and Others (Ref)		1.00
Muslims	.600	.692
Caste		
SC, ST and Others (Ref)		1.00
General	.817	1.129
Mother's education		
Illiterate (Ref)	.003	1.00
Literate, <middle school complete(1-6)	.052	* 2.187
Middle school complete(7+)	.003	*** 4.967
Standard of living		
Low (Ref)		1.00
Medium	.155	.645
High	.389	.730
Constant	.008	6.079

****P< .001,   ***P< 0.01,   **P< 0.05, *P< .1

Delivery Care Services

Reproductive and Child Health program (RCH) encourage deliveries under proper hygienic conditions and under the supervision of trained health professionals. NFHS-2 (National Family Health Survey – 2) shows that within Mumbai, slum women are more likely to use public health facilities for maternal health care services where as non slum women are more likely to use private health facilities for the same. According to the two NFHS surveys, the proportion of deliveries attended by a health professional increased from fifty three percent in NFHS-1 to sixty percent in NFHS-2. Babies with low birth weights (less than 2.5 k.g.) face substantially higher risk of dying than do babies with normal birth weights. In the questionnaire, the question to the study women, who have given birth during the last three years were asked, where she gave birth and who assisted during her delivery. Table no 4 shows that 35 percent of study women had deliveries at their home while rest of the deliveries i.e. 48 percent had at government hospital and 17 percent at private hospital. In accordance with delivery practice, about 65 percent of deliveries were conducted by doctors from government hospitals and private hospitals. Delivery characteristics reveal that height and weight of child born were not known to mothers. This is about 37 percent. It indicates that these deliveries are due to home delivery practice. Another question was asked whether women know, height and weight of the child was normal. About 8 percent of study women were unaware. Besides to these 5 percent of study women had caesarean. Hence delivery care among women in the Rafi Nagar slum area is very poor. Thus lack of antenatal care and delivery care for the women were the reasons for high infant mortality, maternal mortality and low life expectancy in this slum area.

Table 4: Percentage women Utilized Delivery Care Services in Rafi Nagar Slum, Deonar, Mumbai.

Particulars	Total cases		Percentage of cases	
Place of delivery (Health facility / Institution)				
Govt .H.P	209		48.3	
Pvt Hp	72		16.6	
Home	152		35.1	
Total	433		100.0	
Delivery Attendant				
Govt.hosp doctor	209		48.3	
pvt doctor	73		16.9	
NGO doctor	12		2.8	
Trained Dai	90		20.8	
Mother in law	11		2.5	
Neighbours	34		7.9	
other relatives	4		0.9	
Others	0		0	
Delivery Characteristics				
Caesarean	20		4.6	
weight and height of child was	**Yes**	**No**	**% Yes**	**% No**
taken	274	159	63.3	36.7
normal	238	36	55.0	8.3
Don't know:	-		-	

Table no 5 shows the relationship between delivery care and socio-economic characteristics of women. The institutional deliveries are highest among mothers of age 15-24 and lowest among the age 25-29, and increases as mothers age increases, about 66 percent. It indicates that these study women prefer to home delivery. Institutional births are stagnate related with order of births and is about 69 percent. Institutional deliveries increase sharply with education of women and the standard of living. About 34 percent of women from low category of standard of living are not availing delivery care services. Thus we can conclude that there is a concentration of women amongst the poorest of economic stratum who goes without adequate maternal care. The proportion of institutional deliveries is higher among Hindu and others than Muslims. Women from General category (non SC, ST and others) have slightly higher proportion of institutional births than the women from SC, ST and others. The proportion of institutional births shows no fixed pattern with the number of antenatal check-ups, in fact it decreases. Women who receive more antenatal check-ups are more likely than other women to deliver in medical institutions because their antenatal care providers advised them to do so. Women with pregnancy complications are more likely than other women to have antenatal check-ups and also deliver babies in medical institutions (Demet Gurel, 1996). The growing awareness of the benefits of medical care among the women may be the contributory factor (Ramanchandran et. al, 2004).

Table No. 5: Percentage Born in Institutions by Selected background Characteristics in Rafi Nagar Slum, Deonar, Mumbai.

Background characteristics	Percentage Born at Institutions		Number of Births
Mother's age	Yes	Percent	
15-24	111	73	199
25-29	78	55.3	193
30-49	92	65.7	181
Birth order			
1	43	68.3	64
2	58	69.9	105
3	59	67.0	123
4+	121	60.8	281
Mother's education			
Illiterate	170	59.6	394
Literate, <middle school complete(1-6)	52	72.2	88
Middle school complete(7+)	59	77.6	91
Religion			
Hindu and Others	19	73.1	33
Muslims	262	64.4	540
Caste			
SC, ST and Others	26	63.4	52
General	255	65.1	521
Standard of living			
Low	97	63.8	199
Medium	119	64.7	193
High	65	67.0	181
Number of Antenatal Check-ups			
0	73	16.9	97
1	54	84.4	87
2	51	72.9	91
3	58	72.5	102
4+	111	76.0	196
Total			**573**

Logistic Regression

The logistic regression results in Table no. 6 reveals that socio-economic background conditions have impact on the use of delivery care services. The odds ratio increases consistently with improvement in the position of the study women in respect of mother's education. The odds ratio differed highly significantly by educational attainment. For example, the respondents who completed middle school (1-6), are 1.75 times more likely to utilize delivery care services than those who are illiterates and those who have completed Middle school and above (7+) education are 2.28 times more likely to utilize delivery care services than those who had no schooling to utilize delivery care services. The odds ratio is not significant by standard of living, religion and caste categories with respect to utilization of delivery care services. Thus it reveals that the likelihood of utilizing delivery care services increase with the level of education in Rafi Nagar slum in Deonar.

Table No. 6: Odds ratios from logistic regression examining the effect of selected Socio-economic variables on Delivery Care in Rafi Nagar Slum, Deonar, Mumbai.

Socio-economic determinants	Sig.	Odds ratio
Religion		
Hindu and Others (Ref)		1.00
Muslims	.335	.606
Caste		
SC, ST and Others (Ref)		1.00
General	.443	1.357
Mother's education		
Illiterate (Ref)	.008	
Literate, <middle school complete(1-6)	.056	*1.745
Middle school complete(7+)	.006	***2.287
Standard of living		
Low		1.00
Medium	.993	.998
High	.563	1.177
Constant	.247	1.764

****P<.001   ***P<0.01 , **P<0.05

Conclusions and policy Implications:

This study finds that extent of utilization of services pertaining to antenatal and natal periods are very low among illiterate women, low category of standard of living women and SC-ST and Other women. The role of socio-economic factors in service utilization is clearly evident in study area. Logistic regression shows that the socio-economic background conditions have strong impact on the use of antenatal care and delivery care services. The odds ratio differed significantly by educational attainment and is very high with respect to antenatal care. The odds ratio is not significant by other religion, Caste and Standard of living category women with respect to utilization of antenatal care and delivery care services.

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This study also reveals good delivery care seeking behaviour of women towards antenatal measurements, about 71 percent but moderate towards antenatal advice, about 55 percent. Most of the problems during the pregnancy of study women remain same; in fact it has increased over the period of time since the last NFHS-2 (1998-99) was conducted. Thus reproductive health condition of study women living in slum remains poor. The women from low category of standard of living, SC and ST and other category women, percent of illiterate women and even Hindu and Muslims women are not availing delivery care services; clearly indicates that there is a concentration of women amongst the poorest of economic stratum who goes without adequate maternal care. Thus this paper suggests that the effective awareness campaign through urban health centers, committed community health workers, easy access to services, better health care delivery system, quality health care, follow-up care and awareness towards every stages of antenatal, natal, postnatal and child health care etc are needed for the betterment of reproductive health of women in such slums particularly to illiterate women.

APPENDIX
The standard of living is calculated by adding the following scores:
Type of House: 4 for *pucca*, 2 for semi-*pucca*, 0 for *kachha*;
Toilet facility: 4 for own flush, 2 for public, 1 for public pit or open, 0 for no facility;
Source of lighting: 2 for electricity, 1 for other, 0 for no facility;
Source of drinking water: 2 for pipe, hand pump, well, 1 for public tap, hand pump, well, 0 for other water sources;
Separate room for cooking: 1 for yes, 0 for no;
Ownership of house: 2 for yes, 0 for no;

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Fig. 1, Fig. 2, Fig. 3 and Fig. 4 are down loaded from internet.

THALASSEMIA IN NORTH CYPRUS
Relations with Malaria and the Results of
Thalassemia Preventation
Programme

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Cyprus, which is situated in the east Mediterranean sea and the midst of thalassemia zone, has allways a high incidence of hemoglobinopathies. Also, there are adequate information that Cyprus was malarious prior to 1878 the British occupation. Malaria had serious epidemies and high incidence during the years 1870-1950. Large numbers of population effected from the disease and this caused socioeconomical damage and poverty. Many people especially children died from malaria. The survivors of the illness, had large spleen, anemia and paracites in the red cells. After a succesful programe, malaria eredicated in the midst of twentieth century (M.Aziz 1947). In Cyprus, thalassemia was not known before the Alan Fawdry's reports (1944-46). He reported typical thal. major patients and during these studies it was observed that thalassemia carriers had a special resistance to malaria. As the world distrubation of major haemoglobinopathies coincides with the areas of malaria, many scientists thought that, there is relations with the occurance of genetic mutations in haemoglobinopathies with malaria .There is experimental and epidemiological evidence to support this view. Since 1944 new thalassemic babies were born and one in every 230 chidren under ten years old was found to be thalassemic.This caused another serious health problem. Unless any preventive measures had been taken, thalassemic patient's numbers would have been increased too much. In the Republic of Northern Cyprus, the fight against thalassemia was first brought to the agenda after the year 1974, and it was from the year 1978 onwards that a planned campaign against it was taken in place. In 1980 it became a legal obligation for all young couples to have a blood test for thalassemia and have a clear knowledge before they get married. Active training and enlightenment campaings were followed by screeing program, and from 1984 onwards prenatal diagnosis tecniques were introduced within the wider program directed at eleminating thalassemia. After the preventive measures and prenatal dignosis, the number of the thalassemic births decreased and furthermore during the last five years no affected baby was born. The existing thal. major patients are enjoying higher living conditions and qualities and also having higher life expectations because of the better treatment modalities.

Key words: *Haemoglobinopathie, malaria, thalassemia , genetic councelling, prenatal diagnosis*

Introduction

Since the second half of nineteenth century onwards there had been a large number of epidemics of malaria in Cyprus. Namık Kemal, the famous Turkish poet, who was sent to prison in Famagusta described the poverty and the bad condition of the city and also he mentioned that malaria was as deadly as the bullets, in a letter written to a friend of his in June 1873. From the excellent reports of M.Aziz, we understood that malaria epidemics continued from 1870's to 1947-48. The highest incidence of disease was in the years 1934-

37.When the eredication programe was started in 1946-48 the incidence of malaria had already decreased but even so in the Famagusta disrict 22 % of school children had palpable spleens and 39% had parasites in the periperal blood film, while in Paphos 58% of cases had palpable spleens and % 80 had parasites in the periperal blood. Plasmodium falciparum was responsible for 42-60% of the cases. Dr Alan Fawdry a district medical officer had reported the high incidence of Thalassemia in Cyprus in1944-46. He described the typical thalasemia major patients who could survive only three years, rarely eight years. According to the writer more than 400 thalassemia major cases seen in 7 years at the whole island, one per 1000 of the whole population and of one in 230 of children under ten. Apparantly there was little difference in incidence amongst the Greeks and Turks. A survey of incidence of thal. trait by the simplifed fragility test was carried out in Limasol district showed that, avarage 17% of the population were thal. trait. During this survey thick films were prepared for malaria paracytes and an opportunity was given for appraising any relationship between the presence of parasites and thal. trait. The 101 thal. trait children were found to be infected with malaria paracites (23%).This showed insignificant deviation from the 17 % of Thal. trait. according to the survey in whole 532 school children (Fawdry, 1946b).But as the world distrubition of major haemoglobinopathies coindices with that the malaria, many scientists think there is relations with malaria and haemoglobinopathies.There is conciderable epidemiological and experimental evidence to support this view.(Bruce-Chwatt,1980) (Harris 1970), and (Livinstone 1967)

Thalassaemia Prevention programme

As it was realised thalassaemia has high incidence and this would cause serious health problems after the malaria epidemies in Cyprus, serious scientific studies started after 1974 . In 1975 "Turkish Haematology Association" organised a seminar at Saray Hotel, where Prof. Muzaffer Aksoy, Prof. Dr. Ayhan Çavdar, Prof. Ayten Arcasoy, Prof. Dr. Çiğdem Altay and many more respectable haematologist were present to discuss about Thalassemia. In 1978, Dr. N.Yeşiladalı and the families of thalassemic children, formed the "Thalassemia Associatıon" to fight against the disease. Dr. Bernadette Modell was invited to Cyprus, to examine thalassemic patients and study the ways of controlling and treating thalassemia. Dr. Modell's report in 1979 concluded that thalassemia was a major health problem in Cyprus.

In Cyprus, 15% of the population x has been diagnosed as thalassemia carrier. 30% of spouses and 2% of married couples were found to be carriers. Furthermore, 2% of the marriages resulted with thalassemia.

It has been projected that if thalassemia were not prevented, the number of thalassemics in Cyprus would have increased untill 2000, in 50 years. This would have caused a serious social, economic and psychological problem. Therefore it was necessary to establish an effective "Thalassaemia Control Programme" in North Cyprus. Dr. A. Berkalp and Dr. Modell studied the "Prevention and Control Programme" with the local doctors. Prof. Aksoy and his friends visited Cyprus several times and gave their support to set up a "Thalassemia Center". As thalassemia was a genetic disease and possible to control, protective measures had to be taken and implement to stop thalassemic newborns. Also it was important to treat the remaining thalassemic patients with appropriate treatment modalities to provide them, longer and better life.

I- Preventive measures:
1- Education and social awareness programs for thalassemia.
2- Laboratory Screening for Thalassemia carriers and genetic counselling.
3- The establishment of a prenatal diagnosis laboratory.

1-Educational Studies On Social Awareness Education and social awareness programs for thalassemia

At the begining of the program, an intensive knowledge on thalassemia was given to the public by media, newspapers and brochures.
Conferences on thalassemia took place at schools, universities and military quarters to inform the youth about the risk of thalassemia. Gynaecologists were strongly advised to carry out thalassemia diagnostic tests for those pregnant women who had not taken the test before. Thus, created a form of social awareness towards thalassemia within the public.

2- Laboratory Screening For Thalassemia Carriers And Genetic Counselling

In 1980, all couples, by law, had to undergo a mandatory carrier screening test before marriage. Women who had not taken the diagnostic test and are pregnant and patients with thalassemia in their families, are subjected to take the thalassemia carrier screening test which is carried out at the "Thalassemia Centre" free of charge.
After identifying the thalassemia carriers, with a basic and clear language that can easily be understood, genetic counselling is given. Genetic counselling is given by specialist doctors or by clinical geneticists.Genetic counselling is the provision of advice for couples with a history of inherited anaemia (couples both being thalassemia carriers) that wish to have children, including the likelihood of having affected children, the course and management of the disorder. There are situations when couples accept to go through with their marriage and others who change their mind on getting married. Nevertheless for those who decide to go ahead with marriage are strongly advised to contact the 'Thalassemia Centre' during pregnancy, to have prenatal diagnosis.

3- Prenatal diagnosis: The couples who are both thalassemia carriers are taken with utmost care, considering that in every pregnancy there is a 25 % risk of giving birth to a child with thalassemia; Gynaecologists were sent to England for training. At the same time, qualified staffs were trained to carry out tests in the thalassemia laboratory. Furthermore appropriate equipment were purchased. By the end of 1984, the prenatal diagnosis program was initiated .

Methods used in prenatal diagnosis

1) The fetal blood sampling method;
At the begining of 1984, the foetal blood sampling method was used , which was a practise done throughout the world. . At 18-20 weeks of gestation, the foetal blood sample was taken, by withdrawal of baby's cord blood transabdominally with a fiberoptic instrument called 'fetoscope'.The foetal blood sample, tested for $\tilde{\square}\,\square$ chain

ratios and if the baby was affected, the pregnancies were terminated .These procedures were quite stresful and difficult, because of the advanced pregnancy, at 22-24 weeks.

2) Since 1991, the methods with DNA through chorionic villus sampling (CVS) at 10-12 gestational period replaced foetal blood sampling. We used this method, for more than 15 years. In this method, the termination of affected baby is easier, as the procedure is carried out during early pregnancy at 12-14 weeks.

3) In the last few years, some of the couples at risk, started to use preimplantation genetic diagnosis (PGD) in various centers .

Treatment of Thalassemia

According to our "Thal. Control Programme" our aim was also, to treat the thalassemic patients in better conditions and provide them longer and better life. Better and safe transfusion, effective chelation, prevention from infectious diseases , management of endocrinological, cardiological, immunological, psychological problems were very important.

-Beta thal. major patients depend on life-long red blood cell support.We tried to obtain enough and safe blood and maintain the pretansfusional Hb levels around 9.0 and 10.5gr/dl according to the "moderate transfusion" program which has been universally adopted and recommended by the "Thalassemia International Federation". Leukocyte-depleted packed red cells, transfused through the bedside leukocyte removal filters, in two or four week periods.

-Effective chelation was essential. Desferal was available since the early 1980's. Patients were encouraged to use desferal via subcutaneous infusion pumps. Some heavily iron overload patients used desferal iv devices . The oral chelators are also available. Ferriprox is being used in the last four years specially by patients, who have hepatic and/or cardiac iron overload and who have difficulty in using desferal with subcutaneous infusors.

MRI T 2* scan, for detecting hepatic and cardiac iron overload, started to be done, in the last few years.This technique helped us to adjust the dose of chelators. The use of ferriprox alone or in combination with desferal saved patients from the dangers of iron-induced free radicals.

- To rescue patients from viral infections through blood transfusions and immunological reactions was important . The donor screening against HIV, HBV, HCV and syphillis is being done routinely in our 'Blood Bank' with improved, completely fully automated instruments.The immunological problems which are increasing year by year, due to weak erythrocyte antibodies are still problems and need to be studied further.

-The endocrinological complications due to iron overload became apparent at the second decade of life. If these complications were not managed in appropriate ways, somatic and gonodal insufficiency would become apparent. So it is necessary to treat by using replacement therapies for achieving better quality of life. Necessary hormon therepies is given due to insuffcency. The incidence of Diabetes mellitus, is also higher than the normal population in these patients.

Good psychological and social support to provide them a normal life is important. As psychological problems are very often in chronic diseases, psychological support and encouragement to live as normal people could be very useful. We encourage our patients to live a normal life, finish their schools, find jobs, get married and have children.

Results
After 30 years of implementing the "Thalassemia Prevention and Control Programme", significant progress has been achieved.

Screening and genetic counselling: Since 1980, an average of 4000-5000 people were screened every year. Opinion polls which were carried out a few times, showed that 75% of the people were aware of the seriousness of thalassemia, but only 42% were coming to the screening test voluntarily. The remaining 58 % were coming as it was compulsary. This showed, how the law, which made premarital screening tests compulsary, was effective to control population.
The screening program has demonstrated that the Turkish Cypriot community had the highest incidence of beta thalassemia in the world. Alfa thal was also common at around 10% considering the prevalence of Hb H disease. Through the DNA tests it will be possible to account for more alfa thal. carriers more accurately.

The globin gene defects in the Turkish Cypriot Community	
The Type of Abnormal Hemoglobin	%
Beta Thalassaemia	16.4
Alpha Thalassaemia (alpha ° carrier, alpha + carrier, Hb H Disease)	10.0*
Hb Lepore	0.1
Hb S	0.3

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Types of mutation	%
IVS-I-110 (G→A)	74.1
IVS-I-6 (T→C)	7.8
IVS-I-1 (G→A)	7.3
IVS-II-745 (C→G)	6.5
Codon 39 (C→T)	0.9
Codon 8 (-AA)	0
Unknown	3.4

Hb0 Arab, Hb Summer Hill, Hb C were also detected at low frequency.
*The frequency of this type will become more definite and precise in the
years to come, with the continuation of DNA testing program.

Molecular Pathology

Beta Thalassemias: In 1987 our Thal. Lab. senior chief, went to Prof. Antonio Cao's lab in
Cagliary for a training course, to characterize the beta thal. mutations. Five mutations were
detected among the Turkish Cypriots, Sözüöz et al. (1988). A similar study was carried out at
Prof. Titus Huisman's laboratory at the Medical College of Georgia, Augusta, Georgia, USA.
. The results , were similar to these described in the previous study . Beta thal mutations
were as follows: IVS-1-110 (G-A) 74.1%, 1VS 1-1 (G-A) 7.3% , IVS -1-6 (T-C) 7.8%,
IVS 11-745 (C-G) 6.5%, Codon 39 (C-T) 0.9%, unknown 3.4%.

Beta thalassaemia mutations

Alfa Thalassemias: In 1993, 25 blood samples with Hb H disease, were brought to Augusta
for screening for alfa thal mutations by Dr. G Bozkurt . As alfa thalassemias were common in
Cyprus, the demostration of alfa globin genotypes , would be very useful for better
understanding of the clinical phenotype of Hb H disease. The samples were studied by
E.Baysal and 74 % deletional , and 26% nondeletional allelles were demonstrated. The
deletional alleles were as follows; alfa 3.7 30%, Med I 36%, Med II 4%, (a) 20.5 4%.
The nondeletional types were PA-1 12%, PA-2 4% , and a5nt 10%. Eight different types
alpha globin genotypes were detected with various combinations of deletional and
nondeletional alleles.

Success of the prenatal diagnosis programme in Northern Cyprus

When we started to screen the commuinty and gave genetic councelling to the families at risk
for thalassemia, and after the inauguration of the PND programme in 1984, the number of
affected newborn babies decreased dramatically from18-20 to 6-7 per year Thereafter the
numbers dwindled down to one or two per year. Two of the affected babies born after1984,
was due to misdiagnosis during the first years of our prenatal diagnosis experience. After
DNA methods were established in 1991, only five affected babies were born due to different
reasons, in a 10-year period.. Since 2002 no affected baby has been born .

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DECREASE OF HOMOZYGOUS BETA THALASSAEMIA BABY'S BIRTH RATES IN NORTH CYPRUS
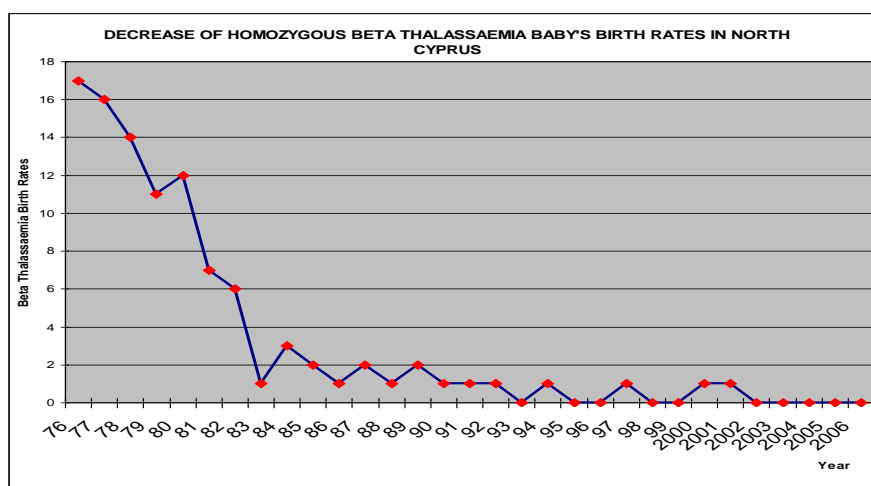
The survival and life standarts standards of the thalassemic patients

Significant progress has been achieved in the quality of life and survival of thalassemic patients. 66 % of the thal . patients are over 25 years old. The age distribution is as follows; 0-15 years 6 %, 15-25 years 28%, 25-35 years 41%, over 35 years 25%.

We encourage thal patients to live as normal persons and also have family and children. Most of the adult thalassemics have jobs. 38% of them are married and have children. We strongly recommend them to marry with a genetically normal person, so as not to have affected babies. Most of them have normal spouses and have healthy children. Interestingly, in recent years there have been marriages between the thalassemics themselves and some have even had babies through IVF.

Conclusions

Cyprus had two important public health problems, which thread the population quite seriously in the last 130-140 years of it's history. Since 1870 to 1950 malaria caused serious health problems and socioeconomic damage on the island. After a succesfull erdication programme, it was eredicated in the midst of twentieth century. Then thalassemia became into the screen as another big threat. After the eredication of malaria from 1948 onwards, every year new thalassemic babies were born .During the years of 1950 to 1974 because of the political problems in Cyprus, there wasn't any serious study for preventing thalasseimia. There was also the lack of the awaraness of the knowledge how to fight with the disease.

In 30 years of period during the years 1975-2005, the implementation of effective measures yielded substantial success in the fight against thalassemia. Affected newborns births have stopped and the thalassemics approached longer and better quality of life. One of the most important elements which contributed to the success was the fact that all the goverments, which came into office in this period, gave uninterrupted full support to this project within the framework of the national health policy. Another important factor which contributed to the achievement of the project was the good and visionary plans and strategies in the process from the very beginning. All teams involved have fulfilled their duties and responsibilities in the best way and to the full extent that they could.

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WATER POLLUTION EPIDEMIOLOGY, WATER HYGIENE AND PUBLIC HEALTH

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Perhaps the most important factor affecting the human and public health directly is providing the public with drinking and using water in a clean, healthy and sufficient condition. This task should not be left solely to the responsibility of a professional group or an institution.

The health personnel have direct responsibility in these efforts as well as local administrations and public institutions. Each health personnel should know the causes of water pollution and its possible effects to health and should take these effects into consideration for health services to be provided. In addition, related members of the local or central administrations performing public service should join the efforts of providing the public with healthy, clean and sufficient drinking and using water in cooperation with the health personnel, benefiting from their consultancy.

On the other hand, doctors and other health personnel working in the field of public health should know the water analysis techniques, follow the improvements, standards and the legislation, and obtain the required knowledge and skills.

The most important element that the living creatures cannot abandon since creation of the first living being until today is no doubt water. We are so resigned to the necessity of the water that when looking for an answer to the question of "Is there any form of life in places outside of our planet?", we search for a proof of existence of water. When setting up a new settlement on earth, we first look for water resources. If we look at the great civilizations in history, we see that they are all founded near water resources. It is seen that the concept that keeps all the biological systems from the smallest to the greatest alive is water. For this reason, water is life in all respects. Water is accepted as one of the most valuable natural resources since ancient times. The truth in this evaluation is expressed in various ways:

In the IVth Century B.C., Empodecles said that, ***"Earth is made of water and soil"***. Later, the ***"Four Elements Theory"*** was developed, widening the borders of this definition. According to this ***"All objects are made of water, soil, air and fire".***
Since it plays a key role in many aspects of life (such as the safety of the food, nutrition, health, a balanced and habitable environment), the management of the water resources also constitutes an indispensable component in terms of the happiness of the people, sustainable and balanced development, ecological completeness and for sustaining the permanency of mankind as a species. Water is a fundamental structure component that is found in all living creatures in huge amounts. For example, 65% of the human body, 80-90% of the blood, 75% of our muscles and 60-85% of the fresh weight of plants is comprised of water. Even though two thirds of the earth's surface is covered with water, the amount of fresh water that can be used by the people as drinking and using water is very limited, considering the world's population. More than half of the world's population is faced with the danger of lack of water. Again, almost 70% of the world's population is deprived of clean water.

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The situation in our country is presented below:

The average annual precipitation in Turkey is approximately 642.5 mm, and annual precipitation on the lands of our country provides us with a total 501 billion metercubes of water. The part of this water that can be consumed is 95 billion m³/year, and eventual consumption is approximately 26 billion metercubes. It is wrong to interpret these numbers as our country being rich in water. Our country is located in a dry and semi-dry climate, and almost half of the population cannot reach clean and healthy water. If it is considered that the water resources are not spread to every part of the country in balance and some of the above-ground waters cannot be used anymore because of pollution by the industry, the importance of using the water resources properly will be understood.

As can be understood from the above information, pollution of water may cause problems even if the resources are sufficient.

The industrial revolution has brought an extravagance and water pollution in horrible dimensions as a result of expansion of the cities and an increase in agricultural production. An average of 20-30 thousand people die daily in the world because of unhealthy water usage, and one in three of the total deaths and 80% of the diseases are caused by polluted water. As a result of the pollution of seas, rivers and lakes, the greatest nutrition resources of the world, the lives of living creatures have been affected in a negative way and some have disappeared completely, shattering the chain of nutrition.

Today industrialization has become an indispensable goal and process. If technical consultation of the healthcare personnel is not used sufficiently and technology is not directed properly, pollution of the water resources in a dangerous way will be inevitable. Today, in many countries, certain water resources are polluted in such a way that they cannot be used by humans or any other living creatures.

Water usage

The regions that are rich in water have been the center of civilizations as well. With development of mankind, water necessity has been increased dramatically and water has been used in different fields (such as industry, entertainment). Water usage can be analyzed in three categories:

Primary usage; drinking, preparation of foods and drinks, bathing and cleaning.
Secondary usage; taking away the waste in houses and factories, performing the functions requiring water in industry, extinguishing fires and similar applications
Tertiary usage; usage of natural waters for fishing, maritime, swimming and entertainment, agricultural irrigation and energy.

The water requirement of individuals is calculated as liters per 24 hours per person. There are also people who take the water requirement per person or the number of the water taps in houses as criteria in healthiness level. An adult person should ingest 2,5 liters of water in a day to perform his/her body functions. Only 600 ml of this is taken with food. Humans can perform their daily functions with 5 liters of water when they are obliged to, but this amount should be minimum 30-40 liters considering the cleanliness of the living environment and the goods that are used.

If the water is procured by carrying from a source outside of the house, 30-40 liters per person is adequate. But if the water is brought to the houses by means of a network, this amount should be calculated as 100 liters per person. When water requirements of the industrial institutions and municipality services in cities are also taken into account, 200-500 liters of water per person is required. Water requirements of schools and hospitals are calculated as 65 liters per student and 500 liters/day per patient bed and the personnel on duty is not included in this calculation.

Water consumption of the people has increased 35 times in the last three hundred years. Clean water requirement increases at a rate of approximately 4-8% every year, which means additional clean water necessity of approximately 3240 kilometercubes yearly. In developed western countries, 69% of the water is used in agriculture (25% of which returns as waste water), 23% is used in industry and 8% is used in houses. However, in our country, 71.2% of the water is used is used in agriculture, 12% is used in industry and 16% is used in the houses as drinking and using water.

Pollution of the waters
The substance that is most easily and most often polluted during its journey from the source to the field that it will be used in is water. Precautions should therefore be taken to prevent its pollution at almost every stage. In civilized societies, water is always used to take away unwanted waste. Rivers, canals, lakes and seas function as a pool for every kind of waste that can be imagined.

Water pollution or its contamination is the incident of mixing of unwanted waste material to water in an amount that spoils the water's quality in a way that can be measured. Another definition is as follows: "W*ater pollution is a change in its quality appearing as a result of the effects originating from the people which restricts or prevents the usage completely and spoils the ecological balance.*"

Many materials that are in contact with the bacteria and enzymes in water for a long time, especially organic compounds, gradually disappear after being degraded or dissolved. Substances that are decomposed in this way are called "biodegradable" substances. This kind of material constitutes a smaller part when compared to more durable materials such as metals, plastics and some chlorinated hydrocarbons. However, materials that can degrade may cause harm to the water source for a long time. In the fundamental health services that are listed in the Alma-Ata declaration, which has the quality of being an international health contract, the subjects of clean water procurement and sanitation article are also present and these are qualified as indispensable.

Table 1. Fundamental Care Concepts that are Qualified as Indispensable in the Alma-Ata Declaration

1. Health training of the society
2.Providing sufficient and balanced nutrition
3.Providing clean water and sanitation
4.Family planning and mother-child health
5.Immunity against the frequently-seen epidemics that cause many deaths and disabled persons
6.Taking endemic diseases under control
7.Appropriate treatment of frequently-seen diseases and injuries
8.Procurement of the fundamental medicines

The GEMS (Global Environment Monitoring System)/Water Monitoring Project was started by UNEP and WHO in 344 stations (240 rivers, 43 lakes and 61 areas of surface water) all over the world in 1997. These studies have indicated that water pollution is not only a problem of the under-developed countries but a problem for all world countries. Waste material is released into the environment only after purification and disinfection in developed countries, decreasing their harm. Many under-developed countries, let alone having the water cleaning techniques, are unaware of the fact that whether there is any harmful material inside the water that they use, and are experiencing dramatic problems caused by the water pollution.

Causes of Water Pollution
Polluted waters harmful to the health, called *"waste water"*, are released to the environment by industrial institutions, power stations and similar institutions. This material pollutes the surface waters and underground waters by mixing with them. The main sources are:

- Houses, industrial institutions, power stations, small enterprises.
- Fertilizers and chemical drugs used against hazardous insects in agriculture
- Agricultural industry facilities such as liquid oil factories, sugar factories, leather industry, and fertilizer factories
- Nuclear stations
- Thermal pollution
- Fields where soil erosion is effective.

These sources cause various types of pollution such as industrial pollution, household pollution, agricultural pollution and thermal pollution.

Precautions that can be taken against water pollution
Precautions that can be taken against water pollution can be grouped as:
- Precautions related to economical water usage
- Technical precautions
- Social precautions

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WATER POLLUTION AND HEALTH

The most important health problems of a society are the diseases that are "*frequently seen and cause many deaths and much disability"*. It is seen that many diseases from polio to intestinal infections caused by polluted water suit to this definition.

Diseases transmitted by water are among the diseases frequently seen in under-developed countries. One in four diseases that are seen in the under-developed countries is a disease transmitted by water and 80% of all disease in these countries is due to lack of clean water.

Table 2. Factors causing water pollution and their effects.

1. Pollution formed by disease-causing biological agents	

	Bacteria
	  a) Salmonella species
	  b) Shigella dysenteriae
	  c) Vibrio cholerae
	  d) Bacillus anthracis
	  e) Brucella species
	  f) Francisella tularensis
	  g) Pasteurella species
	  h) Leptospirae species
	  ı) Chlamydiae psittaci

	Viruses **Poliovirus**

	Parasites
	  a) Trematode
	  b) Cestode
	  c) Nematode

2.Pollution Caused by Organic Materials	
3.Industrial waste	
4.Oils and similar substances	
5.Synthetic detergents	
6.Radioactivity	
7.Pesticides	
8.Artificial Organic Chemical Materials	
9.Inorganic salts	
10.Artificial and Natural Agricultural Fertilizers	
11.Heat Waste	
12.Pollution caused by combined waste material	

Diseases caused by water constitute the most dangerous disease group for the society as they spread very rapidly to a large segment of the population. Some of the epidemics in history are shown in the table below.

Table 3. Past major epidemics originating from water (Atakent 1974).

Date	Place	Infection	Number of cases	Number of deaths
1854	**Crimean epidemic (French army)**	**Cholera**	**?**	**7,000**
1854 – 55	**England**	**Cholera**	**?**	**20,000**
1892	**Hamburg**	**Cholera**	**18,000**	**8,000**
1933	**Chicago**	**Amoebic dysentery**	**1,000**	**20**
1937	**England (Croydon)**	**Typhoid**	**341**	**41**

Certain diseases transmitted by water are important morbidity and mortality causes in our country. The increase in the incidence of enteritis is especially important.

When their transmission ways taken into consideration, water related infectional diseases can be analyzed in four groups (Aksakoğlu and Ellidokuz, 1969):

1. Diseases that can be caused as a result of pathogen microorganism transmission to the water
2. Diseases originating from lack of water
3. Diseases transmitted by some creatures living in water
4. Diseases transmitted by water-related vectors

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Table 4. Relations of some important infectious diseases with water (Aksakoğlu and Ellidokuz, 1969).

Group	Disease	Frequency	Importance	Threat of Becoming chronic	Expected reduction with an improvement in water (%)
1	Cholera	+	+++		90
	Typhoid	++	+++		80
	Paratyphoid	+	++		40
	V. hepatitis	++	+++	+	10
1+2	Bacillus dysentery	++	+++		50
	Amoebic dysentery	+	++	++	50
	Gastroenteritis	++	+++		50
2	Impetigo	+++	+	+	50
	Trachoma	+	+++	++	60
	Conjunctivitis	+++	+	+	70
	Scabies	++	+	+	80
	Leprosy	+	++	++	50
	Dermatophytes	+	+		5
	Ascariasis	+++	+	+	40
3	Schistosomiasis	++	++	++	60
4	Malaria	++	+++		60

Faulty Sanitary Installments and Chemical Pollution:

One of the most frequent mistakes is faulty installation. Important health problems may occur if the connection pieces are not mounted using the appropriate technique, pipe and bend radiuses are not taken into consideration during the connection process and maintenance is carried out by the people who do not have necessary technical qualifications.

Air pressure tank systems that are used in the apartments are important interventions to the system pressure and can sometimes cause polluted waters inside the water tanks to be absorbed by the installment. Sometimes, it can also facilitate the absorption of the pollution factors in the environment by the pipe system feeding the water tank. When two different types of plastic pipes are being connected, it can sometimes be forgotten that the cement that will provide this connection may be suitable for one type of pipe and not for the other pipe. The fact that plastic pipes can be easily chewed by rodents should not be forgotten. Important epidemics can develop due to plastic pipes that have been chewed by the rodents in building installments. Placing S traps improperly may prevent air input and cause explosions and breakups. T type traps are more suitable on condition that they receive air in an appropriate way. If network water is used in hot exchange units, problems can occur when water is pumped from the cooling tower to a broken down heat dispatch unit. Problems also can occur when pipes with small radiuses are used for long distances.

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Friction between the pipe and the water will cause important energy losses. When valves that should only be used for water (gate valves) are used in steam systems, they can cause important problems. Valves that are produced only to be used as steam valves (globe valves) should not be used for water. Garden hoses may constitute one of the most important ways that building water installments become polluted.

There can be hundreds of factors that cause harm to the installment. Laboratory aspirators, coffee and washing machines, swimming pools, bathtubs, water taps, dust bin washing systems, ice machines, steam tables and vegetable peelers can be important factors for the pollution of drinking water.

There is not sufficient that can perform the cost-gain analysis of the appropriate installment investment. But taking into consideration the epidemic diseases and the required labor for mending, etc., it is seen that the this cost is a reasonable investment.

Examples of Epidemics due to the Installment Inadequacies
There is an important parallel between the decrease in the rate of epidemic diseases and the improvement of sanitary installment technologies. In a water installment, there is not only pollution due to the contaminants coming from the outside, but also related to the installment itself.

In 1993, one of the most horrible amoebic dysentery incidents known took place in Chicago. The epidemic appeared in the hotels where the people who had come to the Chicago World Fair stayed. The installments of the hotels were old and brokendown. There were cross connections. The back siphonage in the bathtubs and toilets caused the drinking water to be polluted. Ninety-eight people died and thousands became ill.

In 1938, students with fever, exhaustion, headache and anemia were referred from a big university. These students were diagnosed as suffering from a brucella infection. This was related to a hose connected to the tap in a laboratory where the students studied. The other end of this hose was in a bathtub filled with water containing the brucella agent. As a result of a decrease in pressure due to high water request in another part of the system, the water with brucella has been absorbed by the system. Eighty students became ill and one died.Most mass diarrhea incidents in the schools are considered in relation to the dormitories but the condition of the water sources should also be examined. It should not be forgotten that sometimes a tap hose left in the water in the sinks where the fruits and vegetables are washed or washing spirals can cause some pollution factors to be absorbed to the installment by back siphonage. In Newton, Kansas, one of the two water procurement systems of a city was left out of service three times in September, 1942. Some unknown people tried to take water from a fire faucet in the network part that was left out of service. The valve was left open when water did not flow. As a result of a blockage in a close-by drainage, the overflowing drainage filled the hole of the fire faucet. The drainage of ten families was absorbed by the fire faucet for two days. When the related network part was put into service, 2500 people from every part of the city were affected by an intestinal infection. As a result, two trains that had stopped to take water in Newton had to carry the patients with bacterial dysentery and two of these patients died.

Again in 1942, a new water connection was established in a factory where 500 people work in Pittsburgh. The city's water was cut during this connection. This decrease of pressure caused river water to mix with the drinking water lines. After water was provided to the city again, most of the workers suffered from a light intestinal infection. A few weeks later, a similar water shortage was followed by an intestinal infection epidemic. The fact that the network was not kept under observation after repeated intestinal infection epidemics created a dangerous situation.

In 1943, it was found that the connection connecting the fire faucet in the deck of a ship located at the harbor to the drinking water network was broken down. This caused a gastroenteritis epidemic. The dirty water of the harbor had probably been pumped to the fire-extinguishing network and bacteria had entered the drinking water network because of this. A total of 1179 people became ill.

In California, a worker, who wanted to spray arsenic in order to kill hazardous herbs with an aspirator connected to the garden hose, realized that the water had been cut off. He pulled the hose out. He died by poisoning from arsenic when he drank a glass of water from the tap that he connected.

It was detected that 25-40% of the workers working in a big plane factory caught gastroenteritis. It was understood that there had been a decrease in pressure due to an extreme water transfer following excessive water demand from the main network during this period. The vacuum created by this pressure decrease had caused the dirty water to be absorbed by the main water network by means of a cross connection.

In 1944, a gastroenteritis epidemic was seen at a school in Oklahoma. There was no a system or mechanism that would prevent the back siphonage in the pressured siphons in the toilet in case of a vacuum. The water inside the main water network had been cut off every evening, and the pressure in the installment had decreased. Dirty water in the toilet system could pass to the drinking water installment as a result of the effect of atmospheric pressure. Most of the people who had been ill had drunk water from the taps on the first floor.

In 1952, when a big transatlantic was 300 miles away in the sea, a dysentery epidemic involving 1000 cases took place. Dirty water on the deck had mixed with the drinking water network as a result of cross connection.

In 1958, workers in a factory realized that the water flowing from the drinking water taps was yellow. The engineer detected that the chromates used to prevent the corrosion had mixed with the water. Closing the valves had been forgotten by mistake.

In 1960, someone realized that the drinking water had the taste of sea water in a big quay on the eastern coast. Three ships anchored to the coast had been connected to the fresh water taps, filling their tanks. Later, it was understood that the high-pressure fire extinguisher systems had caused the pumped sea water to mix with the drinking water network.

In 1961, ethylene glycol antifreeze was pumped to the antifreeze dispatch system from a big tank. The system had cross connection with the city water network. More than 100 gal of the 60% ethylene glycol had been pumped to the main network. The main network had been polluted with this toxic substance at a concentration of 20.000 ppm.

In 1962, 700 people caught gastroenteritis in a big harbor. They had drunk water from the harbor region while working. It was understood that there was a cross connection between the system used to extinguish the fires and the drinking water system.

In 1970, a water valve was left open after washing one of the distillation tanks in Ohio, Cincinnati. As a result, Burgundy wine was spread to the city network by means of the valves.

In 1969, an air conditioning system with chromate was blocked. The worker, who wanted to learn the reason of the blockage, established a connection with a hose in order to open the blockage. But the flow took place in the opposite direction and 23 students using the drinking water in the building became ill.

In 1964, people were complaining about rusty water that flowed from one of the taps in a hospital in Michigan. Drinking water taps were two doors away from the hospital's autopsy room. There were deep reservoirs collecting the autopsy remains on the hospital's autopsy tables. Hoses with showerheads had been connected to these reservoirs in order to be used in washing task. Since there was no hanger on the tables, the pathologist was leaving the hand hose with the showerhead in the deep reservoir on the table when he did not use it. A one-way valve to prevent back flow in case of a vacuum was not present and the blood and other autopsy leakage had been absorbed by the hospital network as a result of the strong back siphonage and reached the water taps.

In 1974, a huge enteric infection developed in New York as a result of the back flow that took place in the big official buildings of the city. Since the typhoid epidemic of 359 incidents that ended in 60 deaths, there had not been any typhoid epidemic in Illinois. A typhoid epidemic appeared in the South Dade work camp in Homestead, in 1973. 172 people were sent to the hospitals and 38 people were otherwise ill but there were no deaths. The drainage system had been established in 1940 and renewed in 1969. The old drainage system that was left behind was very close to the water source. Salmonella was found in the feces inside the system. The paint that was poured 3 meters away from the wells was detected inside the wells in 15 minutes. The paint poured to the bottom of a well, appeared in the water network in 3.5 minutes. There were many solution channels in the regions surrounding the wells. Ninety meters away from the wells, there was a general toilet and waste was pouring into an accumulation hole that was an oil trap. Three hundred meters away from the wells, there was a rubbish dump of 50.000 gallons containing beer cans, bottles, junks and feces. Detecting which of the related places was responsible for the epidemic in this example was very difficult but whatever the mechanism, the connection of the pipe system with one of the contaminating sources was the reason.

Hundreds of epidemics appear in many countries probably as a result of connection and pressure changes in the pipe systems but because of an insufficient record system and epidemiological evaluation, the cause of most of them cannot be exactly defined.

These evaluations should be performed in detail where the disease may have originated from water. A period of 20 minutes is required for the effect of the chlorine to be take place and it should not be forgotten that an epidemic risk is present if short distance pollution is also seen with chlorinated water. These kinds of connections can be important pollution causes today. Many chemical tanks are washed with hoses, and the water inside these hoses is taken from the main water network. An insufficiency in the hose connection will lead to chemicals leaking to the network in dangerous levels.

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HEAVY METALS

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Metals that cause harmful effects when entered into the human body are called "toxic metals". However, not all heavy metals are toxic. Toxic metals are among the most hazardous environmental pollutants today. They impair the activities and stabilities of some enzymes which are vital to the organism's physiological functions. Simply put, they are "enzyme poisons". As a result, many anabolic processes, and hemoglobin, nucleic acid, protein and hormone biosyntheses are disrupted. In general, with the increasing atomic numbers, local effects decrease yet general toxic effects increase.

The most common toxic materials in the nature are mercury and lead. Metals can be divided into two groups based on their concentrations: *abundant* and *trace* ones. Trace elements or metals make far more prominent contribution to environmental pollution than abundant elements. Living things confronted trace elements not at all or rarely, through the geological eras. Because of that, they could not establish mechanisms to adopt those metals. However, their confrontation with the abundant elements caused them to develop a harmony with them, and even, some metals played a very important role in the human body. Living organisms need trace amounts of heavy metals such as cobalt, copper, iron, manganese, molybdenum, vanadium, strontium. But excessive amounts of those metals could be unfavorable for an organism. Other heavy metals including mercury, lead and cadmium do have no known benefit for the body.

Heavy metals occur naturally in the earth crust. They do not decay nor they can be eliminated. Heavy metals are dangerous because they tend to accumulate in the body biologically. This bio-accumulation means an increasing chemical concentration in the human body, when compared to nature. Compounds may accumulate in living things any time. The reception to the body and storing is much faster than their metabolizing or discarding.

Some of the heavy metals are aluminum, gold, antimony, arsenic, copper, barium, bismuth, mercury, gallium, silver, cadmium, tin, chromium, lead, lanthanum, manganese, nickel, platinum, tungsten, vanadium. The most important ones are lead, mercury and cadmium, as far as their chronic affects are concerned.

LEAD

Lead is a solid, gray metal that appear not much in the nature but commonly used. In the nature it mostly appears in the form of galena (PbS) that is a sulfide ore. Due to its common existence, even the rural people take several hundred micrograms of lead in water and food. In cities, industrial wastes and the contamination through vehicle exhaust are added to this. Because of this, even the people who are not handling lead professionally, particularly urban people, have lead levels close to upper limit.

It is widespread in the commercial life as it can be easily formed and found, with relatively lower melting point (327°C). Lead exposure of general public increases with the improving metallurgy, contamination caused by power products and their acquisition increases rapidly depending on the usage processes. Drinking of the water transmitted through a lead pipe, using lead dishes or ceramics to serve meals, mixing of lead with foods due to other reasons as well as lead poisonings without any relation to profession attract attention of our society. The exposure of the members of a society could be classified as follows:

1. Social exposure
a) Through air (air pollution, gas, dust)
b) Through water
c) Through foods
2. Professional exposure
3. Intentional exposure

1. Lead affection through air:
Scientists have proven that the atmosphere is polluted by lead. Environmental lead contamination is a significant problem depending on leaded oil and vapor sprays, particularly in many industrial region.

As the lead content of oil decreases, parallel to unleaded oil use and additive oil use, the lead content in the blood decreases. It can be said that the main source for the lead in the bloodstream of the people living in the city is the lead in oil. A significant part of the lead in the air is the tetraethyl lead and tetra methyl lead. 70 to 75% of the lead discharged to atmosphere due to burning of lead oil are inorganic lead compounds and 1% is in the form of lead compounds. 20 to 25% remain within the exhaust system or engine lubricant.

In 1910s, in the United States of America (USA), the primary source of lead in atmosphere was paints. When the threats of lead on the human health was realized, lead addition to paints was terminated as of 1940s. Now, however, lead consumption increased parallel to the increase in the oil consumption as well as increasing number of motor vehicles.

In Turkey, according to 2003 data, the amount of lead released into atmosphere from motor vehicles is about 230.000 kg per year. In the oil, the most significant lead source in Turkey, lead levels are constantly reduced. In the studies carried out from 1990 to 1994, the blood and cord blood lead levels were found in the range of 8 to 9 μg/dl. It was 2 to 4 μg/dl in the studies from 1999 to 2002. Considering he influence of blood lead level on the IQ (Intelligence Ouotient) scores, a blood lead level higher than 4 μg/dl was found to increase the child's having a score lower than normal by 8 times.

The environmental pollution due to organic lead compounds will reduce by the reducing number of older motor vehicles. In the USA and Japan, many motor vehicles are equipped with catalytic convectors and use unleaded oil. In other countries, and particularly in Western Europe, the same tendency prevails. On the other hand, organic lead consumption is increasing in developing countries.

Household lead:

Mostly children are threatened by the lead in the household environment. The lead exposure in the house was primarily due to wearing walls which had been painted by lead based paint. Particularly, failure to clean the dusts caused by the wearing of walls causes dusting to the internal ambiance from the ground and increase the dust density. Furthermore, the toys painted with lead paint and baby beds are the prominent factors Another threat mentioned in the literature is the newspapers printed with lead or lead letters. In the house environment, lead intake takes place through respiration, direct skin contact, contaminated foods or toys or orally.

1.b. Lead influence through water:

Mixing of lead in water mainly takes place by transmission of water in lead pipes. Remaining of soft water stationary at nights in lead pipe causes dissolving of lead and diffusing into water. Lead is no more used for water pipes. But, as is the case in some European cities, lead water pipes still exist in some buildings. Because of that, the people living in buildings equipped with lead pipes should be careful and they should open the tap first to allow some fast water flow in order to eliminate lead particles. Another reason for lead in water could be passage of lead in the air into the water.

1.c. Foods influenced by lead:

There is lead in the environment and foods and it may gradually accumulate in human body. Lead can contaminate food by a number of ways, depending on its existence in soil or water. Additionally, use of leaded oil, mine waters or lead vapors may also cause contamination. Direct contamination with most of the foods is by means of lead containing pesticides or tin boxes. According to FDA (Food and Drug Administration), 13 to 14% of the lead in the food originate from such tin boxes. The lead in food is closely related to the food type, pH, lead content in solder and the preservatives in the tin box. It is impossible to prevent lead in the food without reducing the lead content of the solder of tin boxes. Lead compounds are used in the developing or underdeveloped countries in glazing bowls and pots, which is a significant threat.

2. Professional Lead Exposure:

Lead mining and metallurgy is a global industry. Manufacturing process uses primary resources or scraps (secondary resources) to produce considerable quantities of lead.

Professional lead exposure is primarily caused by lead production using lead ore (galena), and secondarily by the lead in the motor vehicle batteries and metal chips, during welded joining and cutting, in foundries, in casting of metal alloys containing lead, soldering with lead solder at very high temperatures, leaded spray paints and painting with leaded paint and leaded drying, crushing lead metal alloys and linings, their sanding. In the workshops where batteries are repaired, automobile and radiator repair workshops, in foundries including the ones specialized in tin and lead alloys, also in shipyards jobsite exposure is expected.

Other places where lead could form gases is the factories and work places where temperature is over 500°C, or while the lead is mixed with raw oil, its processing and handling. Particularly when cleaning large tanks, fatal intoxications can occur depending on the organic lead content. Organic lead compounds can also pass through skin. The professional exposure limit is 0.075 mg/m^3 for tetraethyl lead and 0.07 mg/m^3 for tetra methyl lead.

3. Voluntary Exposure:

In different parts of the world, particularly the adolescents from 11 to 19 years old, in the ethnical groups where there is a severe cultural and social pressure on adolescents "oil smelling habit" has been reported. Inhaling of leaded oil vapor / gas, may result in hallucination euphoria, nausea, vomiting, agitation and anxiety. Furthermore, it may cause ataxia, tremors, confusion and other neurological symptoms. The lead intake of smokers is higher than the non-smokers, and smoking raises blood lead level as an independent risk factor.

Chronic Influence on Public Health

In case of the chronic influence of lead, rapid exhaustion, headache, muscle and joint aches, anxiety, dyspepsia, abdominal pains or such other non-specific symptoms form a basis for the primary condition. Anemia and spasm of the skin capillaries cause gray-yellowish skin color. Classical symptom is the weakening of muscles which hold upper extremities and the used part and at the advanced level, motor paralysis. Long lasting constipation due to intestinal spasms, and central neural system damages could be encountered. Nephrosclerosis and renal deficiency are among the symptoms of this period

Lead is a very much emphasized metal in literature as it causes common neurotoxicity and behavioral changes. The neurotoxicity mechanism of the lead could not be exactly understood. But the primary mechanism could be its contest for the proteins binding with zinc and calcium and its impairing their functions. Lead binds itself with ALAD from those enzymes and it reduces production of hem and hem-dependent proteins, and causes aminolevulynic acid. This accumulation prejudices oxygen storage, transmission, mitochondria energy production and P450 detoxification systems. Lead reduces snaps and dendrite formation and also, in contest with calcium, changes synaptic transmission.

First neurotoxic influences of the leaded paints were first diagnosed in 1892. Today, the mild or even slight exposures (<10 μg/dl) cause behavioral anomalies, intelligence deficit, short and long term memory, reading, spelling, hearing, visuomotor performance, sensory integration and reaction time problems. The studies conducted show that the development and behavioral influences are permanent even the lead levels go lower.

The half life of lead in blood is 1 month while this is 10 years or above in tissue and bone. The received lead is stored in bone, liver, kidney or brain. After being exposed, first hematological symptoms appear, depending on the increasing dose, neural system is also prejudiced. Eclampsias, behavioral changes, mental decline, lack of stability, clumsiness are the primary symptoms. Method development studies have been made for determining the effect of low lead levels on intelligence. Additionally, a relation between lead exposure and the increasing tendency to violence in adolescence has been determined.

Prenatal lead exposure considerably increases motor function loss risk. But this condition could be remedied after 5 years of age. Postnatal lead exposure could cause permanent problems in school activities such as reading. In the studies carried on children, if not treated, lead is reported to cause fatal encephalopathy.

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For the children with blood lead level between 10-24 μg/dl, getting far from the source, elimination of the source, suitable diet and close monitoring approach is used, while for the children with blood lead level over 25 μg/dl, British Anti-Lewicite (BAL), calcium-disodium, ethylene diamine tetra acidic acid (CaNa2-EDTA) treatments are used.

MERCURY

Mercury is in the form of mine ore, or occurs naturally in fossil fuels such as coal and oil. It is liquid metal at room temperature and is in silver color. Every year, 3.600 tons are produced in the world and mostly employed in chlorine-alkali industry.

The most important source for methyl mercury, which is toxic for humans, is microbial biotransformation of the inorganic mercury into methyl mercury, which accumulates in fish and enters into the food chain. Because of that nearly all fish contain mercury (0.1 μg/g). Mercury is used for insecticides, pesticides, cosmetics, batteries, fluorescent lamps, medicines (laxatives, spositoirs), amalgam (tooth fillers), solvents, plastic, printer inks, varnishes, paints and many other items.

From the amalgam fillers containing 50% mercury, a constant mercury vapor release takes place, which is inhaled and absorbed by the lungs. The release increases by about 5 times while chewing, tooth brushing, hot drink consumption and mouth breathing. In the low dosage exposure, the most vulnerable organs are brain and kidney. The number of amalgam filled teeth that would cause daily tolerable mercury vapor quantity (0.014 10-μg/kg/day) has been found as 1 in children, 3 in adolescents and 4 in adults.

Mercury and its compounds are transformed into methyl mercury in the nature, in case of a chronic intake, mercury accumulates in human body. It enters into human body by inhalation, eating, drinking and skin contacts. 95% of the received methyl mercury is rapidly absorbed and passes through placenta and blood-brain barrier. Neural system is very sensitive to, it may have a negative impact on the central nervous system and causes behavioral changes and attention deficit. Vein retention in brain and kidney is high. Depending on the mercury intake dose, many symptoms may be observed including visual disorders, demans or muscular coordination disorders. Determination of methyl mercury level in blood and hair is significant to find chronic exposure.

In chronic mercury effect, the triple case (triad) consisting of eretism, stomatitis and tremor is typical. Eretism is characterized by anxiety, excitability, sleeping disorders, anxiety, memory problems and reducing self confidence. Tremor is first observed in eyelids, tongue and lips. Worsening hand writing due to tremor in hand is a characteristic finding. Stomatitis is related to excessive saliva release. As a result of that, there might be tooth decays and losses. Heavy metals accumulate in kidneys and causes renal deficiencies. In the front capsule of the eye lens, yellow-brownish reflux is observed in the lens.

Although neurotoxic influences of the organic mercury was known since 1966, our knowledge database is mostly from epidemic poisonings. The most important one of this epidemic poisoning was in Minamata, Japan in 1956. In Minamata Bay of Japan, particularly in the people regularly consuming fish, a disease similar to myelitis was observed. This coincided with the foundation of the factory in the region, where mercury oxide was used as a catalyst. The disease was first reported in 1956; but in 1963, the relation of the disease with methyl mercury was revealed with the high methyl mercury level in mussels and fish in the bay. The relation was not however accepted until 1968, when the factory operation was terminated.

Researchers have determined approximately 2000 patients of whom 64 suffered prenatal intake. In adults, psychoneurologic symptoms, muscle retention similar to myelitis, and kidney and heart retention were observed. The affected infants who seemed normal at the time of birth suffer mental retardation, abnormal reflexes, ataxia, dysarthria, involuntary movements and cerebral palsy later. None crawled, stood up or walked before 3 years of age; this condition has been defined as "Congenital Minamata Disease". In evaluation of the children from 13 to 16 years old, lower IQ and sensory disorders were reported more frequently in comparison to the control group.

A similar epidemics was encountered in Iraq in 1970s. The seed wheat were treated with methyl mercury after catching fungicide. They were not used as seeds instead, they were consumed as bread and 65.300 people were poisoned of whom 59 died. Similar epidemics were also reported in Pakistan, Guatemala and Gana, and in the end, the use of alkyl mercury compounds use in seeds was banned.

The primary studies related to low dose environmental exposure to mercury is the cohort studies in the societies consuming fish intensely. While in some of these studies neurological affection was reported, it was not reported in some others. According to the results obtained from those, recommended safe daily intake was determined as 0.10-0.47 μg/kg body weight / day. FDA recommends that pregnants and women during reproductive period should avoid consuming shark, mackerel or sword fish and others (children and nursing mothers) should restrict consumption of fish that contain methyl mercury over 1 ppm once a week (200 gr a week). FDA also recommends less than 350 gr per week fish intake, including tuna fish, to children and pregnants.

In the studies carried out in Turkey in relation with the mercury pollution, the blood mercury level in the people residing at industrial regions was found as 12 to 30 μg/L whereas the levels recommended by CDC (Center for Disease Control) is between 4.7 to 7.9 μg/L.

Another source of mercury for the children is the vaccinations. Particularly inactive vaccinations contain ethyl mercury in the form of thiomersal in order to prevent microbial contamination. 49.6% of the thiomersal is mercury and when metabolized, it is broken into ethyl mercury and thiosalicilate

According to the immunization program applicable in Turkey, the infants up to 6 months take 2 doses of hepatitis B vaccination and 3 doses of diphtheria, pertussis, tetanus combined vaccination. Both multiple dose vaccinations contain 0.01% thiomersal and the ethyl-mercury it contains is about 25 μg per dose. Accordingly, the mercury intake of children in Turkey through vaccination is within the safe limits.

Finally, the USA Institute of Medicine Immunization Safety Review Committee convened in 2004, refused the cause-result relation between thiomersal and vaccinations considering the new epidemiologic studies in USA, Denmark, Sweden and United Kingdom as well as the studies involving the biologic mechanisms between vaccination and autism. The committee furthermore stated that the benefits of immunization were scientifically proven while speculative concerns which have not been proven scientifically could cause failure of vaccination programs.

CADMIUM

The major cadmium sources are mining of cadmium or other non-ferrous metals, their manufacturing and consumption activities. Cadmium contamination is common in the people residing near non-ferrous mining and casting sites.

Cadmium has a widespread use in industry. Particularly steel and iron is covered with cadmium for the purpose of protecting it against corrosion. Soil with cadmium content is used for brass casting, while cadmium bars are employed in nuclear power. In forming alloys with various metals; enamel, ceramic, glass, plastic and leather dyes also use cadmium. The use of nickel cadmium batteries is constantly increasing today. Although there are some restrictions in cadmium industry, the workers who work in extracting of mines such as zinc or copper, or metal glazing somehow are exposed to cadmium.

In addition to professional exposure, cadmium is taken by humans in air, water and food. Cadmium may contaminate drinking water, or it may come from pipes galvanized with zinc, solder containing cadmium, water coolers or heaters or armatures. Surface water can also contain cadmium. The waters with low acidity do have higher corrosive impact, which in turn increase cadmium contamination risk. In uncontaminated waters, cadmium concentration is expected to be lower than 1 μg/L.

Smoking is the most important cadmium source. Cadmium concentration in the cigarettes produced in Europe and United States of America is 0.5 to 2 μg/g (dry weight) of which 10% is absorbed. By smoking 20 cigarettes every day, a smoker is exposed to 2 to 4 μg cadmium.

For the non-smokers, the most important source for the ambient cadmium is foods. Cadmium can be transmitted to humans through vegetables growing on the soil contaminated or irrigated with polluted water. Cadmium is also transmitted to humans by consuming the meat of the animals which are fed on the plants growing on the contaminated soil or irrigated by polluted water. Highest cadmium concentration is in the mammal offals (kidney, liver) – (100-1000 μg/kg). If the products were grown on the soil contaminated with cadmium, a large quantity of cadmium is accumulated. Cadmium might be very high in fish, particularly in shell marine animals such as mussels. The lower the pH of the soil, the higher is the cadmium absorption by the plants. Insensible agricultural disinfection may also cause pH drops, which is another factor facilitating cadmium transmission. Raw phosphate always contains cadmium at a certain level. While production of phosphate fertilizers have a negative impact on workers' health, its use as fertilizer may cause contamination of soil by cadmium.

Itai Itai, the first disease found as associated with cadmium was caused by cadmium poisoning in Toyama region of Japan in 1950. It was named after the patient moaning due to bone and joint pains. Extracting and processing of cadmium increased between 1910 to 1945. The River Jinzu was mostly affected by such contamination. Jinzu's water was primarily used for irrigating rice fields, it was also used for drinking and consuming the fish living in it. The pollution in the river continued for years. First impact was on the fish which began to die. Irrigated by the river water, rice absorbed the cadmium in water and soil, transmitting the cadmium to the dishes.

Kidneys and bone tissue are the organs primarily affected by cadmium. Osteomalasia, softening of bones, is converted to osteoporosis. Increase in the risk of bone breaks causes a pain in the joints. It causes renal tubular dysfunction in the second important organ, kidneys. Being permanent, this damage causes low phosphate levels and associated muscular weaknesses. Hyperirusemia caused by proximal renal tubular dysfunction leads to an arthritis similar to gout. Toxic influence on liver, loss of smelling sense and severing menopause symptoms are other influences.

Because cadmium exists in the nature with lead, arsenic or chromium, these heavy metals may also have a combined effect in environmental impact.

3 to 7% of the cadmium consumed in the diet is absorbed by the intestines, the absorption rises to 15 to 20% in the patients with iron anemia. Likewise, the absorption increases in calcium, zinc or selenium deficiency. The cadmium transmitted to the blood flow is bound by metallotionin and filtered through kidneys. But when the metallotionin capacity is exceeded, it begins accumulating in the proximal tubular cells of kidneys with a toxic effect. The amount of cadmium increases with the increasing age. Cadmium is primarily stored in kidneys and liver. Biological half life of cadmium is 10 to 35 years, such little as 0.007% of the stored cadmium is discharged through kidneys.

Cadmium is expected to be fatal when 350 to 3500 mg is consumed orally. Weekly tolerable cadmium intake is 7 μg/kg or 400 to 500 μg. Daily intake of 140-255 μg cadmium within the diet causes microalbuminuria in olders. To form proteinuria in low protein weight, the critical concentration in the renal cortex is 200 mg/kg. This concentration can be reached by taking 170 μg cadmium per day for 50 years. The low protein weight proteinuria formed thereby causes Fanconi syndrome with a course of impairing calcium and phosphorus absorption. Advanced level of the Fanconi syndrome is itai-itai disease.

The cadmium intake through inhalation may start osteoporosis. Although changing according to sex and body mass index, 0.6 to 1.1 μg/L in blood doubles and 1.1 μg/L and over triples the osteoporosis risk.

There is no finding associating long term cadmium intake with cancer risk. There is no valid finding concerning its teratogenical or embryotoxical effects. Yet there are some findings that constant cadmium inhalation at work could cause lung cancer, this association has not been proven yet.

The upper limit in drinking water should be 5 ppm (EPA-Environmental Protection Agency), its use as food colorant should be limited with 15 ppm (FDA) and the upper limit of cadmium in workplace air should be 100 μg/m3 (OSHA-Occupational Safety and Health Act/Administration), while pesticides should not contain any cadmium at all (EPA).

Protection involves elimination of cadmium resources, or their reduction, rehabilitating the source output, prevention of cadmium transmission to people, banning widespread use of cadmium (for example, using of less pollutant lithium ion batteries instead cadmium batteries) and monitoring of cadmium vulnerable individuals. All these control measures also provides protection from other metals existing with cadmium in the nature, such as lead, arsenic or chromium.

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PRESERVATION OF THERMAL WATER RESOURCES & SUSTAINABLE EXPLOITATION FOR THERAPEUTIC TOURISM "PRE-THERM"

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The objective of the project is to preserve the thermal water resources of the area of Karahayit and Pamukalle, in the Aegean region of Turkey, and exploit fully their therapeutic qualities. There is already a sizeable tourism activity that is based on the archeological site of Hierapolis and the attraction of the unique thermal spring travertines but the therapeuting potential of the thermal waters is not exploited. Developing therapeuting tourism will broaden the tourist attraction base of the area, strengthen significantly its economy, provide new jobs, and establish conditions for sustainable development. The project will develop fully documented plans for regulating the usage of thermal waters to ensure the sustainability of thermal water resources and for introducing thermal health facilities and developing therapeutic tourism, and will initiate their implementation.

Environmental Problem

Karahayit town of Denizli province is a place having the residential population of 2,400 persons. Karahayıt district is accessed thorough Pamukkale located 20 km in the north of Denizli. Upon the approved development plan, the tourism area has been involved in the southern part and location area in the northeast of district. The southern border is consisting of 10 archeological areas under protection in the planning area and Denizli plain lies down on the western part. The forest areas surround the northeast part of location area. The areas where the development plan is to be executed are far 4-5 km from Pamukkale travertine.

The spring waters, which are the significant resources of Turkey, in Karahayıt and Pamukkale occurred as a result of active geologic movements in Aegean Region. Pamukkale, archaic city of Hierapolis and thermal spa were taken under protection by UNESCO. The archaic city of Hierapolis, travertine and the high quality thermal spa are the factors that constitute the tourism potential of Karahayit. The travertine that spread out in an area of 11 km^2 in Hieropolis and foots of the mountain paced among Pamukkale and Karahayıt locations. The accommodation facilities in Karahayıt serve the tourists in the region. Total bad capacity is 3,206. In addition, total bed capacity reaches up to 5,785 including 4 and 5 stars hotels in Karahayıt. Total 64% of bad capacity is present in Karahayıt.

Karahayıt has been taken under protection by the Special Environmental Protection Council (SEPC) in 1990. Karahayıt has also been dedicated as the region where the tourism facilities will be established in respect of the state decision for the buildings to be destructed in the region. The part of ¾ of location has been planned to separate as the tourism facilities. The construction has been done in part of 36% of the area separated as the tourism area in present. The green area of 131 sqm was dedicated per person in the plan. It is also necessary let the green land/park to be used in big scale among the tourism facilities in order to ensure the region improved as a thermal resort center at the high level.

Therefore the prestige and the visual value of the location shall increase. The construction prohibition was announced by SEPC in the area at the southeast part outside the plan borders. The environmental problem of is that the usage of the thermal water resources is not regulated or controlled in any way. It is estimated that there are at present over 160 known users of thermal water, who include 45 hotels and about 120 pension houses, and an unknown number of individual households. Each of these users has bored its own well and collects thermal water at will. Before the designation of the Karahayit & Pamukalle as protected area in 1991 and the introduction of the Development Plan in 2003 by the Special Environmental Protection Council, wells up to the depth of 10 ms were allowed without formalities or registration and were legal. The Development Plan did not affect the legal status of these wells as long as they would not go beyond the depth of 10ms but it requires licencing and registration for all new wells and for any old wells if they go beyond the depth of 10 ms. There is no up-to-date information of the range of sound depths, but all available evidence and word-of-mouth indications suggest that a substantial proportion of wells have now gone to a depth between 20 and 250 ms.

In spite of the provisions of the Development Plan no licences have been issued so far. More than 100 wells are believed to have been opened without permission after the introduction of the Development Plan, and as most of the older wells are believed to be now well beyond the 10 ms limit. As a result, virtually all the current usage of thermal water is illegal. The reason for this situation appears to be a combination of: first, reluctance by the users of thermal waters to register their wells and apply for a licence, which costs highly and involves a bureaucratic procedure, takes a long time, and, second, reluctance by the competent government at provincial and central government level, to enforce the respective provisions of the Development Plan. From what is known there are only 2-3 hotels that have recently initiated the procedure for getting a licence.

This situation of absence of regulation and control of thermal water usage will sooner or latter lead to the depletion of the thermal water resources and the loss for Karhayit of its only tourist attraction and source of income. Indeed in the 1970's a small water spring in Kortur village dried because of excessive usage with unauthorized wells whining the village. There is an additional environmental problem that concerns the disposal of thermal waters after their use. Their disposal without treatment represents a pollution risk for the thermal water resources themselves, whilst their chemical composition does not allow their treatment by the waste treatment plan that has recently been built.

There is an additional environmental problem that concerns the disposal of thermal waters after their use. Their disposal without treatment represents a pollution risk for the thermal resources themselves, whilst their chemical composition does not allow their treatment by the waste treatment plant that has recently been built.

At the same time the absence of regulation and control does not allow for the most profitable use to be made of the available thermal water resources. There is some self-instituted rationing in the case of most hotels and very few of the pension houses, which make available thermal water in the hotel rooms for specific hours during the day,. However in either case, the therapeutic value of the thermal water is not really utilized; the majority of foreign tourists do not come because of a health condition and in any case most stay only for one night; most of the Turkish tourists who stay for a longer period (one or two weeks) do come because of a health problem that they believe but in the absence of proper therapeutic facilities and professional health advice their benefit is minimal if not existent; whilst in the case of private households the thermal water is used in lieu hot water

This situation presents two related problems that the proposed project will tackle, which represent a threat to be avoided and and an opportunity to be sized:

- The first problem, that represents a threat, is the total absence of regulation and control of the thermal water usage, by hotels, pension houses and individual households without licences or charges, and the depletion of the thermal water resources stock if the growing use of thermal water continues unchecked. Therefore there is an urgent need to introduce a system for controlling thermal water usage that will secure the sustainability of the thermal water resources. If this does not happen the result will be an near environmental catastrophy and the end of the economic activity that supports the local population and the tourism industry.

- The second problem, that represents an opportunity, is that the therapeutic potential of the thermal water resources is not exploited. At present for foreign visitors, the therapeutic value of the thermal waters is not the reason for coming and as they stay only for one or two nights as part of a package holiday cannot benefit anyway; Turkish tourists stay for a longer period and most do come because of a health condition but in the absence of proper therapeutic facilities and professional health advice their benefit is minimal if not existent; whilst in the case of private households the thermal water is used in lieu hot water. The opportunity for the area is to exploit the thermal water resources for developing therapeutic tourism, attract the visitors from the Spa market, broaden the economic base of the area and its surrounding territory, and contribute to the tourism industry.

Objectives of the Project

The objective of the project is to preserve the thermal water resources of the area of Karahayit and Pamukalle, in the Aegean region of Turkey, and exploit fully their therapeutic qualities. There is already a sizeable tourism activity that is based on the archeological site of Hierapolis and the attraction of the unique thermal spring travertines but the therapeuting potential of the thermal waters is not exploited. Developing therapeuting tourism will broaden the tourist attraction base of the area, strengthen significantly its economy, provide new jobs, and establish conditions for sustainable development. The project will develop fully documented plans for regulating the usage of thermal waters to ensure the sustainability of thermal water resources and for introducing thermal health facilities and developing therapeutic tourism, and will initiate their implementation.

Actions and means involved

- Assess and monitor current usage of thermal water; locate al thermal water users, measure usage characteristics, install metering equipment in selected user establishments to monitor usage.
- Determine level of maximum usage that will secure sustainability of the thermal water resources; conduct geological survey.
- Determine therapeutic qualities of thermal waters; conduct chemical analyses and draw on specialist opinion.
- Determine demand of thermal water; conduct market demand survey and take into account projected tourist accomodation as set by Development Plan, inluding projected usage for therapeutic tourism
- Prepare plan for therapeutic tourism development; conduct feasibility study for Therapeutic Health Centre facility , prepare business plan and implementation plan.
- Design operations and management system for regulating the use of thermal waters; conduct feasibility study, prepare business plan and action implementation plan.
- Establish Thermal Waters Management agency with responsibility for implementation plans and thermal water regualtion nd control; conduct feasibility and organisational design study.
- Coordinate and manage project; establish Steering Committee that will include, apart from the beneficiary and partner, represetation of the Special Environmental Protection Council and of thermal water users in a consultative role, including Karahayit Hotel Association and pension owners who will be invited to organise their representation in the Committee.
- Inform and involve users of thermal water throughout the project duration; disseminate information on project objectives and progress through newsletters, establish user panels to consult on options available before decisions are taken.

State-or-art and innovation

There are four innovative aspects in the proposed project:

- The first innovative aspect relates to process of socio-economic intervention for moving from a situation where there is no regulation and control at all over the use of a valuable natural resource that runs the risk of depletion, to a situation where there is full regulation and control that ensures the sustainability of the resource and its optimum utilisation for local development.
- The second innovative aspect relates to the project approach and strategy for sustainable local development, by exploiting the resource available for introducing a new tourist product, namely therapeutic tourism, and broadening significantly the volume and quality of tourism and strengthening the base of the local economy and labour market.
- The third aspect relates to the technical approach of the project for the regulation and control of the thermal water resources, namely the projected combination of central distribution and control at the level of the user and the utilisation of state-of-art engineering and ICT.
- The fourth aspect relates to the strengthening of the management capacity and control over local development of the municipality itself, whose role at present is more that of an observer rather than that of a central participant in the process of local development.

Environmental cost/benefit ratio

Quantitative value for money calculations cannot be made at the present stage regarding the two major investments foreseen, concerning respectively the Therapeutic Health Centre and the operations and management system for the regulation and control of the thermal water resources. In both cases there will be a feasibility study and business plan that will determine the key parameters of required capital investment and expected return on capital. Implementation will be based on these two parameters that will determine the viability of the implementation plan and the potential for attracting private investment.

Regarding the proposed project itself, the nature of the project does not allow quantitative value for money calculations. Nevertheless, the fact that there is valuable natural resource that runs the risk of depletion, and at the same time represents -together with the archeological site of Hierapolis- the base for the local economy and makes a significant contribution to tourism industry in Turkey, makes it imperative that a system of regulation and control is established and worthwhile to tap the potential for broadening its contribution to the local economy and the tourism industry by developing therapeutic tourism. The actions proposed in the project represent a necessary condition for being able to establish such a system. The project through the process of considering alternative options, the conduct of feasibility study and the preparation of business plan will ensure that there will be a positive environmental cost/benefit ratio to the implementation action plan proposed in these respects.

The avarage heat of the termal waters in Karahayit Region 55 – 60 oC with the capacity of 30 Mwe and 600 MWt. Flow rate reaches to totally 450 liters per second. This capacity is under threaten by illegal usage of the thermal waters. This project aimed to establish a sustainable management to control and reasonable distributing and usage to extend life of resources. Main issue is establish a central usage system for Katahayit town to save resources and qaulity of waters in the region. This will causes valuable uses of thermal water at new and better areas such as health and central heating and energy recovery. The central usage system also will take into re-using of thermal water because of the re-generation wells which will pump back to the resources used waters to control resource water balance.

Contuniously measurements will be taken to design a master plan for the region and follow up the main problems dimensions to develop certain solutions. These measurements are;

- Flow rates of the resoruces (at wells),
- Water losses at wells
- Inventory (depths, static and dynamic levels)
- Seasonal changes of water using
- Follow up water quality
- Observation of waste water
- Minerological analysis
- Follow up illegal and new wells
- Water usage amount and quantity
- Potentials of the region
- Therapeutic usage of the thermal waters

Expected results

- Assessment of present-day situation of thermal water resources, the risk of depletion and determination of the level of thermal water usage that will secure their sustainability.
- Business plan and implementation plan for an operations and management system for the regulation and control of the thermal water, that will secure the sustainability of thermal water resources.
- Plan for maximizing the health potential of the thermal water resources by developing therapeutic tourism, including business plan and action implementation plan for a Therapeutic Health Centre.
- Initiation of implementation through the setting-up of Thermal Water Management Agency and developing and piloting prototype state-of-art metering and control equipment for the the thermal water regulation and contol management system.
- Consensus with thermal water users regarding the thermal water regulation and control system to be introduced, and active involvement in the process of developing therapeutic tourism.

MYCOTOXINS AS ENVIRONMENTAL CONTAMINANTS

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The contamination of food by chemical hazards is a worldwide public health concern and is a leading cause of trade problems internationally. Contamination may occur through environmental pollution of the air, water and soil, such as the case with toxic metals, PCBs and dioxins, or through the intentional use of various chemicals, such as pesticides, animal drugs and other agrochemicals.

Among food contaminants, mycotoxins will have greater consequences in terms of both human and animal health as well as economics. Mycotoxins are substances produced by moulds that contaminate various agricultural commodities either before harvest or under post-harvest conditions. More than 300 mycotoxins are now known to exist. They are present in the environment and, in some cases; human exposure has been documented, mainly through food contamination or occasionally through inhalation. In addition to the various moulds occurring in crops which are improperly stored, certain plant diseases are responsible for the production of mycotoxins. Different weather conditions, such as unseasonable rains at the time of flowering or cyclones and droughts during harvest and post-harvest stages; mould growth; and mycotoxin contamination can also pose serious problems.

Some mycotoxins, such as the aflatoxins, have been extensively studied by toxicologists. Aflatoxin is a potent human carcinogen. The occurrence of aflatoxins is influenced by the weather, (temperature, and humidity - warm and wet); so the extent of contamination will vary with geographic location, agricultural and agronomic practices, and the susceptibility of the peanuts to fungus before they are harvested, and during storage, and/or processing periods.

Keywords: Mycotoxin, food and environmental contaminants, aflatoxin

Introduction

Among grains and other field crops, perhaps the most prevalent source of food-related health risks are naturally occurring poisonous substances called mycotoxins. Mycotoxins are toxic secondary metabolites of molds that exert toxic effects on animals and humans (Bullerman, 1979). Mycotoxins consist of relatively low molecular weight, nonvolatile compounds with diverse chemical structures ranging from the simple monolliformin to complex polypeptides with molecular weights over 2000 (ACGIH *Guidelines* 1) and include polyketides, terpenes and indoles (ACGIH *Bioaerosols* 24). With respect to indoor environmental exposures, the mycotoxins of primary concern are cytotoxins (i.e., aflatoxin) produced by *Aspergillus flavus* and *Aspergillus parasiticus*, and the trichothecene toxins produced by *Stachybotrys chartarum*, *Mycrothecium verrucaria* and others (Burge and Hoyer 1997). There are hundreds of mycotoxins known, but few have been extensively researched and even fewer have good methods of analysis available.

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According to FAO estimates, 25% of the world food crops are affected by mycotoxins each year. And also crop loss due to aflatoxins contamination costs US producers more than $100 million per year on average including $ 26 millions to peanuts ($69.34/ha). Fungi on crops produce them in the field, during handling, and in storage. Usually, exposure is through consumption of contaminated feedstuffs or foods.

Although the potentially harmful effects of feeding moldy grain and foods has been known for many years (Matossian, 1989), mycotoxicology, the study of mycotoxins, began with the outbreak of Turkey-X disease in the United Kingdom in 1960. This outbreak was linked to peanut meal imported from Brazil (Sargeant et al., 1961). Because of an intensive mulitidiciplinary research effort a blue-fluorescent toxin was isolated and mycelia of *Aspergillus flavus* was observed. *A. flavus* was soon shown to produce the same toxic compound(s) found in the toxic peanut meal. The toxin was characterized chemically and biologically and was given the name, aflatoxin. Aflatoxin was shown to be very toxic and carcinogenic in some of the test animal species used and that it resulted in a toxic metabolite, aflatoxin M1, in milk of dairy cows (Allcroft and Carnaghan, 1962; 1963).

The discovery of aflatoxin and clarification of some of its effects led to research on other livestock health and production problems linked with moldy feedstuffs and to the discovery of additional mycotoxins produced by other fungi. In dairy cattle, swine, and poultry, mycotoxin contamination of feeds reduces growth, milk production, egg production, lower reproduction, and immunity (Diekman and Green, 1992). Mycotoxins have also been involved in outbreaks of human diseases (CAST, 1989; Hayes, 1980; Joffe, 1986).

Mechanism of action of Mycotoxins

Mycotoxins exert their effects through three primary mechanisms:
(1) A reduction in amount of nutrients available for use by the animal. Mold growth can reduce the content of nutrients such as vitamins and amino acids such as lysine in feedstuffs (Kao and Robinson, 1972). The energy value of feeds is usually reduced by mold growth. Second, some mycotoxins reduce feed intake which lowers nutrient intake. Third, a mycotoxin-produced irritation to the digestive tract can reduce nutrient absorption, and forth, certain mycotoxins interfere with normal nutrient metabolism such as the inhibition of protein synthesis by T-2 toxin.

(2) Effects on the endocrine and exocrine systems. An example is the effect of zearalenone on reproductive performance due to its estrogenic effects. Zearalenone's estrogenic effect results from the affinity of zearalenone and its derivatives to bind with the animal's estrogen receptors (Klang et al., 1978).

(3) Suppression of the immune system. The effects of mycotoxins on immunity have been reviewed (Sharma, 1993). Trichothecenes such as DON and T-2 toxin reduce immunity by inhibiting protein synthesis and thus cell proliferation. Some mycotoxins are cytotoxic to lymphocytes in vitro. Corticosteriods produced in response to stress also reduces immune function.

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Natural occurrence

Contamination by mycotoxins effects as much as one-quarter of global food and feed crop output. Food products contaminated with aflatoxins include cereal (maize, sorghum, pearl millet, rice, wheat), oilseeds (groundnut, soybean, sunflower, cotton), spices (chillies, black pepper, coriander, turmeric, zinger), tree nuts (almonds, pistachio, walnuts, coconut) and milk.

Routes of Contamination

Many fungal genera are associated with mycotoxin contamination of raw and processed foods including *Aspergilus, Penicillium, Byssochlamys, Alternaria* and *Fusarium.* Production of mycotoxin depends both on characteristics of fungus and environmental factors. Figure 1 describes the possible routes of contamination of foods with mycotoxins (Nijs and Notermans, 1998).
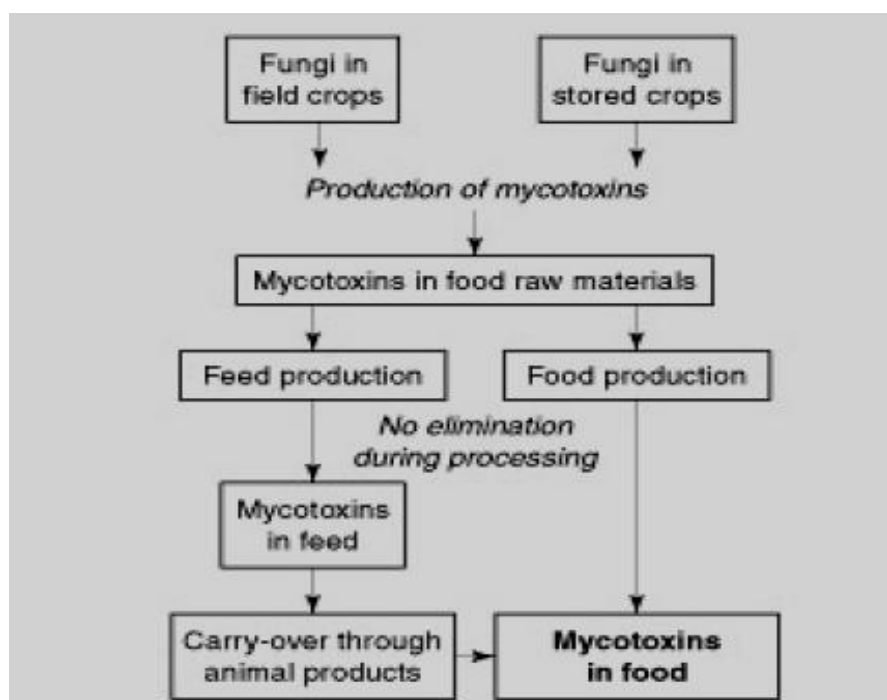
Figure 1. Routes of contamination of foods by mycotoxins (Nijs and Notermans, 1999).

Mycotoxin production (types and amounts) depends on the fungal species, metabolism substrate, temperature, pH, presence of other organisms and related environmental factors. More than one fungal species or genus can produce the same mycotoxin compound. Additionally, a single fungal species can produce more than one mycotoxin. When mycotoxins are produced, they are typically identified in the fungal spores (mycelia) and in the growth substrates (wood, paper, etc.) in quantities dependent on the specific fungal species and strain.

Under normal temperature conditions, the fungal genera *Aspergillus* and *Penicillium* seldom infect cereal crops. Production of carcinogenic mycotoxins, aflatoxins and chratoxin occurs during growth. When the harvested cereals are stored under sub-optimal conditions, these fungi create a risk. One of the significant factors for mycotoxin production is rise in water activity. A moist atmosphere during harvest, increased environmental humidity, leaking water in depot or condensation of moisture during storage or transportation cause these fungi to grow. These fungi can infect crops in the fields in the tropics and subtropics. Most reports are of aflatoxin contamination of (ground-) nuts and figs (Figure 2).

Figure 2. Aflatoxin contaminated peanuts.

Physical and chemical properties

Aflatoxins are potent toxic, carcinogenic, mutagenic, immunosuppressive agents, produced as secondary metabolites by the fungus *Aspergillus flavus* and *A. parasiticus* on variety of food products. Aflatoxins are normally refers to the group of difuranocoumarins and classified in two broad groups according to their chemical structure; the difurocoumarocyclopentenone series (AFB1, AFB2, AFB2A, AFM1, AFM2, AFM2A and aflatoxicol) and the difurocoumarolactone series (AFG1, AFG2, AFG2A, AFGM1, AFGM2, AFGM2A and AFB3). The aflatoxins display potency of toxicity, carcinogenicity, mutagenicity in the order of AFB1 > AFG1 > AFB2 > AFG2 as illustrated by their LD50 values. Structurally the dihydrofuran moiety, containing double bond, and the constituents liked to the coumarin moiety are of importance in producing biological effects.

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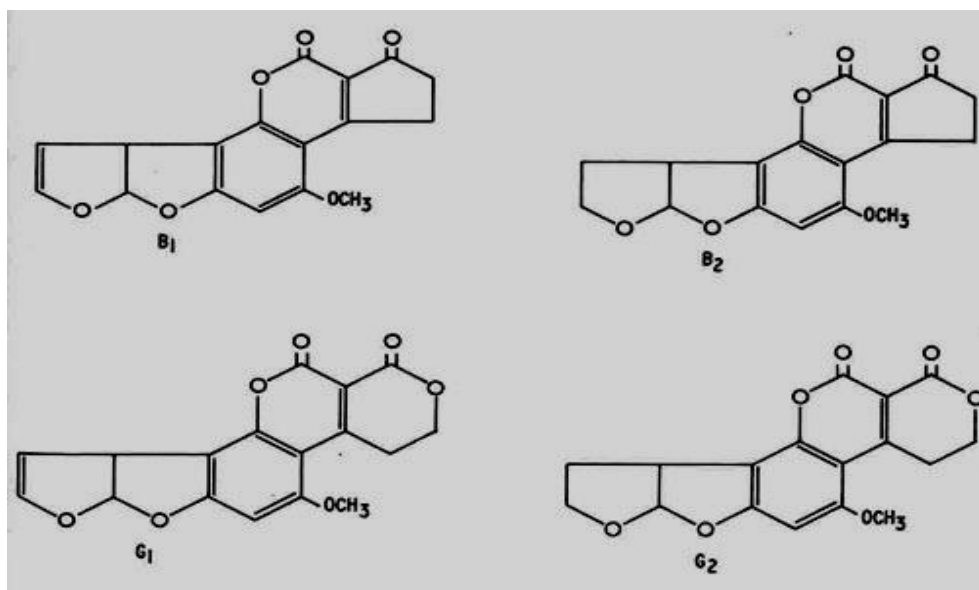
Figure 3a. Structures of aflatoxins B_1, B_2, G_1 and G_2
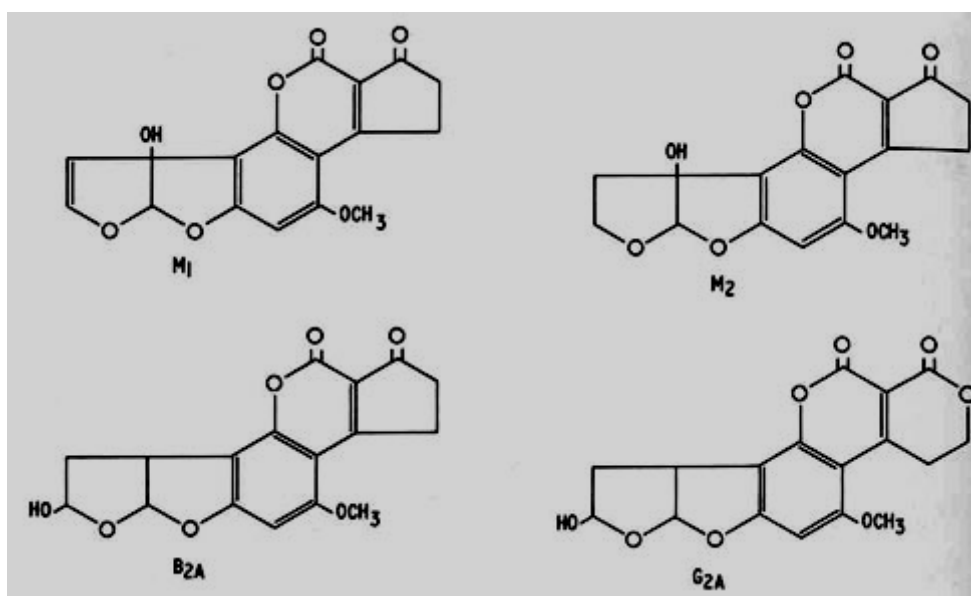
Figure 3b. Structures of aflatoxins M_1, M_2, B_{2A} and G_{2A}

The aflatoxins fluoresce strongly in ultraviolet light (ca. 365 nm); B1 and B2 produce a blue fluorescence where as G1 and G2 produce green fluorescence.

Health effects of mycotoxins

Mycotoxicoses are diseases caused by exposure to foods or feeds contaminated with mycotoxins (Nelson et al., 1993). Mycotoxins exhibit a variety of biological effects in animals such as: liver and kidney toxicity, central nervous system abnormalities, estrogenic responses and others. Food contaminated with mycotoxins can cause sometimes fatal acute illness and is associated with increased cancer risk from longer term exposure.

Mycotoxins can increase incidence of disease and reduce efficiency of production. In the field, animals experiencing a mycotoxicosis may exhibit a few or many symptoms including: digestive disorders, reduced feed consumption, unthriftiness, rough hair coat or abnormal feathering, undernourished appearance, subnormal production, impaired reproduction, and/or a mixed infectious disease profile. Some of the symptoms observed with a mycotoxicosis may be secondary, resulting from an opportunistic disease which is present because of immune suppression. Therefore, the progression and diversity of symptoms are confusing and diagnosis is difficult (Hesseltine, 1986; Schiefer, 1990). Diagnosis is further complicated by a lack of research, by a lack of feed analyses, by nonspecific symptoms, by interactions with other stres factors. A definitive diagnosis of a mycotoxicosis cannot be made directly from symptoms, specific tissue damage, or even feed analyses. Previous experience with mycotoxin-affected herds or flocks increases the probability of recognizing a mycotoxicosis. A process of elimination of other factors, coupled with feed analyses and responses to treatments can help identify a mycotoxicosis. Regardless of the difficulty of diagnosis, mycotoxins should be considered as a possible cause of production and health problems when such symptoms exist and problems are not attributable to other typical causes (Schiefer, 1990).

Increasing production is the national goal of every developing nation and therefore the measures to avoid losses during preservation, processing, storage and marketing, have to be afforded due priority in the developmental plans particularly with regard to the invasion of toxic fungi. To protect consumers from these health risks, many countries, including the United States, have adopted regulations to limit exposure to mycotoxins, often taking the form of product standards. Mycotoxin monitoring programme has been integrated with the study of causative fungi for developing a viable strategy to control the mycotoxin contamination in food and feed.

However, different perceptions of acceptable health risks have led to widely varying standards among different national or joint agencies. Developing countries need to be channelled to increased production by avoiding unwanted natural contaminants like mycotoxins.

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HOW VOLATILE ORGANIC COMPOUNDS EFFECT FREE RADICAL AND ANTIOXIDANT ENZYME ACTIVITES IN TEXTILE WORKERS

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Various effects of exposure to volatile organic compounds (VOCs) are recently became an important issue because of widespread use of VOCs in industry. The aim of this study was to determine volatile organic solvent-associated effects commonly used in textile of paint industry on free radical level and antioxidant enzyme systems in workers who work in these factory. Twenty workers were included in this study. Twenty workers were employed in a textile factory. Control group was constructed of twenty healthy people. Blood samples were drawn after an overnight fast of 10-12 hours. MDA (Malondialdehyde), TAC (Total antioxidant capacity) and ALT, AST levels were studied at serum. SOD activity was studied at erythrocyte. Data were analysed with SPPSS 10.00 program. Stastical analysis was performed using ANNOVA and Kruskall- Wallis analysis tests.

MDA level was found to be elevated at the textile group than the control group (p<0,01). Textile group's SOD activity was higher than control group (p<0,01). Whereas no stastical difference was observed in TAC levels between textile and control group (p<0,01). Serum ALT, AST levels were not significantly difference between each two groups (p>0,05). As a result, elevated MDA levels in the textile group may indicate that increased lipid peroxidation at exposure of long-term organic solvents. Whereas elevated SOD activity in the textile group compared to control exposes that antioxidant system is activated against to lipid peroxidation.

Key Words: VOC, MDA, TAC, SOD, ALT, AST

Introduction
Free radicals are continuously produced during aerobic metabolism. Oxidative damage caused by free radicals is counteracted by a number of enzymes and vitamins. The imbalance between the rate of free radical production and the effect of protective antioxidants leads to oxidative damage, which is also known as oxidative stress (1). The toxic effects of volatile organic compounds are caused by formation of reactive oxygen species (ROS). Free radicals are highly reactive species that are involved in cellular damage and can contribute to the conversion of normal cells. Reactive intermediates also are generated by the cytochrome P450 enzymatic system. These intermediates may bind covalently to proteins, lipids, deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) and may inactivate receptors and proteins, damage cellular membranes or initiate mutagenic reactions (2).ROS are believed to cause lipid peroxidation resulting in damage to biological membranes (3).Antioxidants such as enzymatic and nonenzymatic defans system is necessary to prevent cellular damage (4)
Studies on textile workers include the association between exposure and health effects, yet little is known about biomarkers of these disorders. Although levels of MDA, SOD, TAC parameters have not been studied in textile workers. Therefore, the purpose of this study was to examine effects of volatile organic compounds on lipid peroxidation and antioxidant enzyme activities in textile worker.

Methods

Twenty male textile workers were chosen as the exposure group and a similar number of healthy male, matched by age, were chosen as controls (Table 1). All workers were asked to answer questionnaire that inclueded questions about age, smoking health, years worked as a textile worker, use of gloves and personal respiratory protective equipment during working. The study was explained to workers and take permission from local ethics comission.

Table 1 - *Characteristics of the Groups Studied*

Parameter	Textile group	Control group	p
Age (year)	31.75 ± 2,12	31.35 ± 3.12	>0,05
Lenght (m)	1,697 ± 6,06	1.77 ± 6,915	>0,05
Weight (kg)	69.5 ± 9.95	80.05 ± 11.93	>0,05
Smoking \year	10 ± 5.97	9.88 ± 6.25	>0,05
Amount\day(sigara)	18.57 ± 3.77	21.87 ± 7.52	>0,05
Working duration (year)	8,27 ± 3,87		
Smokers\nonsmokers			

Note. Data are presented as mean ± SD of 20 subjects in each group.

Blood samples were taken from each subject after 10-12 hours fasting from workers at working site were codified and transported to the lab, where they processed. Sera were seperated and used without any treatment. Erytrocytes were washed with %0,9 NaCl solution and centrifuged for 10 min. Washing was repeated 3 times. After complete lysis, cellular particles were removed by centrifugation and hemolyzate was used for the determination of SOD activity.

Measurement of MDA levels
Serum lipid peroxide levels were determined by measuring malondialdehyde, which is an end product of lipid peroxidation. Spectrophotometric malondialdehyde method described by Jain et all (7). The amount of colored complex obtained by the reaction of MDA and thiobarbituric acid was determined 532 nm at spectrophotometer. The absorbtion was slamed absortivity coefficient and the result was given as nanomol per liter of serum.

Measurement of Erythrocyte SOD Activity Levels

The activity of superoxide dismutase was measured according to RANSOD kit (Randoz Laboratories Ltd, UK). The role of superoxide dismutase is to accelerate the dismutaion of the toxic superoxide radical (O^-_2), to hydrogen peroxide and molecular oxygen. This method employs xanthine and xantine oxidase (XOD) to generate superoxide radicals which react with INT to form a red formazon dye. The superoxide dismutase activity is then measured by the degree of in inhbition of this reaction at spectrophotometer, 505 nm. Levels of hemoglobin were measured by an automatic complete blood counter. The results were given hemoglobin concentration per erytrocyte SOD activity.

Measurement of Total Antioxidant Capacity Levels
The quantity of total antioxidant capacity was measured according to Immun diagnostic kit procedure. The determination of the antioxidative capacity is performed by the reaction of antioxidants in the sample with a defined amount of exogenously provided hydrogen peroxide (H_2O_2) The antioxidants in the sample eliminate a certain amount of the provided hydrogen peroxide. The residual H_2O_2 is determined colorimetrically by an enzymatic reaction which envolves the conversion of TMB to a colored product. After addition of a stop solution, the samples are measured at 450 nm in a microtiter plate reader. The difference between applicated and measured peroxide concentration in a defined time period is proportional to the reactivity of the antioxidants of the sample (antioxidative capacity).

Statistical analysis
Mean and Standard deviation were calculated for each parameter. Data were estimated with SPPSS 10.00 program and microsoft excel. Kruskall- Wallis variance tests were used. A value of $p < 0,05$ was considered statistically significant.

Results
None of the textile workers in this study used gloves and protective respiratory equaipments. All of the workers have spent least 5 year in occupation. There were 9 smokers and 11 non-smokers both paint and control group (Table 1).

MDA level was found to be elevated at the textile group than the control group ($p < 0,01$). Textile group's SOD activity was higher than control group ($p < 0,01$). Whereas no stastical difference was observed in TAC levels between textile and control group ($p < 0,01$). Serum ALT, AST levels were not significantly difference between each two groups ($p > 0,05$).

Table 2 - *MDA, SOD and TAC levels in textile and control group.*

Parameter	Textile Group (n=20)	Control Group (n=20)	p
MDA[a] nmol/mL	4.35 ± 0.46	1.52 ± 0.45	<0,01
SOD[b] Ü/gHb	1234.18 ± 26.39	1045.19 ± 14.75	<0,01
TAC[a] µmol/L	280.18 ± 50,84	244.72 ± 57.11	<0,01

Note. Data are presented as mean ± SD of 20 subjects in each group.
[a] In serum.
[b] In erythrocyte
[c] Significant difference from control (p<0,01)

Discussion

Free radicals are continuously produced during aerobic metabolism. Oxidative damage caused by free radicals is counteracted by a number of enzymes and vitamins. The imbalance between the rate of free radical production and the effect of protective antioxidants leads to oxidative damage, which is also known as oxidative stress (1).

Organic solvents are a chemical class of compounds that are used routinely in commercial industries. They share a common structure (at least 1 carbon and 1 hydrogen), low molecular weight, lipophilicity, and volatility, and they exist in liquid form at room temperature (5). They differ in chemical structure yet generally share important characteristics. They will evaporate (form vapor) quickly and easily at room temperature. So that by inhalation, diffusion from alveoli to blood proceeds rapidly. The liver is the site of most solvent metabolism, specifically the cytochrome P450 mixed function oxidase system, which varies in individuals by ethnicity and age. Cytochrome P450 was shown to yield very high levels of reactive oxygen species (6).

ROS-induced lipid peroxidation is an oxidative process associated with membrane lipid destruction. So that MDA is formed as an end of the lipid peroxidation. Superoxide dismutase is an enzyme extensively used as an indicator of oxidative stres. At the first strep of the defense system against oxidative stress, it catalyzes dismutation of the superoxide anions (O_2^-) into hydrogen peroxide (H_2O_2). H_2O_2 is one of the most active oxygen species (7).

A significantly increase in SOD activity in erythrocytes in our study may have occured in order to neutralize the excess superoxide anions originating from volatile organic compounds such as benzene, toluene and thinner. Also, benzene metabolites are known to produce oxidized species and reactive oxygen (8). Furthermore, inhibition of benzene metabolism by toluene increases the reactive oxygen is produced, the more the activity of SOD is increased in order to convert into H_2O_2. Since we could not find any similar study which examined the effect of antioxidant enzyme and free radical at exposure of textile workers. Halifeoğlu et all was found that increased MDA and SOD activity at working with paint thinner (9). Increased SOD activity was reported in adolescents with inhalant abuse (10). The antioxidant system has many components. Antioxidant capacity may give more relevant biological information compared to that obtained by the measurement of individual compenents, as it considers the cumulative effect of all antioxidants present in plasma and body fluids (11). Whereas no stastical difference was observed in TAC levels between textile and control group.

This findings showed that the other antioxidant defans mechanism is used versus to oxidative damage. Our data indicate that smoking is not a confounder for the association between solvent exposure and changes in blood parameters.

As a result, elevated MDA levels in the textile group may indicate that increased lipid peroxidation at exposure of long term organic solvents. Whereas elevated SOD activity in the paint group compared to control exposes that antioxidant system is activated aganist to lipid peroxidation.

Whichever the case is, our results permit us to conclude that textile workers studied represent a risk group and should be medically followed up with more frequent periodic examinations. This workers may be taken some antioxidant supply and should be used gloves and protective equipments tightly.

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A TURKISH EXAMPLE ON BREASTFEEDING CHARACTERISTICS OF 0-11 MONTHS OF AGE INFANTS

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BACKGROUND AND OBJECTIVES

The importance of appropriate infant and young child feeding for child survival, growth and development is well known. Exclusive breastfeeding for the first six months of life confers important benefits on the infant and the mother. It protects infants against childhood diseases, including repeated gastrointestinal infections and pneumonia, and hence against some of the major causes of childhood mortality. Timely introduction of adequate and safe complementary foods at six months of age helps to fill the dietary gaps that cannot be met by breast milk alone. Continued breastfeeding for two years or beyond confers major nutritional benefits and is an essential component of appropriate complementary feeding. [1-3] Unfortunately, infant and young child feeding practices world-wide are not optimal although they seem to be increasing.

Global monitoring indicates that only 39% of all infants world-wide are exclusively breastfed, even when the assessment is made in children less than 4 months of age. The timely complementary feeding rate is similarly low with a global average of 60% in 2002[1,4]. Survey data from 43 countries indicate a significant increase in exclusive breastfeeding, from 39% to 46% between 1989 and 1999, with wide variations within and between geographic regions. In many developing countries certain cultural beliefs continue to interfere with optimal breastfeeding, especially feeding colostrum and breastfeeding exclusively. [1]

World Health Organization (WHO) and United Nations Children's Fund (UNICEF) jointly developed the Global Strategy for Infant and Young Child Feeding which calls upon governments to ensure that the health and other relevant sectors protect, promote and support exclusive breastfeeding for six months and continued breastfeeding for two years or beyond and to promote timely, adequate, safe and appropriate complementary feeding with continued breastfeeding. Scientific evidence has guided the development of international recommendations for optimal infant feeding practices, which include exclusive breastfeeding for 6 months (breast milk only with no other liquids or foods given) and continued breastfeeding up to 2 years of age or beyond with timely addition of appropriate complementary foods. Improving childhood nutrition is essential to achieve these goals. [1, 5-8]

In this cross-sectional study we aimed to determine the frequency of breastfeeding, some breastfeeding indicators (WHO indicators [5,6]) and the influencing factors on mothers' breastfeeding behaviors in the catchment area (CA) of a primary health care unit (PHCU) of a district in Ankara.

METHODS

Mothers having infants, age of 0-11 months, and living in the CA of a PHCU of a district in Ankara, are included in the study. According to the records of the PHCU, the total number of the infants was 370 in the region. Within the total, 102 infants were chosen for the sample. Data collection was completed by face to face interviewing technique. Verbal consent of both the director of the PHCU and the participants were taken prior to the interviewing process. The dependent variable of the study was "selected characteristics of the infant nutrition" and there were various independent variables such as socio-demographical characteristics, delivery properties, etc. SPSS program 13.0 was used for data entry and statistical analysis. Logistic regression analysis was used for further analysis.

Exclusively breastfeeding rate under 6 months and 4 months age (Number of infants aged less than 4/6 months who were exclusively breastfed in the last 24 hours/ Number of infants aged less than 4/6 months surveyed), complementary feeding rate (Number of infants aged 6-9 months receiving complementary food in the last 24 hours/ Number of infants aged 6-9 months), bottle-feeding rate (Number of infants aged 12 months and over bottle feeding in the last 24 hours/Number of infants aged 12 months and over) were calculated.

RESULTS

Table 1. Characteristics of the Infants (Ankara, 2006)

Characteristics	Number	%
Sex		
Male	54	52.9
Female	48	47.1
Age (month)		
<6	25	24.5
≥ 6	77	75.5
Mean±sd= 7±0.02, Median=7		
Mothers' age		
18-24	31	30.4
25-29	40	39.2
30-34	23	22.5
35-39	7	6.9
≥40	1	1.0
Mean (±sd)= 27.2 ± 4.7 Median=27 Min-max= 18-41		
Fathers' age		
18-24	3	3.0
25-29	36	35.3
30-34	40	39.2
35-39	13	12.7
≥40	10	9.8
Mean (±sd)= 31.4± 4.9 Median=31 Min-max= 23-46		
Mothers' education		
Literate, not graduated from Primary School	3	2.9
Primary School	36	35.3

Secondary School	13	12.7
High School	35	34.4
University/Academy	15	14.7
Fathers' education		
Literate, not graduated from Primary School	1	1.0
Primary School	27	26.5
Secondary School	12	11.7
High School	42	41.2
University/Academy	20	19.6
Mothers' work status		
Doesn't work	89	87.3
Works	13	12.7
Fathers' work status		
Doesn't work	3	2.9
Works	99	97.1
Social insurance		
No	15	14.7
Yes	87	85,3
Total	102	100.0

Of the infants, 52.9% were males (54 infants), and 47.1% (48 infants) were females. Majority of the infants were 6 months of age and older (77 infants; 75.5%). Mean age of the mothers were 27.2±4.7 years, 34.4% were graduated from high school and 87.3% didn't work. Mean age of the infants was 220,7±8.8 days and 47.1% were females (Table 1).

Table 2. Characteristics About the Infants' Feeding Process (Ankara, 2006)

Characteristics	Number	%
Parents hold the baby		
Right after the birth	22	21.6
In the first 30 minutes	31	30.4
After the first 30 minutes	48	47.0
Doesn't remember	1	1.0
Time when the infant was breastfed first		
Never breastfed	1	1.0
In the first 30 minutes	40	39.2
After the first 30 minutes	61	59.8
Breastfed		
Yes	90	88.2
No	12	11.8
Early rooming		
Yes	98	96.1
No	4	3.9
Pacifier used		
Not used	65	63.7
Yes, used because it helps the baby *	37	36.3

		22	59.5
to stop crying			
to sleep		12	32.4
Do not know		3	8.1
Bottle feeding			
No	46	45.1	
Yes	56	54.9	
To give formula		28	50.0
To give complementary food		12	21.4
To give water		11	19.7
To give breastmilk		5	8.9
Total	102	100.0	

Of the infants, 21.6% were hold by the mother right after the delivery and 39.2% were breastfed in the first 30 minutes. Thirty-six point three percent were given pacifier and 54.9% were fed with bottle. Eighty eight point two percent of the infants were breastfed whereas 70.6% were given complementary food and 44.1% formula. Infants were bottle fed to give formula (50%), complementary food (21.4%), water (19.7%) and breast milk (8.9%) (Table 2).

Table 3. Frequency* of Nutrition Status of the Infants (Ankara, 2006) (n=102)

Type	Under 12 months of age n (%)	Under 6 months of age n (%)
Breastmilk	90 (88.2)	36 (94.7)
Complementary food	72 (70.6)	9 (23.79
Formula	44 (44.1)	13 (34.2)
Water	35 (35.3)	7 (18.4)
Bottle feeding	2 (2.0)	11 (29.7)

*More than one answer was reported.

Ninety infants were given breastmilk (88.2%); 72 were fed by complementary food (70.6%); 44 were given formula (44.1%); 35 were given water (35.3%); and 2 had bottle feeding experience (2.0%) under 12 months of age (Table 3). Of the infants under the age of 6 months, 72.0% were given breastmilk and water, 32.0% were given breastmilk and formula, 4.0% were given breastmilk and complementary food. Frequency of exclusively breastfeeding was 64.0% in this group.

Table 4. Breastfeeding Indicators (Ankara, 2006)

Indicators	%
Exclusively breastfeeding rate (%) (less than 6 months age)	64.0
Exclusively breastfeeding rate (%) (less than 4 months age)	69.2
Complementary feeding rate (%)	44.7
Bottle-feeding rate (%) (last 24 hours)	33.9

Exclusively breastfeeding rate of the infants younger than six months of age was found to be 64.0%. Similarly, complementary feeding rate was 44.7% and bottle-feeding rate was 33.9% (Table 4).

Table 5. Characteristics of Nutrition of the Infants (Ankara, 2006)

	Water		Complementary food		Cow's milk		Formula	
	Number	%*	Number	%*	Number	%*	Number	%*
Initiation time (months)								
< 6	23	22.6	29	28.4	1	1.0	35	34.3
≥ 6	12	11.7	43	42.2	1	1.0	12	9.8
Didn't give	67	65.7	30	29.4	100	98.0	57	55.9
Directed by								
No one	79	77.4	53	52.0	101	99.0	75	73.5
Someone*	23	22.6	49	48.0	1	1.0	27	26.5
Total	102	100.0	102	100.0	102	100.0	102	100.0

   *Dietitian, doctor, nurse, family members, relatives

Mothers started to give water to 22.6%, complementary food to 28.4%, and infant formula to 34.3% of the infants under 6 months of age. They gave water to 11.7%, complementary food to 42.2%, and infant formula to 9.8% of the infants after 6 months. Mothers who started to feed their babies with other products in spite of breastmilk stated someone's direction on their choices (22.6% for water; 48.0 for complementary food; 1.0 for cow's milk, and 26.5% for formula) (Table 5).

Table 6. Associations Between Breastfeeding Status and Some Selected Statements of Mothers on Factors Influencing Their Breastfeeding Behaviors (Ankara, 2006)

Some factors which influence mothers' feeding status of their babies with breast milk	Breastfeeding					
	Yes		No		Total*	
	n	%	n	%	n	%
Have supportive husband						
Yes	50	90.9	5	9.1	55	53.9
No	40	85.1	7	14.9	47	46.1
χ^2: 5.53 p>0.05						
Availability of information on child health media programs						
Yes	59	90.8	6	9.2	65	63.7
No	31	83.3	6	16.2	37	36.3
χ^2: 4.35 p>0.05						
Influenced by other family members' directions						
Yes	45	91.8	4	8.2	49	48.0
No	45	84.9	8	15.1	53	52.0
χ^2: 5.76 p>0.05						
Need recommendations of friends' and neighbors'						
Yes	42	89.4	5	10.6	47	46.1
No	48	87.3	7	12.7	55	53.9
χ^2: 5.53 p>0.05						

Belief on living in an urban district to be more

influential compared to living in rural places						
Yes	51	85.0	9	15.0	60	58.8
No	39	92.9	3	7.1	42	41.2
χ^2: 4.94 p>0.05						
Mothers' education						
Ortaokul ve altı	47	90.4	5	9.6	52	51.0
Lise ve üstü	43	86.0	7	14.0	50	49.0
χ^2: 5.88 p>0.05						
Mothers' age**						
≤27	48	88.9	6	11.1	54	52.9
>27	18	90.0	2	10.0	20	47.1
χ^2:2.35 p>0.05						
Social insurance						
No	14	83.3	1	6.7	15	14.7
Yes	76	87.3	11	12.7	87	85.3
χ^2: 0.47 p>0.05						
Mothers' work status						
Doesn't work	81	91.0	8	9.0	89	87.3
Works	9	69.2	4	30.8	13	12.7
χ^2: 0.21 p<0.05						
Total	90	88.2	12	11.8	102	100.0

*Column percentage, others are row percentage
 **Classified according to the median age.

Majority of the mothers who were supported by their husbands on their baby-nutrition decisions breastfed their babies more that the ones who did not declared this support (90.9% versus 85.1). Mothers who had easy access to information via media programs, who were influenced by either other family members or friends-neighbors gave breastmilk to their babies more than the ones who did not easy access to information via media programs, were not influenced by either other family members or friends-neighbors. On the contrary, mothers who believed that "living in urban settings could have been more influential on the breastmilk preference" breastfed their babies less. None of these relationships were found to be statistically significant (p>0.05) (Table 6).

Of the mothers who stated that the socioeconomic status did not influence their choices, 51.1% fed their babies with infant formulas, whereas of the mothers who stated that socioeconomic status has influenced their choices, 34.5% gave infant formulas (p<0.05).

Of the mothers who doesn't work 91.0% breastfed their babies whereas of the mothers who work, 69.2% did. There was significant association between these groups (χ^2: 0.21 p<0.05) (Table 6). There were no significant associations between getting information or not before or after birth, education status and age of mothers, and nutrition status.

DISCUSSION

Achieving the goal to increase the frequency of "exclusively breast feeding" requires both international and national powerful regulations. One of the major global strategies is the "Baby Friendly Approach" which has been put into practice since 1990s. Briefly, with this approach, there are specific regulations promoting the mother to start to feed her baby as early as possible until the baby is 6 months of age. [9,10] In many of the countries, especially developing countries the breastfeeding rate for a period of time might have found to be satisfactory in some aspects. [3]

Although the mothers start to breastfeed their babies after birth, there is a very important problem in maintaining this behavior until the baby reaches to 6 months of age. In our study, exclusively breastfeeding rate of the infants younger than six months of age was found to be 64.0%. It is higher than the global rates [4,11], however it is still lower than the recommended rates as we have almost traditional practices on this issue. As optimal breastfeeding requires maternal choice combined with the ability to implement that choice, our result may emphasize a number of rationales. Influences such as cultural attitudes and national policies, may or may not be directly perceived as affecting mothers' choices. All of the facts including the late onset of first breastfeeding, cesarean section, existence of health problems at birth, low birth weight, good income, multiparity, pacifier use and bottle feeding and more are powerful determinants that influence the degree to which a mother experiences support or barriers to optimal breastfeeding. [1] In our study we found that frequency of bottle feeding was 54.9% and pacifier use was 36.3% (Table 2). Studies show that pacifier use is associated with significant declines in the duration of full and overall breastfeeding. Women who introduced pacifiers tend to breastfeed their infants less frequently and experience breastfeeding problems consistent with infrequent feeding. Pacifier use also effects the general health of the babies. [11,12] In Unsal et. al's study, it was found that the frequency of breastfeeding in the first six months was low for the infants whose mothers used pacifiers or fed their babies with bottle. [11] According to studies in other countries, these factors are found to be important and effective on duration of breastfeeding. [11,12]

Recent studies showed that mother age has positive effects on breastfeeding but in our study we didn't find significant association although mothers more than 27 years old were more likely to breastfeed their babies. [13,14] Breastfeeding were more common among the mothers who were graduated from primary school (92.3%). There are studies revealing that high education status has positive effects on breastfeeding [13,14], neverthless we didn't find similar results. This result may be due to the small sample size of our study (Table 6).

Parallel with our data, TDHS 2003 data shows that in this age group, 18% of the infants were given formula.[15] In our study seventy percent of the mothers using formula, stated that they were directed by a doctor on their decisions (Table 5). This result shows us that there may be some gaps in informing and directing the mothers and also health workers may not be well informed or adequate to support mothers. Labarere et. al's study provides preliminary evidence of the efficacy of breastfeeding support through an early, routine, preventive visit in the offices of trained primary care physicians. It also suggests that a short training program for practicing physicians may contribute to improving breastfeeding outcomes. [16]

In our study we wanted to learn about the influential factors of the mothers' feeding choices. We found family members or relatives to be effective on mothers' choices. Another finding of our study was that father's support and active participation had positive effects on the initiation and duration of breastfeeding. However, we could not find a statistically significantly relationship between these variables (Table 6). Other studies from different countries with significant results were similar to our findings. [4, 9,13,17-24]

Breastfeeding is a natural act. However, mothers need to learn how to feed their babies accurately. They should have active support for establishing and sustaining appropriate breastfeeding practices. [4,9,13,17,18,22-24] The governments have roles and regulations on this purpose with the help of "Baby Friendly Initiatives". The Turkish Government has also practices on the same issue as we have 323 Baby Friendly Hospitals nationwide in 2006. [25]. Many countries including Turkey have taken action to implement and monitor the International Code of Marketing of Breast-milk Substitutes and subsequent relevant Health Assembly resolutions. The Code is a set of recommendations to regulate the marketing of breast-milk substitutes, feeding bottles and teats. The Code advocates that babies be breastfed. If babies are not breastfed, for whatever reason, the Code also advocates that they be fed safely on the best available nutritional alternative. Breast-milk substitutes should be available when needed, but not be promoted. [26]

LIMITATIONS OF THE STUDY

Research was conducted in weekdays so the interviewers had to visit some of the houses more than once. Sample was chosen using the records of the PHCU and only represents the region of the catchment area of this health center. More data is required to have and discuss on a broader perspective.

CONCLUSION

In the study region, mothers' breastfed their babies but the frequency of exclusively breastfeeding should have been promoted as the frequency is 64.0% for the babies under the age of 6 months. Detailed information giving priority to cultural characteristics on the influencing factors of mothers' breastfeeding choices is recommended to be collected. Essential interventions to protect, promote and support appropriate infant and young child feeding should be supported.

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PUBLIC HEALTH IMPORTANCE OF RECREATION WATER

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Recreation waters, by definition, serve the purpose of relaxing and enjoying all kinds of recreative activities. This category also includes river, lake (natural and artificial), sea and pools.Lately there has been set an increasing global trend of intensive exploiting of recreation waters and, along with it developing new sports and new ways of recreative activities.

Modern people are being more and more overwhelmed by their work, which makes it even a greater pleasure to relax by the waters thus becoming a need.

However, due to a global ecological imbalance and all sorts of human environment segments, these waters are being more and more contaminated thus representing a source of numerous and different kinds of diseases.

The area of Herzegovina-Neretva Canton is very rich with all kinds of recreation waters and, it represents the only area in Bosnia and Herzegovina that includes the beach, meaning that it includes its part of the sea.

Public Health Institutes, in co-operation with sanitary inspectors, works on testing the quality of the waters, during the period of using recreation waters.

In our work we will present our own results based on many years of working in testing the waters, along with the difficulties we have come across in our work.

Key words: *recreation waters, contamination, Herzegovina-Neretva canton*

Introduction

Water is very important for the life of people. It has meny functions and one of the very important of them is the role of water for recreation. The modern lifestyle is very stressing and does not leave people much free time. In the same time the need for the recreation on the water and recreation and active use of free time is becoming more important every day.

Among the most favourite recreations are different kinds of sports and social events wich take place on the water or the coast nearby the water.Water is also an inspiration for artists: painters, musicians.
Also, preserving of water as a natural resource is one of the most important aims of ecological organisations.

The name „recreation water „ most offen refers to different kinds of sports on the water, and there is a a big number of them. There are: swimming, diving, the driving of glissers, boats, scuters, waterskiing, rafting.

The area of Bosnia and Herzegovina is very rich with different kinds of recreation water and beside it is very common. One of the elementary precautions for safe sport on the water is good quality thet means its microbiological safety.

In recreation waters different kinds of microorganisms can be found, some of them are patogenous.That is the reson why after recreation in contaminated water different infections can appear. The most common among them are infections of gastrointestinal tract, the most often it is enterocolitis, also meningitis serosa and skin infections.

The jung children and non swimmers are the most affected people because they recreate in water nearby the coast, where the contamination is the most intensiv.

The public health institutes are institutions wich work on the examininig of the recreation water quality, and in cooperation with sanitary inspectors they give recommendation for the safe use of water to owners of recreation objects, beach owners and users.

Goal: To show the recreation waters in the southern part of Bosnia and Herzegovina, Herzegovina- neretva canton, with a special attention given to health value of recreation water as an important public health problem.

Material and methods: In this work will be used available date of recreation waters on the area of Herzegovina- Neretva Canton, our rule-books about the quality of recreative water and the reports about the results of microbiological analysis of thes waters.The descriptive method will be used for the description of recreation waters. The data from the reports about the results of microbiological analysis will be show statistically and some of them will be presented grafically.

Results : The area of Herzegovina-Neretva canton has different kinds of recreation waters. This is only part of B&H wich has an approach to the sea, with 23 km a coastline on the Adriatic sea. This part of the seaside is visited by many tourist, domestic aa well as from abroad. The touristic season lasts from may to septembar thanks to the good climate.

The second category of recreation waters are lakes. On the area of Herzegovina-Neretva Canton is a big natural lake called by name Boračko lake. There are also few arteficiale lakes, that means hydroacumulations wich arised from river after the building of damms. Thanks to the correct relation of Public company of stream (Elektroprivreda B&H) wich keeps the necessary level of water during the whole season, these lakes are becoming a favourite touristic destination in Bosnia and Herzegovina in the last few years.

Despite of all rivers are the most favourite recreation places for many people. On the area of Herzegovina-Neretva Canton the longest, the riches wich water and the most beautiful among all rivers is the river of Neretva.

It is the river 225 km long and has the caracteristics of a mountain river. Neretva is famous for its smaragd –green colour, pure and in the upper parts totally drinkable water. A special, more popular category of recreation waters are pools. They are part of the touristic-recreations objects, but also very often in the private houses.For the menttioned

categoris the requirements about the quality and health usefulnees of water are quiet different. Informations about water quality have to be available to potential users.

In the control of the seawater the used criteria are recommended by MAP (Merditerranean action plan) According to the estimation of the water quality , estimationt of the existing and potential risks must have an important role . It is in the domen of inspection work.

Inspection control is defined as : very low, low, medium, high and very high.

Aslo, important part of recreation water control is the examining of microbilogical contamination. The main goal is protection the health of people wich use it for recreation. The dynamics of taking samples is correlated to the water quality (according to potential risks). Samples are taken every four weeks from water with excellent quality, every tree weeks from water with good quality, and every two weeks from water with bad quality. After an incident contamination, samples are taken again after seven days.

In order to present the real status of the water quality, samples are taken one month before, all the time during the season of using the seawater for recreation and one month after the season. For the correct estimate of quality it si necessary to take at least four samples in the season, and the interval between the samples must not be longer than one month. The water quality is under surveillance for three seasons, wich means that it is necessary to take minimum 16 samples (according to EU regulation it is four seasons)

The samples are taken on placese with the biggest number of swimmers and in the time when it is most frequent. The quantity of Intestinal enterococci and Escherichia coli in 100 ml (According to MAP) in 95 % of taken samples is important for the classification of fecal contamination of sea water.

Water of A category, or with exellent quality are those wich contain less than 100 intestinal enterococci and less than 250 E.coli.

Water of B category, or with good quality can contain 101-200 Intestinal enterococci and 251-500 E.coli in 100 ml of water.

Water of C category, or with bad quality contains 201-500 Int. Enterococci and 501-2000 E coli.

Water of D category, or the water with the worse quality contains more than 500 Int.enterococci and more than 2000 E coli.

For the estimation of the water quality of rivers and lakes (natural and arteficial-hydroakumations) as parametar for microbiological contamination is used the most possible number of colliform bacteria in one litre. According to that number waters are divided into four categories. The first category – water can contain 2000 bacteria per litre, second category can contain to 20 000 bacteria, water of thrird category contain to 200 000, and water of fourth category over 200 000 bacteria per litre. Only first and second category can be used as recreation water.

Recreation waters in swimming pools have to fit the same criteria as a drinking water. On the area of Herzegovina-Neretva Canton in the last four years the number of taken samples is under the necessary number.But it is important to point out the increase of the number of taken and analised samples of recreation waters in the last four years, wich shows the interest of the society for the public health importance of recreation water is groing up.
On the following graph we will show the ratio of samples taken and microbiologically examined, according to the type of recreation water in 2003.

Graf.1 : Ratio of samples taken in 2003. (according the type of recreation water)
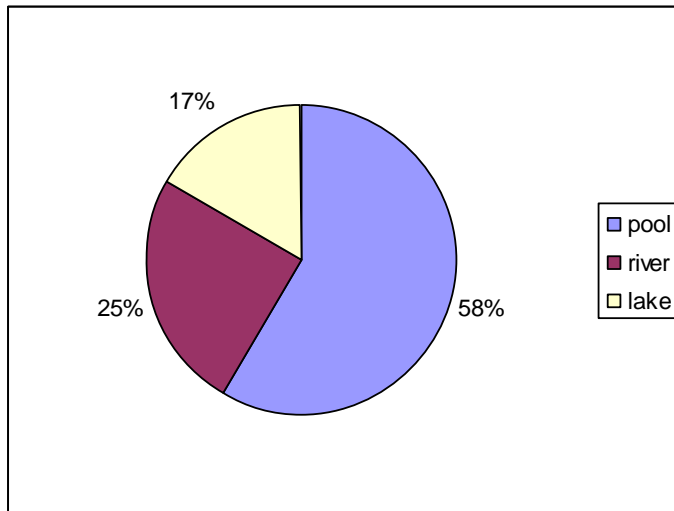
It is markable that the most samples were taken from pools, even 58%. The results of the analyses of rivers showed that over 70% are waters of first category and less than 30% are waters of second category.

The worst results were from waters of pools, where 42% of samples were positives.

Graf 2. Ratio of positiv and negativ samples

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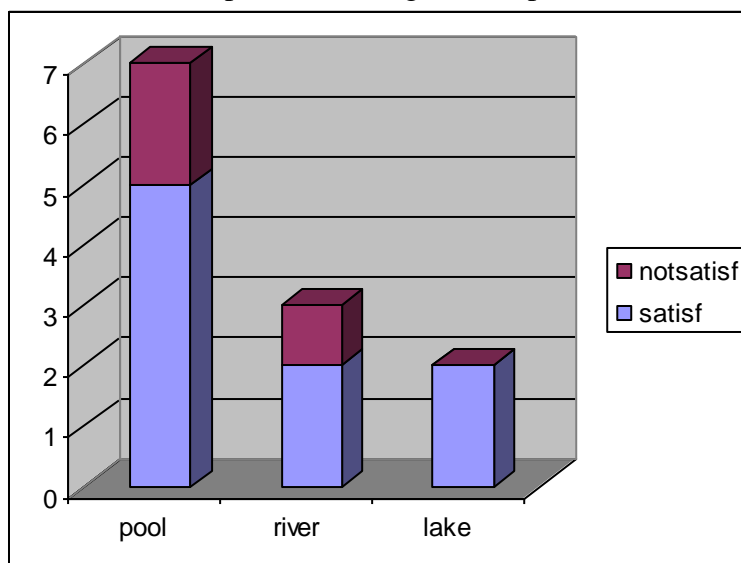
The best caracteristics had the samples of water from lakes, than the river water with 33 % positive samples.

In 2004. the structure of taken samples changes, so even 70% of taken samples was the recreation water of rivers.

Graf.3.: Ratio of samples taken in 2004. (according the type of recreation water)
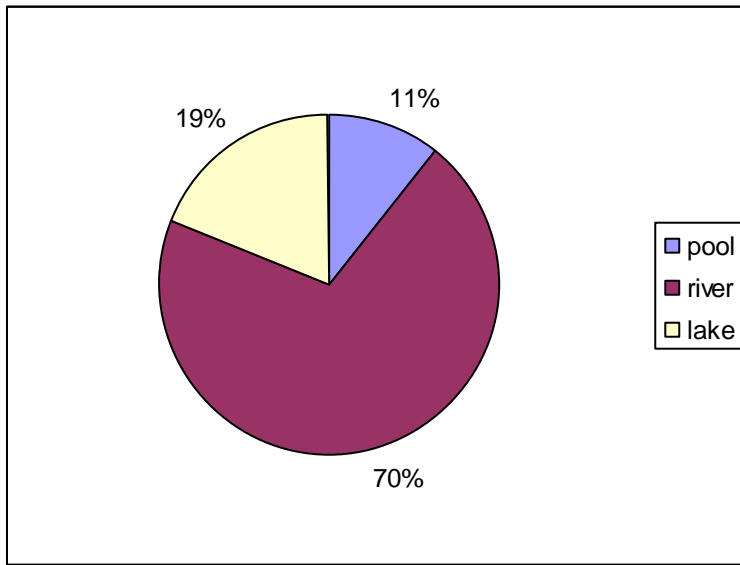
The number of samples taken from lakes slowly increased. From all taken samples in 2004. year 37% were with inadequate quality At the samples taken from rivers the third category had those samples taken from the coast, beaches, down the river, under bigger settlements

Graf.4.: Ratio of samples taken in 2005 (according the type of recreation water)
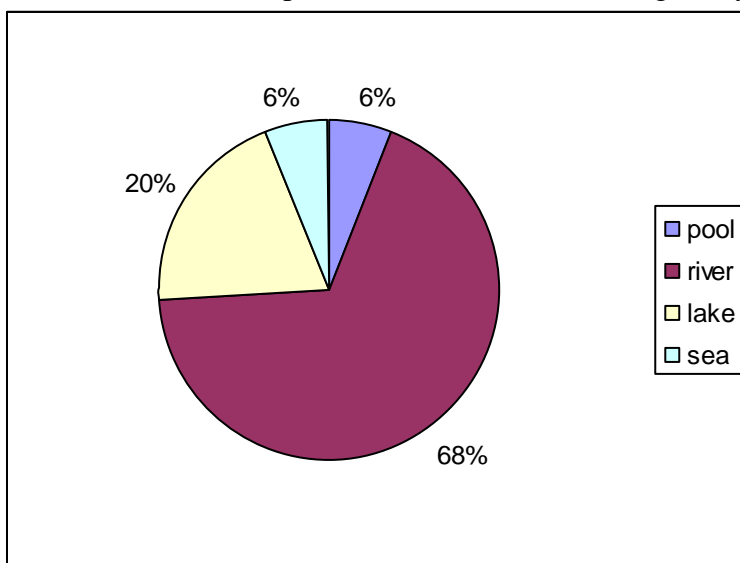
In 2005. year the sea water was sampled for the first time The share among the other three types shows further decreasing of samples taken from pools and a slowly decrease of the number of samples taken from lakes.

Among taken samples 34% had inadequat quality according to microbiological parameters. A significant increase in the control of recreation waters was made in 2006.. when the number of taken simples had been the greatest. In the same time the number of samples from all kinds of water increased, and the ratio of samples is shown on the next graf.

Graf. 5.: Ratio of samples taken in 2006 (according the type of recreation water)
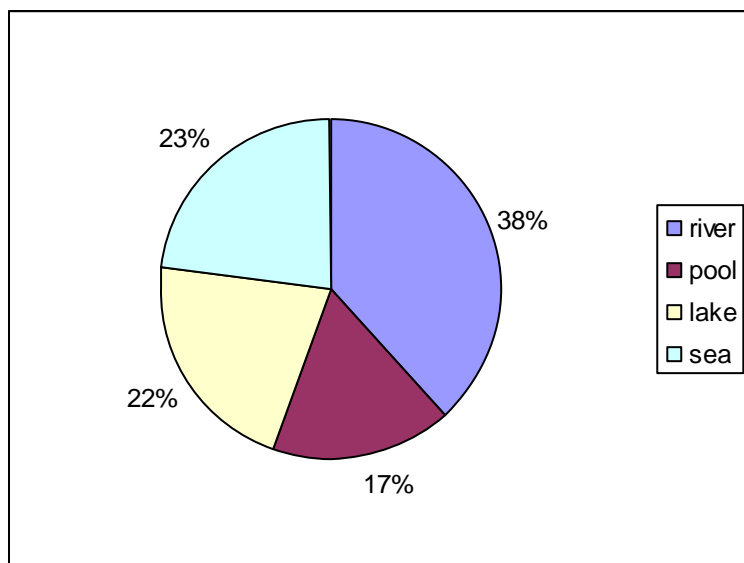
It is markable thar the ratio of samples taken from rivers was the biggest, it was 38%, from the sea is quite the same as in 2005., and the percentage of samples from pools is a bit smaller. The percentage of positive samples was 25% and reffered to the water of rivers which were third category.

The contamination of water in lakes and rivers was markable in samples taken near settlements. The main reason for that is the incorrect disposition of waste, especially raw sewage, because many settlements don t have a canalisation system,

During the season of using of recreation waters there is a continual control of infective diseases that can be transmitted over contaminated water, as meningitis serosa, enterocolitis and different skin infections.

During the four monitored years these infection diseases were evidented just sporadic, and they did not appear in a big number.

Because these infections can be caused by other different risk-factors so it can not be surely that the using of recreation water had the dominant role in their appearance.

Discussion and conclusion

The area of Bosnia and Herzegovina, and especially the southern part Herzegovina- Neretva Canton is rich with all kinds of waters. Recreation nearby the water is becoming more important for the people from these areas and for many tourists from abroad.

According to the showed results waters used for recreation on the area of Bosnia and Herzegovina have very good quality. The most taken samples were adequate, according the regulation. Samples in wich microbiological contamination was proved were mostly taken nearby the settlements, and the samples taken from lakes were contaminated only naerby the coast.

In the last years health control of recreation waters increased and relevant institutions and factors were introduced with the results of analyses, so necessary prevention measures against the outbreak of infective diseases were used.

The infective diseases wich can be related to the recreation in waters that are mycrobiological contaminated appeared only sporadicly.Among them enterocolitis appeared the most often. All cases of enterocolitis are not caused only with contaminate reacreation water, there are many other risk-factors.

The recreation waters in Bosnia nad Herzegovina are good quality and anable safe recreation. It is the reason that recreation waters are a big touristic potential of our country, and because of the important inluence on the health of people they need a continual surveillance in order to save a good quality.

HUMAN HEALTH AND THE ENVIRONMENT. CASE OF ALBANIA

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This paper presents a most important issues in relation to impacts of environmental on human health in Albania. We analyse some Environmental conditions associated with health risks as following: *Air pollution in Albania Indoor air quality   Drinking water, waste water and health*

Also in this paper will analyse Environmental health policy and management. It includes :
Policy commitments relevant to environmental health
Legal instruments and institutions
Environmental health monitoring and information systems
Professional education in environmental health

At local and district levels, health inspectorates are responsible for tasks that span both environment and health, while inspectors of the regional environmental offices are also responsible for environment. The coordination of their tasks is not always optimum, and neither has sufficient capacity. Low salaries and better opportunities in other countries have led to a massive emigration of specialized staff. In order to allow for efficient and effective performance of tasks, better coordination between the different inspectorates is essential.

Overall health status and environmental conditions

Population development
The rapid urbanization of the population is of growing concern. The urban/rural ratio of the population has changed, with the urban population of the ten major urban centres accounting for 36 per cent of the total population in 1999 compared to 20 per cent in 1990. The Tirana region has seen a population increase of 30 per cent due to internal migration mainly from places with poor economic opportunities, for instance rural areas in the mountainous north. Population growth in urban areas is expected to be 3.8 per cent and, as a result of migration, urban populations are expected to increase by 10 per cent over a ten-year period, resulting in 55 per cent of the population living in urban areas by the year 2009. Lack of access to good health care in mountainous rural areas is the biggest contributing factor.

Environmental conditions associated with health risks

Air pollution
Air emissions from stationary sources have decreased sharply, dropping in 2005 to 45 per cent of their 1989 level. Today the main air polluter is mobile sources. In 2005 transport contributed 15.2 per cent of the total air pollution against only 1.4 per cent in 1989. This pattern is more remarkable in Tirana, where, according to a recent study, traffic-related emissions contribute approximately 65 per cent of the total air pollution.

In Tirana in particular the incidence of respiratory diseases is 10-15 per cent higher than the country's average, which may also be related to higher levels of air pollution, mainly dust and particulate matter.

Using the methodology of the WHO project "Health Impact Assessment of Air Pollution in the WHO European Region", it was estimated that, in Tirana, between 15 and 42 deaths annually may be attributed to O3 exposure, of which 6-19 are due to cardiovascular and 1-5 due to respiratory diseases.

Indoor air quality

In Albania there are no studies on exposure to indoor air pollutants. Assumptions can only be made based on the change of heating and cooking fuels. At the beginning of the 1990s, kerosene was widely used for cooking while wood and coal were used for heating. Nowadays more and more electricity is used for cooking and heating.

Though the quantity of cigarettes smoked per person in Albania remains substantially lower than in the EU and other Central and East European countries, the rate of increase is much higher than in these countries.

The number of cases of smoking-related diseases followed the same trend. This marks an increase of 24.3 per cent, compared to a 19 per cent decrease on average in EU countries and 2 per cent on average in other Central and East European countries.

Drinking water, waste water and health

The determinant factors of drinking water quality and associated health problems can be summarized as follows:

The contamination of drinking water in the supply system due to irregular water supply and low water pressure, illegal connections to the pipes, cracks in the old pipes and cross contamination from waste water;

Waste water from hospitals and industries (with some exceptions) also flows into the pipes or directly into rivers. In rural areas household latrines are common and ultimately all the waste water is directly discharged into rivers;

Uncontrolled and irregular chlorination in rural areas. Disinfection with calcium or sodium hypochlorite is often irregular and approximate. Furthermore, not all chlorination plants are working; enterprises often lack the money to buy calcium or sodium hypochlorite; The lack of respect for sanitary protection perimeters. An investigation of domestic wells showed that 73 per cent were bacteriologically contaminated; and

The inconsistent and irregular sampling of drinking water.

Although the Ministry of Health, through the Institute of Public Health and the regional directorates, is in charge of regular drinking water measurements in 36 districts, there is no clearly regulated framework. However, measurements focus on a few parameters and are not clearly defined by population, territory and risk parameters.

Bathing waters and the development of tourism
There are a number of environmental health concerns that hinder appropriate tourist development: High sea water pollution due to direct discharges of waste water from polluted rivers and households. The large volume of waste from construction or dumps. Nature and landscape damage caused by the extraction of raw materials like sand, gravel, stone, and clay and The exploitation of toxic raw materials like oil, iron, zinc.

Food Safety
At this moment, food quality control is probably one of the most serious agricultural, environmental and health problems in Albania. Two thirds of a normal rural family's income derives from agriculture, with more and more cash income deriving from the sale of the livestock products, the milk, vegetables, fruits and grapes they produce. As in many East European countries, food illegally sold on the streets, especially milk and meat products, is a major income-earner for many families, in particular in the countryside. There is no legal provision or any other instrument available to block the illegal sales on the streets. Moreover, given the precarious economic situation, selling food on the streets is the only means of income for many families.

There are problems with enforcement mechanisms and, in particular, with both the collection of fines and the implementation of administrative measures. This is true for a number of legal instruments, including the Law on Food.

Health care waste
The daily production of hospital waste in the seven main cities has been estimated at 7.3 tons/day. Hospital waste is composed of non-risk waste, which can be stored in containers and transported to landfills, and risk waste. In Albania, risk waste such as infectious materials (e.g. gauze, used cotton, bandages, rubber gloves, syringes and placentas) is simply stored in plastic containers and also taken to landfills. All hospitals in the country are dependent on municipal structures for waste management (i.e. none has a separate system for disposing of medical waste). Even in landfills hospital waste is not separated from household waste. Risk and non-risk health care waste is often stored in open containers in the courtyard of the hospitals. Health care waste from private surgeries too is dumped in municipal waste containers.

Due to the low level of awareness among the hospital staff about the risks associated with exposure, ash and residue from the crematoriums were removed by hand using little or no protective measures.

Only the University Hospital in Tirana has an incinerator. An assessment by WHO has shown that there are problems with the installation and lack of ancillary equipment. There are concerns that the flue gas emitted from the incinerator contains dust and noxious gases. Despite the protective measures taken to minimize the risks associated with the use of this device, significant amounts of smoke are dispersed in the surrounding area.

Albania lacks a general law on waste management. The 2002 Law on Environmental Protection and Decision No. 26 of the Council of Ministers on hazardous waste and residues contain some articles banning hazardous waste imports for destruction and disposal, but they do not provide the basis for a sound and specific health care waste legal framework development. The definitions of waste and hazardous waste in such legal acts are not consistent with EU directives. In the meantime, the environmental legal framework does not include any definition of health care waste or any of its categories.

The Environmental Centre for Administration and Technology's project outlines the need to develop and adopt such a law and introduce the European Waste Catalogue. The main principles (prevention, reduction, recycling before disposal, value-based principle, producer responsibility principle, duty of care, precautionary principle and proximity principle) of good waste management should be included in the primary legislation. Besides these basic principles of waste management, the duty for waste producers to keep records on waste production, to plan and forecast waste production and to indicate the methods of disposal several years in advance should be established on the same level of legislation.

When such a general legal basis exists, the legal framework can be completed by developing some legal and regulatory acts or governmental orders related to the classification and categorization of health care waste, and technical standards for its packaging, labelling and transport, which are necessary administrative structures for sound health care waste management at hospitals at the district and national level. In this regard, scientific institutes or other bodies under the Ministry of Health's authority can prepare different guidelines based on those of WHO or other advanced experience in the field.

Another option, based more on the experience of other countries in the area with economies in transition, is to develop and adopt a self-standing specific law (enacted by parliament) on the management of health care waste.

During ten years outbreaks of lead intoxication occurred in some rural zones as a result of the use of flour ground in old flour mills, repaired with lead. About 3000 individuals living in those zones were exposed to this pollutant in varying doses. Lead intoxication symptoms include headaches, muscle tremor, kidney damage, loss of memory, gastrointestinal problems and others. No information was available on what happened to these people, as there was no post-monitoring of these outbreaks.

Ionizing radiation
Until the late 1980s, the problem of radon exposure was considered only within the framework of the occupational exposure of miners mining uranium and other minerals like coal bauxite, polymetals, and phosphorites in the early 1990s, the Geological Survey assessed the potential risk posed by radon in the Albanian western plain. This study, conducted on 5 per cent of the country's territory, showed that there was a risk due to the soil's high radon concentration.

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The protection of the population from different types of ionizing radiation is the responsibility of the State Commission for Radiation Protection at the Ministry of Health. The Radiation Protection Office is the executive body of the State Commission for Radiation Protection and acts as an inspectorate. It controls the implementation of the relevant legislation, inspects facilities and installations, drafts the regulations and standards for radiation protection, prepares the licences for the Commission regarding each subject and applies fines on behalf of the Commission. *Noise*

Noise, mainly industrial, was studied in Albania from the early 1970s to the late 1980s. Ten thousand workers were estimated to be exposed to higher levels of noise than admissible for professional exposure (85 dB). Today the levels of exposure to industrial noise are estimated to be 10 per cent of those recorded at the end of the 1980s. During the past 10 years noise from traffic has increased. Buildings do not have special insulation. A survey performed at busy roads in Tirana showed that levels varied from 60 to 90 dB. Political, economic and social changes have created opportunities for private activities with uncontrolled noise levels, which have mostly developed within the residential areas. It is important to stress that no standards or admissible levels exist for noise in residential areas.

Occupational health
Exposure to chemical and physical hazards in the workplace has changed dramatically during the past 10 years. Prior to 1990, a number of large heavy industry plants, including mining, metallurgy, chemical, and fertilizer plants, were operating near and around all the big cities. After the collapse of State industry in the early 1990s, the country's economy witnessed a rapid decline in industrial production and the closure of almost all the large industrial facilities. These developments also affected the occupational health services and the monitoring of the health status in the workplace. Prior to 1990, all enterprises had a doctor.

The responsibility for monitoring occupational health and hygiene at the workplace lies with the State Health Inspectorate. However, there is no well-defined monitoring programme; the health inspectors in the districts and the Occupational Hygiene Section in the Institute of Public Health intervene mostly in emergencies or accidents. The latter is responsible for monitoring the indoor environment of industrial facilities, through specialized laboratories at the Institute of Public Health, and for drafting national occupational standards. The Labour Inspectorate is also responsible for occupational health and conditions at the workplace, but the respective responsibility of each is not clear.

Environmental health policy and management

Policy commitments relevant to environmental health
The Government approved the National Environmental Health Action Plan (NEHAP) in 1999. It was developed with the support of WHO and the participation of a large working group which, in addition to the Ministry of Health, included the Ministry of Public Works and Transport (now the Ministry of Transport and Telecommunications), the Ministry of Tourism (now the Ministry of Territorial Adjustment and Tourism), the Ministry of Agriculture and Food, the Ministry of Public Economy and Privatization (now the Ministry of Industry and Energy), the National Environmental Agency (now the Ministry of Environment) and non-governmental organizations.

However, when the NEHAP was drafted, the Ministry of Environment did not yet exist and was not included in the distribution of tasks. Furthermore, the NEHAP has an exhaustive list of objectives and actions, but it is not clear how these actions could be taken, who is responsible and who will fund them. Another problem is that it is not yet clear how the new health care reform will consider, fund and implement environment and health actions. There is a need to consider the NEHAP recommendations when restructuring the Ministry of Environment, and to develop a feasible plan of environment and health interventions within the health care reform.

Legal instruments and institutions
The Ministry of Health is the main financing source and provider of health care services. A national policy for the health care sector was produced in 1993, but it has not been updated. The World Bank, in collaboration with the WHO, is currently developing a new health care strategy. It is not clear what role the Institute of Public Health will have in the new health care strategy.

Within the current Albanian system, the Institute of Public Health provides technical and scientific assistance to the Ministry and is responsible for the technical guidance of the inspectors of the Primary Health Care Directorates at the district level. Several sectoral laws define many of the inspectorates' activities, which include controlling drinking water, waste water, solid waste, air pollution, food hygiene, hygiene in the workplace and at school. Four major sources of problems have been detected in the work of the public health inspectorates:
Difficult collaboration with the elected local bodies that bear the executive responsibility for the elimination of the identified problems;

Difficulties in collecting fines and insufficient support to enforce penalties; Lack of coordination among inspectorates, for instance food, veterinary and labour inspectorates; Better information through the efficient functioning of a modern reporting system would make it possible to analyse potential risk – the basis for the successful protection of consumer health. An infectious disease alert system has been set up. If there is an outbreak, the Institute investigates it and tries to solve the problem, with direct feedback to the Ministry of Health. Congruent with the political stance of the country, two main features of the public health system financing in Albania in recent decades need to be mentioned:
The main source of funds was the government budget;
The system was characterized by severe under-funding, which can be identified as the direct cause for difficult conditions and low-quality health services. At present government and municipal budgets remain the basic sources of health care funding (approximately 60-70 per cent), followed by contributions to the Health Insurance Institute (a further fifth of the total). One of the major gaps in the legal provisions is that there is no formal development of health impact assessment because strategic environmental assessment and environmental impact assessment laws are still being drafted. There is no law on outdoor and indoor air quality to set standards in compliance with WHO air quality guidelines.

Environmental health monitoring and information systems
The Albanian system of monitoring air, water, waste and environment in general is very basic. It is mainly a responsive but not an evaluative system. In most cases it does not respect European legislation, in particular with regard to the frequency, the methodology and the types of indicators selected. Biological monitoring is almost non-existent due to the impossibility of conducting analyses in time and space. Therefore it is impossible to develop epidemiological studies at present.

Air quality
The Institute of Public Health is responsible for monitoring air quality in urban areas. The monitoring network consists of 13 sampling sites in seven major cities: Tirana, Shkodër, Durrës, Elbasan, Fier, Vlorë and Korçe. The most extensive monitoring is carried out in Tirana, through six sampling points selected for spatial distribution and population exposure. Based on preliminary screening, Korçe has been selected as the reference of a "clean" location. In the other cities, there is only one sampling point in the centre of the cities. The Institute of Hydrometeorology also monitors air quality through its own network.

Radiation
Standards for radiation have been reviewed during the past two years. Two types of standards on occupational and population radiation are currently in force (see Box 12.2).

Drinking water
Twenty-seven district laboratories are supposed to monitor chlorine in the drinking water and the cleanliness of drinking water, and to monitor surface waters and bathing waters. Cleanliness is based on the measurement of six basic indicators: ammonia, nitrites, nitrates, organic matter, chlorites and phosphates. The complete pollution check includes 13 indicators altogether, but very few laboratories are able to carry it out due to the lack of equipment and reagents.

There was no information available on waste, waste water or other types of monitoring. It seems that waste is monitored only if there are problems. Otherwise no information is made available to the public.

Professional education in environmental health
Training courses for health inspectors have started in cooperation with the *Ecole Polytechnique Fédérale de Lausanne* (1995 – 1996), under the Phare Programme (1999), under the WHO – FAO cooperation (2000-2001), under UNICEF cooperation (2001) and under INTEREC II cooperation (2001). Around 90 per cent of district health inspectors have participated so far.

Conclusions and recommendations

The Government approved the National Environmental Health Action Plan (NEHAP) in 2001. It was developed with the support of the World Health Organization and the participation of a number of ministries. The NEHAP makes many recommendations, but it is not clear how these can be implemented, who is responsible and who will fund them. The Ministry of Environment, which was established when the NEHAP had already been completed, has not been closely associated with it. Both the Ministry of Health and the Ministry of Environment now need to work together to review the NEHAP, clarify the tasks and the responsible bodies for implementation, and put the Plan in motion.

At local and district levels, health inspectorates are responsible for tasks that span both environment and health, while inspectors of the regional environmental offices are also responsible for environment. The coordination of their tasks is not always optimum, and neither has sufficient capacity. Low salaries and better opportunities in other countries have led to a massive emigration of specialized staff. In order to allow for efficient and effective performance of tasks, better coordination between the different inspectorates is essential.

Recommendation 1:
(a) The Ministry of Environment and the Ministry of Health should tighten their intersectoral cooperation in the implementation of environmental health policy and work jointly at a more concrete definition of the tasks to be undertaken and the measures needed to accomplish those tasks;
(b) The Ministry of Environment and the Ministry of Health, within the context of health care reform, should review the roles and organization of their inspectorates and ensure the coordination and efficient use of scarce resources. Working conditions should be improved and more attention given to institutional memory and appropriate training for all inspectors.
T
he context of the current health care reform demands an assessment of the organization of the Institute of Public Health and the regional networks together with their management and products. The same is true for public health and hygiene activities. Particular attention should be given to management, the motivation of staff, opportunities for capacity-building and the assignment of specific responsibilities within the legal and institutional framework. The Institute of Public Health could serve as the reference institution with regard to evidence-based research, the collection and analysis of environment and health monitoring information, licensing, outbreak investigation and capacity-building.

Recommendation 2:
The Ministry of Health should clarify and assess the respective roles of the institutions within the Ministry and subordinated institutions involved in environmental and health activities, and they should be given adequate consideration within the health care reform framework.

One of the major gaps in the legal framework for health and environment is the lack of health impact assessment, because strategic environmental assessment and environmental impact assessment laws are still being drafted.

Recommendation 3:
The Ministry of Health should develop a methodology for health aspects within Environmental Impact Assessment.

There are severe temporal and spatial gaps in the current health and environment information system. Information about the environment is often insufficient since the Albanian system of monitoring air, water and waste is mainly responsive, not evaluative. In most cases it does not respect European legislation with regard to frequency, methodology and types of indicators selected. Finally, the information flow is unidirectional, from the bottom up, without feedback. A new information system is under development, but as long as the spatial and temporal data collection on environment and health cannot be assured, the information system will continue to be insufficient.

Recommendation 4:
The Ministry of Health, in cooperation with the Ministry of Environment, should develop an environmental health information system and good spatial and temporal coverage.

Air quality is of increasing concern in the big cities, in Tirana in particular. At present, the source of the problem is not so much active industrial facilities as older sites that have ceased to operate. At the same time, transport has become a more significant source of air pollution. The growing use of old, poorly maintained passenger cars and the use of diesel fuel have dramatically worsened air quality in urban areas. However, the real impact of the present urban air pollution on public health is not known.

Recommendation 5:
(a) The Ministry of Health should promote studies to clarify the health impacts of pollution, with a special focus on urban centres and hotspot areas;
(b) The Ministries of Transport, Health and Environment should undertake actions to implement the World Health Organization's Charter on Transport, Environment and Health. The Ministries should also give consideration to the WHO-UNECE Transport, Health and Environment Pan European Programme.

Health care waste presents a risk to human health. Urgent measures have to be taken in hospitals to reduce the risks to human health that exist with the current handling of hospital waste. Professional conduct should be expected from every health worker to achieve good hygiene in hospitals to control infections. This includes proper management of health care waste. For this purpose, a national policy should be developed to establish good conduct guidelines for all medical staff (in private practice as well as in hospitals). In the hospitals, every medical department should be encouraged to adopt the WHO "three-container segregation system"; that is, segregating general waste, infectious waste and sharp waste. To improve waste-related hygiene in medical areas, health care waste management staff needs to be provided with.This will require the allocation of additional resources to health care waste management. Since these measures are costly, a stepwise strategy is suggested.

Recommendation.6:
(a) The Ministry of Health should improve the management of health care waste by:
• Drawing up a national policy on health care waste management;
• Deciding on a set of minimum standards for health care waste management to be applied in each hospital;
• Giving the medical staff clear responsibilities for health care waste management in their department;
(b) The Ministry of Health and the Ministry of Environment should improve and stimulate the separate collection of medical waste at all hospitals and treat it or incinerate it. To this end hospitals must receive additional funds from the regular budget.

The quality of drinking water is another major concern for the health of Albanians. Appropriate measures should be taken for a more rational management and protection of water resources and a better knowledge of the situation of Albanian water through the development of water monitoring (see Recommendation 4.1).

The environmental hot spots require urgent action from the Government. All sites represent a risk to human health. The sites need to be ranked by health risk in order to implement urgent action, e.g. forced evacuation of the population from the Durrës plant .

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ANTIOXIDANT VITAMINS (VITAMIN E AND C) IN ACTIVE AND PASSIVE MALE NIGERIAN CIGARETTE SMOKERS

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Background: Cigarette smoking is banned from many public places because it contains over 4000 chemicals which when released into the environment are mutagenic and carcinogenic to passive- or secondhand- smokers. Secondhand smoking occurs when non-smokers breath-in side stream smoke from the burning end of a cigarette and "mainstream" smoke which has been inhaled and then exhaled by the smoker.

Protocol: This study assessed the risk of passive smoking by determining and comparing the levels of antioxidant vitamins E and C in passive and active smokers. Passive smokers selected for this study are close associates of heavy smokers (at least 24 sticks daily) for at least 10 years.

Results: The levels of vitamins E and C were not significantly lower in active smokers compared with passive smokers. The levels of these antioxidant vitamins were significantly lower in both passive and active smokers compared with non-smokers. The imbalance between oxidant–antioxidant status lead to deranged immunity, thus predisposes to various diseases.

Conclusion: It is concluded from this study that non-smokers who breathe other people's tobacco smoke for a long time are exposed to same 4,000 chemicals that a smoker inhales. The implication is that passive- and active– cigarette smokers are at equal risk of hazardous health effects of cigarette smoke.

The study therefore emphasizes the importance of public health measures to stop environmental pollution caused by cigarette smoke.

Keywords: *Cigarette, antioxidants, Vitamin E, Vitamin C, Illnesses.*

INTRODUCTION

Cigarette smoking alone has been implicated as a major factor for several chronic diseases, including cardiovascular disease, brain tumour, pulmonary disease, menstrual disorders miscarriages, infertility and cancer (1, 2). There is also a strong association between smoking and a number of common eye diseases, which include Grave's opthalmopathy, age related muscular degeneration, glaucoma and cataract (3). Cigarette smoking has also been implicated as a risk factor of osteoporosis. It was suggested that smoking lowers bone mineral density, as a result of decrease in calcium absorption associated with secondary hyperparathyroidsm and increased bone resorption (4). Smokers show higher rates of peptic ulcer diseases (PUD) than non-smokers, probably due to detrimental effects on gastric mucosa (5).

Cigarette smoke contains high amount of free radicals and other oxygen-derived species (6) that triggers plasma antioxidant depletion, lipid peroxidation, and protein modification (7). Products of lipid peroxidation and protein modification react with cigarette smoke constituents creating additional toxic products. The toxic products resulting from both the direct and secondary reaction with cigarette smoke activates immune responses, hence more free radical generation.

Passive or involuntary smoking occurs when the exhaled and ambient smoke (otherwise known as environmental or secondhand smoke) from one person's cigarette is inhaled by other people. Passive smoking involves inhaling carcinogens, as well as other toxic components, that are present in secondhand tobacco smoke. Carcinogens that occur in secondhand tobacco smoke include benzene, 1,3-butadiene, benzo[a]pyrene, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone, and many others (6, 7).

It is confirmed that, in adults, secondhand smoke causeslung cancer, nasal sinus cancer, breast cancer in younger women, heart diseases, heart attack, and asthma induction. Secondhand smoke is also known to harm children, infants and reproductive health through acute lower respiratory tract illness, asthma induction and exacerbation, chronic respiratory symptoms, middle ear infection, lower birth weight babies, and sudden infant death syndrome (7). No study on passive or secondhand smokers had been carried out in Nigeria.

Indeed, smokers have poorer dietary habits and less healthy lifestyles than non-smokers (8), and Vitamin is defined as a substance necessary in small amount in the diet to assist normal metabolism and whose lack causes one or several clearly defined deficiency states. The antioxidant Vitamins (Vitamin E, C, and beta-carotene) mediate an antioxidative reaction through the mechanism of chain breaking, free radical scavenging, and singlet oxygen quenching (9). These reactions that provide direct protection effect mainly prevent the membrane from lipid peroxidation. In the process of doing so, the antioxidants may be depleted or consumed completely. This study will measure the antioxidants Vitamin status in the plasma of Nigerian active cigarette smokers, passive cigarette smokers and non-smokers; such data does not exist in Nigeria.

MATERIALS AND METHODS

Study Population
A total of 170 apparently healthy male volunteers were recruited for this study. Each subject completed an extensive questionnaire regarding his medical histories, cigarette and drug usage histories, alcohol consumption, intake of nutrient supplements and demographics. These were divided into 50 active cigarette smokers with at least 3 years history of smoking and are still active smokers, 50 passive cigarette smokers who is a close associate of an active smokers for 10years. The controls consist of 70 age and sex matched non-smokers.

Blood Collection

UCH/UI Ethical Committee approved the study before commencement. Also, informed consent was obtained from each participant before sample collection. Between 6.0 – 10.0mls of whole blood was collected by venepunture without stasis from each subject into bottles containing lithium heparin, which was quickly transferred into ice pack in a black waterproof polyethylene bag. Blood samples were centrifuged at 3,000 pm for 5 minutes in an MSE Centrifuge (Centaur) in a working area with low intensity light.

Determinatination of Vitamin C

Vitamin C was estimated using colorimetric method of Aye Kyaw (10). To 2ml plasma in a centrifuge tube, 2ml of colour reagent was slowly added, mixed thoroughly, allowed to stand for 30 mins at room temperature and centrifuged at 3,000pm for 15 mins. Blue coloured supernatant was carefully transferred into another test –tube with Pasteur pipette without disturbing the precipitate. The blank (distilled water instead of plasma) and standard were treated similarly as the plasma samples. For each batch of samples analyzed, a fresh blank and standard were prepared. Absorbance was read at 700nm wavelength using the blank to set to zero. Concentrations of samples were extrapolated from standard calibration curve. Tocopherols and carotenes were first extracted into xylene and extinction read at 460nm to measure the carotenes. To correct for carotene, ferric chloride was added and absorbance read at 600nm.

Determination of Vitamin E

Vitamin C was estimated using colorimetric method of Baker and Frank (11). 1.0ml of absolute ethanol was pipetted into glass-stoppered test tube and 1.ml of plasma was added into corresponding labeled tube slowly with shaking to obtain a finely divided protein precipitate. 1.ml of reagent-grade xylene was added and the tubes were covered tightly and content mixed vigorously for 30 seconds. All tubes were centrifuged at 3000rpm for at least 5 minutes. 0.5ml of the xylene layer was extracted from each tube into corresponding labeled (light screened) tube. 0.5ml of a dipyridyl solution was added to each tube and mixed thoroughly. Blank was prepared by adding to 1.0ml of xylene, 0.5ml of alpha, alpha dipytidyl and to 0.1ml of ferric chloride hexahydrate solution.

Using the blank, the spectophotometer was set to zero and absorbance was read at 460nm, within 4 minutes of addition of TPTZ. To each tube, 0.1ml of ferric chloride hexahydrate solution was added at definite time intervals and mixed thoroughly. Again the spectrophotometer was set to zero using the blank, and absorbance of both the sample and standard was read at 600nm within 12 minutes as the colour of each specimen fade with time. Standard solutions were freshly prepared with each batch of specimen to serve as quality control.

Calculations:

Vitamin E $= \dfrac{\text{Absorbance of sample at 600nm} - (0.40 \text{ x absorbance of sample at 460nm}}{\text{Absorbance of standard at 600nm}}$

Statistical Analysis

Results were computed using the SPSS version 10.00 for windows at the Computer section at the University College Hospital, Ibadan, Nigeria. ANOVA was used to compare differences between means of the three groups. Student's t-test was used as post hoc test. The $p < 0.05$ was taken as significant.

RESULTS

The mean ages for the subjects participating in this study were similar. The mean daily cigarette consumption for active smokers was 13.66±8.87 sticks per day. Mean plasma concentration ± S.D of Vitamins C and E in both controls and smokers were summarized in Table 1. In both groups of smokers, the mean values of the two-antioxidant vitamins were higher in the controls compared active or passive smokers. The levels of vitamins E and C were similar in active and passive smokers. Only vitamin. C was significantly negatively correlated with number of cigarette sticks smoked per day (Table 2). There were negative correlations between mean plasma concentration of Vitamin C and the ages in the controls and the smokers (Table 3).

Table 1: Comparison (Mean + S.D) of age, plasma Vitamin C and Vitamin E levels in smokers and non-smokers.

Parameters	Active smokers n = 50	Passive smokers n = 50	Non-smokers n = 70
Vitamin E (mg/d)	0.67±0.22♣	0.69±0.20♣	0.77±0.25
Vitamin C (mg/d)	0.63±0.25♣	0.65±0.26♣	0.84±0.31
Age (years)	32.89±9.14♣	30.00±8.86♣	34.14±9.45

♣Signinificantly different from the controls

Table 2: Correlation coefficient between vitamins C and E and number of cigarette smoked per day

	Vitamin C	Vitamin E
r-values	-0.34	-0.075
p-value	0.01	0.20

Table 3: Correlation between age of subjects and the levels of plasma vitamin C and E.

	Vit.C (mg/dl)	Vit. E (mg/dl)
Non-smokers Mean ± SD		
r-values	-0.211	-0.080
p-values	0.05	0.20
Smokers Mean ± SD		
r-values	-0.031	-0.002
p-values	0.20	0.20

DISCUSSIONS

Free radicals have been implicated in the causation or progression of various diseases including cardiovascular disease, pulmonary disease and cancer. Cigarette smoke has been reported to contain high amount of free radicals and other oxygen derived reactive species (6). In this study, there were statistically significant lower plasma vitamin C and E levels in the smokers (active and passive) compared with the non-smokers.

The study showed a significant inverse correlation between plasma levels of vitamins C and E and the number of cigarettes smoked per day. This shows that cigarette smoking is associated with decreased plasma vitamin C and E concentrations. The decrease in the plasma levels of Vitamins C and E is suggested to be as a result of:
-Lower dietary intake and other unhealthy lifestyle habits in smokers.
-Bad cooking habits (such as blanching of vegetables) thereby reducing the vitamin C content since vitamin C is a water-soluble vitamin.
-More utilization of these antioxidants to remove excess free radicals generated by smoking because it has been found that smoking enhances generation of free radicals and decreases levels of antioxidants in the blood circulation (12). Evidence has revealed that antioxidant defense system protect against free radicals that have the capacity to react in an indiscriminate manner leading to damage to almost any cellular component (13).

Ascorbic acid has been found to be a very good scavenger of several radicals (14) and alpha tocopherol interrupts the chain of membrane lipid peroxidation and is a chain breaking antioxidant (13). It is also known that ascorbic acid inhibit both phagocyte-induced- and endothelial cell- induced lipid peroxidation processes (15), thus playing a role in immune system.
There were no statistically significant differences in the mean levels of vitamins E and C in passive and active smokers. This shows that cigarette smoke is one of the environmental pollutants that has adverse effect on whoever is in chronic contact with it.

It may be concluded this present study, that decreased levels of the antioxidant vitamins may predispose cigarette smokers to manifestation of many diseases and that it may be necessary to recommend diet reach in antioxidant nutrients for smokers.

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MICRONUCLEUS INDUCTION AND ALTERATIONS ON BODY WEIGHT IN THE MICE EXPOSED TO LEAD AND MERCURY HEAVY METAL IONS

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Heavy metals cause an enhanced level of chromosomal aberrations in living cells. Micronuclei (MN) assay appears to be a useful tool for exploring the effects of chemicals on cell. In this study, the effect of Hg and Pb heavy metal ions on the micronuclei induction and the alterations of body weight in albino mice were investigated. This study was carried out in 70 albino mice. Study consists of three groups: control, Hg and Pb treatment groups. Mice were treated with three dose levels (10, 15 and 20 ppm) of Hg and Pb metal ions during 15 days in treatment groups. The initial and final (after treatment period) weights of all mice were determined by sensitive balance in order to investigate the effect of Hg and Pb metal ions on the weight of mice. We collected peripheral blood samples from mice at the end of the treatment period and prepared blood-smear slides for the analysis of MN level. We found that the differences of MN level between Hg or Pb treatment and control groups were statistically significant ($p < 0.05$). The MN level increased significantly as correlated with the increasing Hg and Pb metal ion concentrations.

Key Words: *Body weight, lead, mercury, micronuclei*

Introduction

As a result of rapid industrial development, about 50.000 chemical substances have been produced within the last decade and also this rapidly developing industry has caused considerable environmental pollution. Food resources are depleting as well as being contaminated by this industrial pollutants. There are the documented reports of contaminated food with heavy metals adversely affecting health. Heavy metals also cause an enhanced level of chromosomal aberrations in living cells (1;2;3).

Heavy metals are natural constituents of the Earth's crust. Living organisms require trace amounts of some heavy metals but excessive levels of essential metals can be detrimental to living organisms. Heavy metals are stable and persistent environmental contaminants since they cannot be degraded or destroyed. Therefore, they tend to accumulate in the aquatic systems and soils. Excessive levels of metals in the marine environment can affect marine biota and pose risk to people consuming seafoods. It is well known that the effects of pollutants are usually displayed first at the biochemical and molecular levels. Then they lead to genetic changes which come cytologically visible, especially in the tissues of organisms which are good pollutant bioaccumulators. Many types of DNA damage caused by mutagens induce an alteration in chromosomes, so the measurement of chromosomal aberrations offers an acceptable parameter for monitoring mutagenic effects of heavy metal ions (4;5;6).

Lead (Pb) and Mercury (Hg) are the important heavy metal ions that widely spread to the environment via traffic activities and industial technologies. Lead inhibits heme synthesis. There is a good evidence for adverse effects of lead in very young children at much lower levels (5;6). Because of size and charge similarities, lead can substitue for calcium and be stored in bone. Lead may cause nephrotoxicity, neurotoxicity and hypertension. And also lead binds to biomolecules and inhibits its function. Mercury poses a great risk to humans. Mercury occurs naturally in the environment and it can also be released into the soil through industrial pollutions. Bacteria in the water cause chemical changes that transform mercury into methylmercury, which binds tightly to biomolecules, especially proteins. High amounts of mercury can damage the nervous system of organisms, triggering health problems such as memory loss, hearing loss, coma and possibly death (7;8).

Micronuclei (MN) assay is one of the most sensitive markers for detecting DNA damage and has been used to explore genotoxicity of varity of chemicals. MN is formed from acentric chromosome or whole chromosomes that have lagged behind during the cell division, being left outside both daugter nuclei. MN is a visible supernumarary nucleus under light microscopy in the cytoplasm of a cell (9;10). Al Sabti (11) suggested that the micronuclei could be about 1/10 to 1/30 smaller than the principal nucleus. So MN tests appears to be useful for investigating the effects of chemicals on cell.

This study aimed to investigate the effects of Hg and Pb heavy metal ions (heavy metal pollution) on body weight and the MN level in healty Albino mice. The effect of metal ion dosage and the exposure time on MN level also were studied.

Materials and Methods
Animals

Studies were carried out in 70 albino mice. The micronucleus assays were performed on erytrocytes cells of male mice with two months aged.

Heavy metal exposure

The study included three groups: Control, Pb and Hg treatment groups. Control groups (ten mice) were housed in 5 per cage and fed with the mouse feed and water. Pb (thirty mice) and Hg (thirty mice) treatment groups were fed with the mouse feed and water containing Pb and Hg, respectively. Hg (II) chloride and Pb (II) citrate were dissolved in distilled water to prepare the treatment solutions. Mice were fed with this solution in 15 days to determine the effect of Pb and Hg metals on MN level of mice.

In order to assess the dose response to the induction of micronucleus, Pb and Hg metal ions were given at different doses (10, 15 and 20 ppm). Every treatment dose was applied on ten mice. In order to investigate the effect of Hg and Pb metal ions on the weight of mice, the initial and final (after treatment period) weights of all mice were determined by sensitive balance. We collected peripheral blood samples from mice at fifth day and at the end of the treatment period. So we determined the effect of exposure time on MN level.

Micronuclei assay

We prepared blood-smear slides for the analysis of MN level in mice blood erythrocytes. Slides were made from 5µl of mice blood. Slides were placed on a slide warmer at 60°C for 30 min and then fixed in ethanol for 10 min prior to staining. Giemsa was used to stain slides and then the slides washed with distilled water (Figure 1). All slides were coded and then examined on an Nikon Ecelipse E 600 light microscope. Micronuclei were scored according to the criteria of Al-Sabti (2).
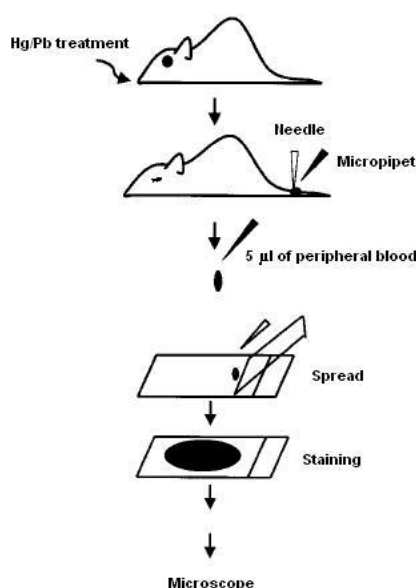
Figure 1. Microscope slide preparation for MN assay

Results

To determine the potential effects of Pb and Hg heavy metal ions in mice, body weight and MN levels were evaluated in control, Pb and Hg treatment groups.

Body weight

To explore the effect of heavy metal ions on body weight of mice, the initial and final (after feeding period) weights of mice were determined. In control groups, the weights of all mice increased about 2.0-3.0 g at the end of experimental period. In Pb and Hg treatment groups, the weights of mice decreased about 2.0-4.0 g (Figure 2).
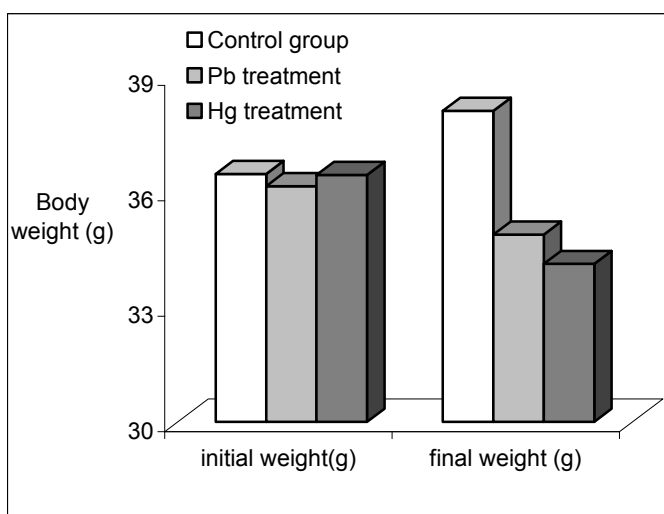
Figure 2. Effect of heavy metal ions on body weight (arithmetic avarage of micronuclei in ten mice with 20 ppm metal ion concentration)

Micronuclei analysis

In MN test, animals were exposed to the metal ions for 15 days and the peripheral blood was collected after this period. And smear preparations were made and stained with Giemsa solution. All slides, including control and treatment groups were coded before analysis. Preparations were analysed for the presence of micronuclei. In control groups, the formation of MN was not seen and erythrocytes were in normal shape (Figure 3).
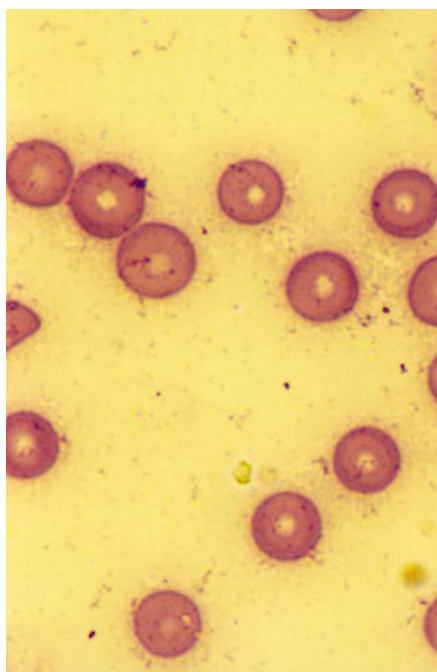
Figure 3. The erythrocyte cells in control groups

The micronucleated erythrocyte observed in Pb and Hg treatment groups are given in Figure 4.
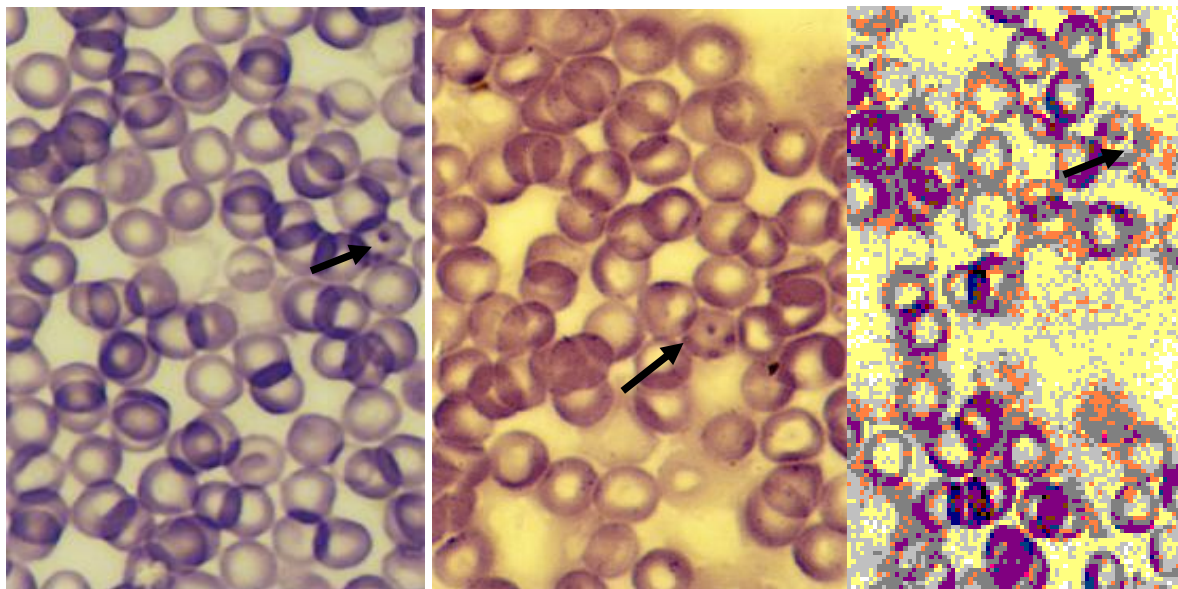
Figure 4. The micronucleated erythrocyte in Pb and Hg treatment groups

To determine the effect of metal ion concentration on MN level, 10, 15 and 20 ppm Hg and Pb metal ion concentrations were used. In both treatment, we found a dose-dependent increase in levels of MN after heavy metal exposure. Level of micronuclei observed in Pb and Hg treatment groups were given in Figure 5 and 6. MN analysis showed that the differences of MN level between treatment and control groups were statistically significant ($p < 0.05$). The MN data indicated little differences in pattern of response between Pb and Hg treatments. We determined, there was a decline of MN levels in Pb treatment compared to Hg treatment. The reduction in MN levels of Pb treatment groups could be partially due to the high toxicity of Hg than Pb.
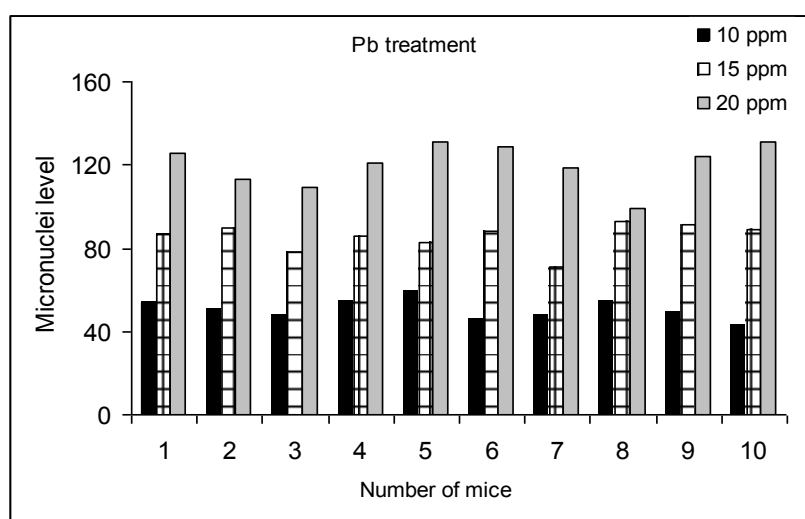
Figure 5. Micronucleus levels in Pb treatment groups with different dosage
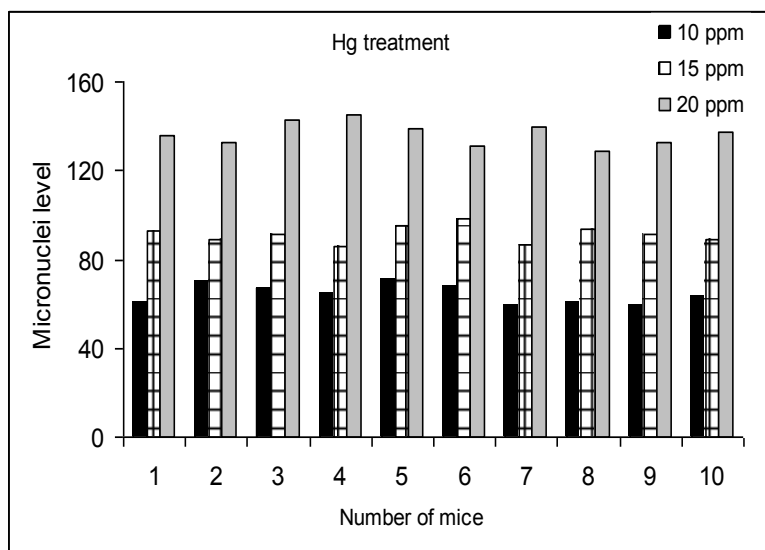
Figure 6. Micronucleus levels in Hg treatment groups with different dosage

There was a linear increase in MN level with increasing metal exposure period (Figure 7). Mice with the five day exposure had significantly lower MN level than mice with longer (15 days) exposure.
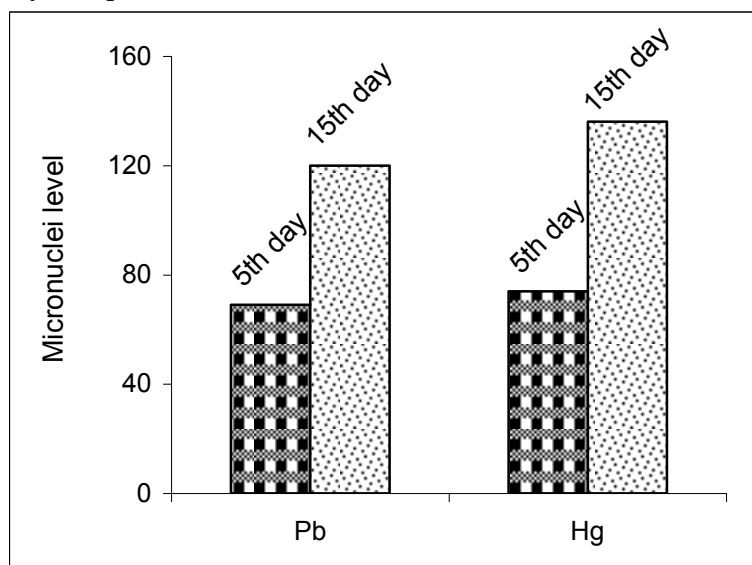
Figure 7. The effect of metal exposure period on micronuclei level (arithmetic avarage of micronuclei in ten mice with 20 ppm metal ion concentration)

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Discussion

The results of our study indicate that exposure to Pb and Hg metal ions via environmental pollution decreased the body weight and induced changes on chromosomes of mice. With the Pb and Hg metal ion concentration increasing in feeding period, the metabolism and diets of mice were changed, and body weight of mice were decreased when compared with control groups (Figure 2). The metabolism of mice were enhnaced for the removal of metal ions from body. So the energy consumption is increased and the mice loss weight.

There are numerous studies examining whether a variety of chemical substances cause chromosomal aberrations, but no study on the effect of Hg and Pb heavy metal ions for chromosomal aberrations in mice has been reported. Korkmaz et al (12) found that N-nitrosopyrrolidine (NPYR) caused chromosomal aberrations in *Mus musculus var. albinos.* Mortazavi et al. (13) reported that the the toluene and microwave exposure was increased the frequency of micronuclei in mice lymphocytes. Rozgaj et al(14) reported that occupational exposure to anaesthetic gases induced MN in women. In our study, we found that Pb and Hg heavy metal ions caused MN formation in mice eryhtrocytes cells (Figure 4). The MN formations in erythrocyte cells change the cell metabolism and function. And also the storage of hemoglobin and the oxygen transport mechanisms may change in micronucleated erythrocyte cells.

Hg (especially methylmercury) and Pb metal ions interact with biomolecules and bind them via reactive groups such as hydroxyl and sulphydryl. So the biomolecule (protein or nucleic acid) conformation changes and the metabolic reactions are broken. Heavy metals may enter cell nucleus and bind to purine and pyrimidine bases or proteins such as spindle. The spindles may be denaturated and the interaction of spindles and chromosome decreased, so the chromosomes may have lagged. Then the chromosomal abrerrations, such as mivronuclei, occured. Aberration analysis is difficult and time-consuming because chromosomes are small in size and large in number. The Giemsa staining facilitated to distinguish MN from other parts of cell (non-DNA particles), thereby reducing the incidence of false results and provide the simpler aberration analysis(15;16;17;18).

To determine the effect of metal ion concentration on MN level, three concentration of Hg and Pb solutions were applied. We found that the MN level in treatment groups was dose dependent and increased with the metal dose increasing (Figure 5,6). The effect of exposure time on MN level was also studied, and with the increasing exposure time (five day to fifteen day), the MN level was increased 42% and 46% in Pb and Hg treatment groups, respectively (Figure 7).
The MN test was more sensitive for evaluating genotoxic effects of heavy metal ions. The MN analysis provides consideration of chromosome aberrations such as micronuclei and also gives insights into the direct and indirect effect of chemicals to organisms. The MN test systems are technically simpler and easier to apply. In this method, MN recognition is technically much easier and more rapid than the direct scoring of chromosomes. For the need of rapid results about the effects of chemicals, MN test is particularly useful for scientist (15; 19;20;21;22). It should be noted that experiments with small animals such as mice and rats must be evaluated for their potential effects when human beings are considered. So the results found in this study are useful for understanding the corresponding mechanisms in humans (23;24;25;26).

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IN VITRO ORAL BIOAVAILABILITY TESTING IN HUMAN HEALTH RISK ASSESSMENT OF METAL CONTAMINATED SOILS: A SHORT REVIEW

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In human health risk assessment (HRRA), soil ingestion can be a major exposure route to soil contaminants for children. The scientific community and governments are more and more conscious that using health criteria values obtained from toxicological and epidemiological studies can overestimate health risks when applied to risk assessment of metal contaminated soils. Oral bioavailability is defined as the fraction of a contaminant that remains in the organism and reaches the systemic circulation from the gastrointestinal tract. Previous studies have shown that oral bioavailability of soil metals depends on soil type and contaminant bonding. Because of default estimates' limitations, site-specific results of oral bioavailability may be required for an appropriate exposure assessment. Therefore, in vivo studies are performed to assess metal bioavailability following soil ingestion for further use in HHRA. However, for practical reasons, it is unlikely that in vivo studies will be conducted routinely.

To decrease costs and avoid technical and ethical difficulties inherent to in vivo studies, numerous in vitro methods have been developed in the past decade as simple, cheap, and reproducible tools to evaluate gastrointestinal bioavailability. In vitro methods measure the contaminant bioaccessibility, which is the soluble fraction of the contaminant dissolved in the gastrointestinal environment, which is potentially available for absorption.

The paper discusses the use of bioaccessibility tests in HHRA of metallic contaminants in soils. The discussion focuses on arsenic, cadmium, lead, and mercury. A short review of current knowledge is presented and applicability and limitations of bioaccessibility tests are discussed. The regulatory position of environmental protection agencies in North America and European countries regarding the use of bioaccessibility tests in risk assessment is also presented.

INTRODUCTION

In North America, ingestion of drinking water and food is the primary exposure route to arsenic (As) (Belluck et al., 2003). The mean childhood intake estimate for inorganic As from food is 3.2 µg/d, with a range of 1.6 to 6.2 µg/d for the 10th and 95th percentiles, respectively (Yost et al., 2004). Yet incidental ingestion of metal-contaminated soil (including As-contaminated soil) is a significant exposure pathway for children (2 to 6 years old) because of their important hand-to-mouth activity (Rodriguez et al., 1999, 2003; Hemond and Solo-Gabriele 2004; Calabrese et al., 1989). Moreover, exposure to As by dermal absorption and inhalation is considered negligible compared to ingestion (Kwon et al., 2004). Therefore, in human health risk assessment (HRRA), soil ingestion can be a major exposure route to contaminants for children.

Assessments of risks to human health from contaminated sites are based on a comparison of predicted human exposure to the contaminant with a Health Criteria Value (HCV), which represents an exposure below which there is little or no risk to human health. Most assessment tools use estimates of exposure based on metal intake, i.e. the amount of metal to which an individual is exposed, expressed as mg/kg body weight/day. For incidental ingestion of soil by children, metal intake is quantified considering the exposure point concentration, the soil ingestion rate, the exposure frequency, the child body weight, and the contaminant relative bioavailability (Ruby et al., 1999).

The scientific community and governments are more and more conscious that using HCVs obtained from toxicological and epidemiological studies can overestimate or underestimate health risks when applied to risk assessment of metal contaminated soils (US EPA, 2005). Therefore, particularly in the USA, the use of animal bioavailability assays (immature swine, monkeys, rats …) has increased in the last twenty years to assess oral bioavailability (also called gastro-intestinal bioavailability) of metals following incidental ingestion of contaminated soils (Saikat S, 2006).

In HHRA, two definitions of bioavailability are used: absolute and relative. Absolute bioavailability can be expressed as the ratio of an absorbed dose to an administered dose. Relative bioavailability is the comparison of absolute bioavailabilities of different forms of a chemical or the same chemical administered in different media (such as soil and water) (US EPA, 2005). Obtaining information on site-specific bioavailability would be likely to reduce uncertainty, strengthen risk assessment, and set up appropriate clean-up objectives for contaminated sites. Oral bioavailability is defined as the fraction of a contaminant that remains in the organism and reaches the bloodstream from the gastrointestinal tract. It is, however, unlikely and impractical that in vivo bioavailability data would routinely be generated on a site-specific basis. Therefore, to decrease costs and avoid technical and ethical difficulties inherent to in vivo studies, numerous in vitro methods (mainly for As and Pb) have been developed in the past decade as simple, cheap, and reproducible tools to evaluate gastrointestinal bioavailability (Ruby et al., 1996, Ruby 2004; Rodriguez et al., 1999; Kelley et al., 2002). In general, these in vitro biochemical methods attempt to mimic children gastrointestinal tract conditions. Metal-contaminated soils are incubated at low pH (1.5-2.5) for a period intended to mimic residence time in the stomach. The pH is then increased to 5.5-7.0, and incubation continues for a period intended to mimic residence time in the small intestine. In vitro methods measure the contaminant *bioaccessibility*, which is the soluble fraction of the contaminant dissolved in the gastrointestinal environment, which is potentially available for absorption. The contaminant bioaccessibility can then be used as an estimate of oral relative bioavailability, therefore enabling a more accurate estimation of metal intake.

The objective of this paper is to discuss the use of bioaccessibility tests in HHRA of metallic contaminants in soils. The discussion focuses on arsenic and briefly examines lead, mercury, and cadmium. A short review of current knowledge is presented and applicability and limitations of bioaccessibility tests are discussed. The regulatory position of environmental protection agencies in North America and some European countries regarding the use of bioaccessibility tests in risk assessment is also briefly presented.

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STATUS OF BIOACCESSIBILITY TESTS

In vitro methods are currently recognised as rapid screening tools in assessing relative bioavailability of metals or metalloids at contaminated sites (Basta et al., 2001; Ruby, 2004). Furthermore, in vitro bioaccessibility methods can be used to compare soils with different properties, which would be cost prohibitive in animal-based studies (Pouschat and Zagury, 2006). However, the challenge in 2007 is to adopt these in vitro methods for developing relative bioavailability values for use in HHRA. Two different in vitro methods (IVG, SBRC) have been found to correlate well against in vivo data for lead (Pb) (Kelley et al., 2002; Schroder et al., 2004; Ruby, 2004). The in vitro gastrointestinal method (IVG) has also been successfully validated with in vivo tests for As and cadmium (Cd) with immature pigs (Rodriguez et al., 1999; Schroder et al., 2003). For Cd, the IVG method was correlated with relative Cd bioavailability for 10 soils dosed to the juvenile swine model. A high-quality "validation" means that the in vitro method has been shown to correlate with results from the animal model, and that the correlation is consistent *across a range of soil types and forms of the contaminant* (Ruby, 2004). Bioaccessible As obtained using the IVG method was reported to be an accurate estimator of oral relative bioavailable arsenic for various non calcinated slags and contaminated soils from mining/smelter sites (Basta et al., 2001). Because of the variability of soil properties affecting As retention among soils, oral bioavailability of As is expected to vary with sites and origin of contamination (for example mining and smelter vs. wood-treatment). Thus, Pouschat and Zagury (2006) assessed As bioavailability in 12 contaminated soils collected near in-service chromated copper arsenate(CCA)-treated utility poles. Arsenic bioaccessibility ranged between 25.0 ± 2.7 and 66.3 ± 2.3 % (mean value: 40.7 ± 14.9 %). The mean value was in agreement with the in vivo arsenic relative bioavailability of 49 % (90 % confidence interval, 41-58 %) reported by Casteel et al. (2003) in soil near CCA-treated utility poles. Bioaccessible Asmwas positively correlated with total organic carbon content ($r^2 = 0.36$, $p < 0.05$) and with water-soluble arsenic ($r^2 = 0.51$, $p < 0.01$), and was negatively correlated with clay content ($r^2 = 0.43$, $p < 0.05$). Using conservative exposure parameters, the mean daily arsenic intake from incidental ingestion of contaminated soil near CCA-treated utility poles was 0.18 µg As/kg bodyweight/day. This arsenic intake was much lower than the daily intake of inorganic arsenic from water and food ingestion for children (Pouschat and Zagury, 2006).

The most relevant study of mercury (Hg) bioaccessibility in contaminated soils is the one concerning the site of East Fork Poplar Creek (EFPC) floodplain in Oak Ridge, Tennessee (Barnett and Turner 2001). This published study is the only one to date, designed to estimate Hg bioaccessibility in contaminated soils using an in vitro extraction protocol. In this protocol, the gastric phase lasts 4 hours at a pH of 2.5 and the intestinal phase lasts 4 hours at a pH of 6.5. The average bioaccessible Hg for the 20 soils was 5.3 % compared with 100 % for the mercuric chloride subjected to the same conditions. Unfortunately, in vivo data using an appropriate animal model is not available to validate in vitro results. The extent of what we currently know regarding bioaccessibility methods to estimate relative bioavailability of some metals and metalloids in soil is presented in Figure 1. The illustration shows that much work remains especially for Hg and Cd.

Lead	
Arsenic	
Mercury	
Cadmium	
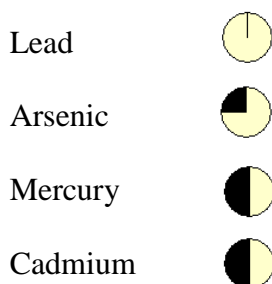
Figure 1. Extent of knowledge regarding metal and metalloid oral bioavailability in soils (adapted from Ruby 2004).

RESEARCH NEEDS

In addition to the in vitro/in vivo correlation which is essential, more work is needed for arsenic, cadmium and mercury before in vitro tests are widely used for generating oral bioavailability values for use in HHRA. This section discusses the current extent of validation and highlights the research needs.

Certified reference materials

In order to compare the different in vitro methods used to assess metal bioaccessibility, the procedures must be tested with certified soil samples. For example, the National Institute of Science and Technology (NIST) Standard Reference soil Materials (SRM2710 and 2711), and the CRM 025-050 from Resource Technology Corporation (RTC) can be tested. The SRM 2710 has already been tested with various in vitro extraction methods (Ellickson et al., 2001; Hamel et al., 1999), whereas the SRM 2711 was previously used to compare five in vitro digestion models (Oomen et al., 2002).

Gastrointestinal bioaccessibility of As in SRM 2710 (626 ± 38 mg As/kg) using the IVG method was 25.2 ± 0.3 % (Pouschat and Zagury, 2006). This value is lower than the values reported in the literature for the same SRM using different in vitro extraction tests. Indeed, Ellickson et al. (2001) found that at the end of their bioaccessibility procedure using artificial biofluids, 65.9 ± 5.2 % of arsenic in the SRM 2710 was bioaccessible. Arsenic bioaccessibility using IVG in the SRM 2711 (105 ± 8 mg As/kg) was 43.0 ± 5.6 % (Pouschat and Zagury, 2006). Oomen et al. (2002) tested the SRM 2711 with five different in vitro methods, but unfortunately, not with the IVG method. They reported bioaccessibilities ranging from 41 ± 2 % to 59 ± 2 % with an average value of 51.8 ± 7.5 %. These results demonstrate that all in vitro procedures are operationally defined, and to be useful, they first have to be validated with in vivo tests. Ideally, a standard SRM for which the relative bioavailability of various elements is known should be developed.

Metal speciation in soils

Because of the variability of soil properties affecting arsenic retention among soils (Yang et al., 2005; Dobran and Zagury, 2006; Pouschat and Zagury, 2006), bioavailability of metals and metalloids is expected to vary with sites and origin of contamination. Therefore, in vitro methods must be validated with different soil types and metal speciation in samples must be consistent with the bioaccessibility results. Metal speciation can be assessed using tools such as X-ray absorption spectroscopy, X-ray diffraction, electron microbeam methods, and single or sequential extractions. This part of the validation process is particularly important for mercury since in vivo data is not available. Recently, a combination of a four-step sequential extraction procedure (SEP) and single chemical extractions was developed to assess Hg fractionation and mobility in highly contaminated soils (Neculita et al., 2005). The SEP was validated using a certified reference material and pure Hg compounds. Our research team is currently working on linking mercury forms in soils to bioaccessibility results.

Standard protocol and QA/QC

It is unlikely that one method will be suitable for all elements. This being said, in vitro gastrointestinal methods such as IVG or SBRC protocols are applicable only if dissolution in the gastrointestinal tract is the limiting step in the oral bioavailability of a particular element. It must be reminded that these methods do not measure absorption through the intestinal membrane. Even if a unique standard protocol suitable for all elements is not developed, the in vitro protocols developed for different groups of metals should be supported by sound QA/QC procedures. Repeatability, reproducibility and accuracy of the results should be assessed and sensitivity analysis of the in vitro test should be provided. Moreover, the developed protocols must be submitted to an independent scientific arbitrage.

REGULATORY STATUS IN NORTH AMERICA AND EUROPEAN UNION

Because different in vitro methods (IVG, SBRC) have been found to correlate well against in vivo data for lead with different animal models (Kelley et al., 2002; Schroder et al., 2004; Ruby, 2004), US EPA published a technical support document which sets out how in vitro data can be used to adjust a site-specific risk assessment for lead-contaminated sites (US EPA, 2005). For As however, the validation against animal models is less robust, and more work is needed to fully validate the in vitro gastro intestinal method. This validation will be achieved when numerous soil samples of different origin (mining-related, CCA-contaminated, and pesticide related) will be tested by in vitro and in vivo methods (preferably using juvenile swine) either in parallel or in isolation. In Hawaii, the Department of Health currently evaluates human health risk using arsenic bioaccessibility in site-specific risk assessments. Health Canada recognises the usefulness of in vitro tests (Richardson et al., 2006) and is involved in the newly formed Bioaccessibility Research Group Canada (BARC). However, at this time there's no formal policy on bioaccessibility.

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In England and Wales, the Environment Agency recognises in vitro test methods; however their application is limited given the uncertainties (Saikat 2006). In the Netherlands, the Department of the Environment has not yet reached a decision on whether or not bioaccessibility testing will be accepted in risk assessments. In other EU countries such as Denmark and Belgium, the regulators do not currently routinely accept bioaccessibility testing in risk assessment. The fulfillment of some research needs suggested in this paper could help the regulatory agencies to move from an occasional use of in vitro methods in location-specific situations to a widespread use in HHRA.

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NOISE HAZARD AND HEARING IMPAIRMENT IN AN URBAN COMMUNITY IN IBADAN, SOUTHWEST NIGERIA

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Urban communities are characterized by several social and economic activities which generate noise.

Noise levels were measured in and around an urban community in Ibadan, southwest Nigeria using a sound level meter CEL 269 (CEL Instruments U.K. Ltd). Measurements were done between the hours of 11a.m and 3 p.m. Audiometric screening was done on 51 residents under standard conditions.

The noisiest locations were areas of industrial activities with machines such as saw mills , 95-102dB, carpentry tools, 87-101dB, printing, 85-88dB and dry or wet milling of foods, 88-105dB. Music shops also constituted a nuisance with noise levels of 88- 89dB. Road –side noise levels on major road junctions was 86-90dB and 61-65dB on side streets. Noise levels in designated markets ranged from 65-69dB and 61-81 dB in street markets. Within residential areas, noise levels were 55-59Db in high density areas. Audiometric screening showed that 28 (55%) had normal hearing. Mild and moderate hearing impairment was recorded among 17(33%) and 6 (11.7%) residents respectively.

There is a need for regulation and control of the several social and economic activities which generate noise in order to reduce the occurrence of hearing impairment in the general population.

INTRODUCTION

Noise is one of the outcomes of rapid industrialization and overcrowding characteristic of large cities. Adverse health effects of noise have been reported particularly in the work environment. Industrial activities which generate noise have received the greatest attention with several reports on the noise induced hearing loss among factory workers (1-3). In Nigeria, several studies have reported workers' perception of noise hazard (4) and effects of noise on factory workers including noise induced hearing loss (5-8). Outside the work environment, less attention is paid to noise. It is well known that urban communities are characterized by several social and economic activities which generate noise. There are few reports on noise in the general environment in the developing world and reports on hearing impairment in the general population in these countries are scant. This study was designed to identify the sources of noise, the intensity of noise and the occurrence of hearing impairment in an urban community in Southwest Nigeria.

METHOD

The study was conducted in Ibadan, one of the largest cities in Nigeria, located in the southwest. The population of Ibadan is estimated to be about two million. The predominant occupations among residents of the city are trading and artisanry in small scale enterprises while a smaller proportion of the population are engaged in government offices, private and public institutions.

Noise measurements were done in selected parts of the city using a type 2 digital integrating sound level meter CEL 269(CEL Instruments U.K). The meter was set for A weighting. Measurements were done during the hours of 11a.m. to 3 p.m. Measurements were carried out in residential areas, roadsides, major road junctions, street markets and some small scale industries located in residential areas.

Audiograms were done on some residents living in a low income community within the city after completion of a questionnaire to collect socio demographic data and information on general health status. Informed consent was obtained from each participant. These subjects had no known exposure to occupational noise. Pure tone audiometry was done with a diagnostic audiometer, Kamplex KLD 21in a quiet office. Hearing thresholds were measured at 250hz, 500hz, 1000hz, 2000hz and 4000hz after aural examination of each participant. Hearing impairment was calculated using the formula for pure tone average of the thresholds for 500hz, 1000hz, 2000hz and 4000hz and was defined as a pure tone average greater than 25dB hearing threshold level.

RESULTS

Table 1 shows the noise levels recorded in selected locations within the city. Low density residential areas had the lowest noise levels ranging from 39 to 41dBA while the high density areas had noise levels of 55-59dBA. Street noise ranged from 61-65dB on side streets and 83-86dBA on main roads to 86-90dBA at major road junctions. Roadside music from music shops produced noise levels of 95- 97dBA. Noise levels in some workshops were above the 90dB range.

Audiograms were done for fifty-one subjects comprising 26 males and 25 females. They were aged 12-60 years. Twenty eight persons, 55% had normal hearing in both ears, 17 (33.3%) had mild hearing loss in the worse ear and 6(11.7%) had moderate hearing loss in the worse ear. Table 2 shows the prevalence of hearing loss in left and right ears. The prevalence of hearing loss increased with age and ranged from 14% in the second decade to 75% in the fifth decade of life. There was no difference in the occurrence of hearing impairment between the two sexes.

DISCUSSION

Table 1 Noise levels in the general environment in Ibadan

Location	Noise levels (dBA)
Residential areas	
Low density	39-41
Medium density	56-59
High density	55-59
Road side	
Side street	61-65
Main road	76-80
Major road junction	81-84
Roadside music shop	
1 metre away	96-99
10 metres away	89-92
Street market	61-81
Designated market	65-69
School	55-59
Workshops	
Carpentry	87-101
Sawmill	95-102
Printing	85- 88
Dry and wet food mills	88-105

Table 2

Hearing loss in left and right ears   N=51

Hearing loss	Left ear	Right ear
Normal hearing (>25dB)	36 (70%)	33 (64.7%)
Mild hearing impairment (26-40dB)	12 (23.5%)	13 (25.5%)
Moderate hearing impairment (41-55dB)	3 (6.5%)	5 (9.8%)

Noise levels in the various locations in this urban community revealed that street noise and noise due to industrial activities involving machines were the main sources of noise in the environment. Street noise produced mainly by vehicular traffic is associated with noise induced hearing loss (9). In this community street noise was accentuated by music blared from loud speakers in roadside music shops emitting noise levels ranging from 90-99dBA. As street trading in Ibadan takes place during much of the daytime, about 10 hours a day and 6 days a week, exposure time may exceed   40 hours a week. The implications of these activities are that road side workers such as street traders are exposed to noise levels exceeding acceptable occupational exposure.   Similar reports of street noise from music shops have been documented from other parts sof Nigeria (10).   Small scale industries constitute other sources of noise in the community. Saw mills, carpentry workshops, printers'

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shops and grain mills contribute to noise in the environment. Noise emission from these and other small scale enterprises exceed acceptable limits of occupational exposure (10,11). Noise levels in residential areas range from 39-41dB in low density areas to 55-59dB in high density areas. Noise levels in high density areas exceed the limit of 50dB for residential areas in Brazil(12).

Noise regulation in Nigeria is rudimentary in spite of several decades of industrialization. While efforts to control noise in the workplace have been very feeble, there is little if any effort to control noise pollution in the general environment. Regulation of noise from small scale industries scattered within residential areas across the city is an additional challenge to noise control in the general environment.

Audiological assessment of a small number of residents within the community revealed a high prevalence of hearing impairment. A little over half of the participants had normal hearing. No sex differences were found in the occurrence of hearing impairment as in other studies (13, 14). Hearing impairment increased with age. While it was not possible to identify the causes of hearing impairment among this group of residents, noise levels recorded in the environment suggests that the contribution of noise to hearing impairment may be significant. Other studies have shown that roadside workers have more hearing impairment than residents living away from the main roads (15). The level of hearing impairment in this community is unacceptably high especially when compared to levels recorded in the developed world. Studies in the general population in Italy (14), Australia (16) and Britain (17) have reported prevalence of hearing impairment of 17%, 22.2% and 16% respectively. Such studies have lent credence to the fact that hearing impairment is the most important cause of disability in the developed world. In the developing world, disability from communicable diseases such as polio, leprosy and onchocerciasis may obscure the prevalence of disability due to hearing impairment.

There is a need for regulation and control of the several social and economic activities which generate noise in the environment in order to reduce the occurrence of hearing impairment in the general population. Community surveys are also needed to determine the prevalence and causes of hearing impairment in the general population.

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ECONONOMIC VALUE OF IZMIR CULTURE PARK

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Rapid and overdevelopment of urbanization and industrialization not based upon ecological principals in Turkey has brought a lot of environmental problems like other developing countries. These environmental issues such as air pollution, water pollution; especially in larger cities like İzmir where population and economic activities intensify; are affecting human health and quality of life negatively. In this situation, urban people are in need of recreational activities to improve their physical, mental and social health. Urban green areas, especially parks are important areas for recreational purposes because these provide many environmental and social services that contribute to quality of life in the cities. However, urban green areas are most affected sites by the urbanization and industrialization. Besides, like most environmental factors urban green areas are not based on economic value and decision making processes are not reliable. In this paper, economic value of İzmir Culture Park; biggest green area of İzmir Metropolitan with a very high potential for recreation activities due to its historical, natural and cultural resources; has been evaluated by using Travel Cost Method.

Key Words: Travel Cost Method, Culture Park, Urban Green Areas, Recreation Areas, İzmir

Introduction

The environmental problem is the 'correct' valuation of the environment, and letting the forces of self-interest manage the environment through the invisible hand of the market. And in this regard there has been a debate over the allocation of property rights to ensure that utility is maximized in the exploitation of the environment. There is a continuing debate over how far, and the method by which, the state can intervene to control the exploitation of the environment. The emphasis is on correctly valuing environmental assets through the technique of cost-benefit analysis. The discussion centres on how the environment can be valued when it isn't marketed as a commodity, and the means by which the future effects on consumers' utility of today's activity are valued (Ken, 1999). Some methods were developed for estimating the economic value of nonmarket environmental goods such as parks and recreation areas in the last 40 years. These methods may be divided into two groups: direct and indirect methods. The indirect individuals' valuations methods rely on the behaviour of consumers in related markets to reveal their valuations of the non-market goods, while direct methods use surveys to ask individuals' valuations for these goods in a hypothetical market (Ortaçeşme et all.,2002).

Travel Cost Method (TCM), the most common indirect valuation methods, is often used for quantifying the value of public lands used for recreational purposes (Karasin, 1998). TCM can be used to estimate the economic benefits or costs resulting from changes in access cost for a recreatioanal site, elimination of an existing recreational site, addition of a new recreational site (Alkay, 2003).

The travel-cost method also can link changes in environmental quality to the demand for recreation trips and the value of these trips. This is accomplished by including measures of environmental quality as variables that describe site characteristics in the travel-cost model (Lupi, 2005).

The basic premise of the TCM is that, although the actual value of the recreational experience does not have a price tag, the visitors' travel costs to a recreational area used as a proxy for the price of the recreational activity, and the visitation rate expenses the amount of the recreational experience bought (Karasin, 1998 and Navrud and Mungatana, 1994). Variations in travel costs and visitation rate can then be used to estimate a demand curve, which is used compute the consumer surplus of the activity, i.e., the recreational value (Navrud and Mungatana, 1994). The sole decision variable is the number of visits to a certain recreation site in a certain period of time (generally one year). Consumer surplus is estimated by relating expenditures to the number of visits (Ortaçeşme et all., 2002).

The Travel Cost Method can be applied in two different ways, namely the Individual Travel Cost Method (ITCM) and the Zonal Travel Cost Method (ZTCM). The ITC method focuses on the number of site visits made by each visitor over a specific period, say one year. The ZTC method, on the other hand, partitions the entire area from which visitors originate into a set of visitor zones and then defines the dependent variable as the visitor rate (i. e. the number of visits made from a particular zone in a period divided by the population of that zone). In both cases an uncompensated demand curve can be derived and consumer surplus estimates of recreational value obtained (Bateman, 2003).

Some of its more significant problems would include the question of what consumer surplus measures, the correct approach to dealing with time, the treatment of different types of travellers, and t the difficulty of attributing costs in multi-purpose trips and the other problems (Karasin, 1998 and Throsby 2001). Despite these reasonably formidable questions, however, there is energetic work attempting to make progress on these and related issues. The TCM has not been given up for a lost cause. Rather–whether because of its own merits or a lack or alternatives–it is one of the most significant tools we have for the estimation of user value for non-market assets (Karasin, 1998).

The main objective of the paper is to estimate indirect market use value of recreational activities in the Culture Park, biggest green area of İzmir Metropolitan with a very high potential for recreation activities due to its historical, natural and cultural resources, by using individual travel cost method. Also, few environmental valuation studies have been carried out in Turkey like the other developing countries. For that reason, this study, as an example, can shows that the Travel Cost Method can be successfully applied to value natural resources.

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Material and Method

Material

The main material of this study is the actual data received by the questionnaire applied face to face to the visitors of Culture Park, which is the most important and the biggest park in İzmir. Data are received by the questionnaire forms appropriate for the purpose. In addition to this, other materials of this study are consist of published statistical data, research reports, articles,

presentations, and also, researches and explanations related with the subject, done by the scientists who are experts on their own subjects.

Description of the research area

Culture Park, the largest protected area in İzmir created in 1936, was selected as research area. This park, nowadays, is in the situation of being an important centre as, first of all, İzmir International Fair and also different fair works, artistic and cultural activities are organized in. With this specialty, it accommodates nearly 4 000 000 visitors every year. Furthermore, a lot of areas as running court, swimming pool, open-air theatre, art centres, museums, sport centre, tennis court, betrothal hall, amusement park, zoo gives opportunity for active and passive recreation.

Culture Park is, also, the largest and the most important green area of the city. It is, on 421 000 m^2 area, created in the centre of the city having 156 000 m^2 green area (Gemici et all., 1992). There are approximately 8000 trees and scrubs representing 200 different species in the Park. With this specialty Culture Park is described as an arboretum and it has been declared as 2nd. Degree Natural Site (Figure 1) (Gemici et all., 1992 and Chamber of City and Region Planners, 2006).

Figure 1. Culture Park

Method

The travel cost method relies upon a survey to gather data and a TC survey must involve at least a high proportion of users of the recreational asset in question. Most typically this involves on-site surveys in which a questionnaire is used to collect data on users' place of residence; necessary demographic and attitudinal information; frequency of visit to this and other sites; trip information such as purpose, length, associated costs, etc. From these data, visit costs can be calculated and related, with other relevant factors, to the frequency of visits in a 'trip generation function' (TGF) from which a demand relationship may be established (Bateman, 2003).

As stated before, the original data of the study are questionnaire received by face to face interview with visitors of Culture Park. Household number of İzmir Metropolitan area was accepted as the study population to determine the sample. To apply ITCM we analyze a sample survey of 70 visitors randomly selected in Culture Park. The questionnaires were applied over the 2 month period from May through July in 2006 by face to face interviews.

A 24 question survey form appropriate fort he study purpose was developed to get data. The questionnaire contained questions to determine the trip-related characteristics, demographic and socioeconomic characteristics and point of view on and behaviours towards environment of visitors and to find out the travel costs involved in their visiting the Park.

Travel cost method frequently, used for estimating the use value of natural and near natural areas, based on the proposition that consumers' valuations of such facilities are indicated by how much they say they would be prepared to pay (or how much they actually pay) in travel costs to visit it. If a sample of consumers is surveyed and their willingness-to-pay responses are revealed, a simulated demand curve can be constructed (Throsby, 2001). The sole decision variable is the number of visits to a certain recreation site in a certain period of time (generally one year). Consumer surplus is estimated by relating expenditures to the number of visits (Ortaçeşme, 2002).

While the method can be applied in two different ways, in this study Individual Travel Cost Methods was used. Data, received from survey, were analyzed by using Microsoft Office Excel 2000 and SPSS 11.0 statistical software and percent rates and mean values were computed.

Afterwards, demand curve and consumer surplus was estimated. As the number of trips taken by individual within a year is necessarily modelled as the dependent variable of regression, for selection of independent variables function tests were used. According to function tests, important F and t values in statistical sense were taken into function. Within that independent variables are total travel costs, settlement region category according distance, other cost, prefences of location of house for distance to Culture Park, are the green areas like the Culture Park effective in preventing environmental problems, age, education, if worked in case of no visit, martial status.

The Zone which is one of the independent variables was grouped according to the distance of residences of visitors to Culture Park. Five zones established accordingly are;

✓ Zone 0 : Residences near surrounding of Culture Park,
✓ Zone 1 : i.e. Karataş, Üçyol, Gültepe, Tepecik, Bozyaka, Eşrefpaşa
✓ Zone 2: i.e. Bornova, Karşıyaka, Hatay, Şirinyer, Bayraklı
✓ Zone 3: i.e. Üçkuyular, Çiğli, Işıkkent, Gaziemir, Karabağlar, Buca
✓ Zone 4: Others

Semi logarithmic function form was selected to estimate the demand model for ease of interpretation and linear form for computing the economic value of the Culture Park via consumer surplus. Gretl was used for econometric estimations.

Results

Demographic Characteristics

The study is based on a survey of a random sample of 70 visitors to Culture Park over a period of two months (May-June) in 2006. Survey results show that 50 percent of the participants were females and 50 percent were males. The age of visitors was considered according to age groups as follows: 0-20, 21-40, 41-60, and over the 61. In this context, it was found that visitors 21-40 years of age had the highest share (68,6%). They were followed by visitors 41-60 years of age (17.1%), 0-20 years of age (8,6%), and over the 61 (5,7%). The visitors were well educated as 47,1% of the survey respondents had a bachelor degree, 34,3% had secondary school degree, %14,3 had primary school degree and 4,3% had graduate degree. 22,9 % of the visitors were self employed, 15,7% offices, 14,3 % retired, 14,3% housewife, 12,9% student and 4,3% artisan. Household income of the participants of questionnaire was analyzed according to 5 group: 0-500 YTL ($ $), 501-1000 YTL, 1001-2000 YTL, 2001-2500 YTL monthly incomes. Results of questionnaire show that visitors with 501-1000 YTL monthly incomes ranked first, represented by 37,1%. They followed by visitors with 0-500 YTL (31,4%), 1001-2000 YTL (22,9%) and 2001-2500 YTL (5,7%). Average weekly working period was 32 hours and average household number was 3.

Visitors' Point of View on and Behaivors towards Environment

To determine visitors' point of view on environment, various questions was asked participants. In this context, answers of 67 (95,7%) participants for the question "Do people damage the environment" were "Yes". 55,7% of participants with the answer "Yes" believe that people harm environment by polluting, 15,7 % believe by exploiting resources, and 10 % believe by excess consumption. Besides, for the question of "what is the importance of the environment for you?" 98,6% of the participants gave the answer that "environment has a nice view", 94,3 % "environment meets the human being needs" and 82,9% "environment creates employment" is very important (Table 1). Urbanization by 51,4% of respondents, soil pollution by 15,7%, air pollution by 14,3%, water pollution by 7,1% were defined as the most important environmental problem of Turkey. 77,1% of the survey respondents thought that . Redoubling of number of green areas like Culture Park can have a role to reduce environmental problems. 7,1% of the respondents are member of an environmental organization.

Table 1. Visitors' point of views on importance of the environment

	Not Important (%)	Important (%)	Very Important (%)
environment has a nice view	-	1,4	98,6
environment meets the human being needs	1,4	4,3	94,3
environment creates employment	5,7	11,4	82,9

Trip-related Characteristics of the Visitors

The residence regions of the survey respondents were grouped according to distance of them to Culture Park. In this sense, first region, which locate near surroundings of Culture Park,

was entitled as Zone 0.   Table 1 shows that 28,6 % of visitors of Culture Park came from Zone 1 (i.e. Karataş, Üçyol, Gültepe, Tepecik, Bozyaka, Eşrefpaşa), 27,1% from Zone 2 (i.e. Bornova, Karşıyaka, Hatay, Şirinyer, Bayraklı), 24,3 % from Zone 0 (i.e. Alsancak, Basmane, Kahramanlar), 15,7 % from Zone 3 (i.e. Üçkuyular, Çiğli, Işıkkent, Gaziemir, Karabağlar, Buca), and 4,3 % from Zone 4 (Table 2).

Table 2. Number of Trips from Each Zone

Zones	Number of Visits	
	Number	**%**
0	17	24,3
1	20	28,6
2	19	27,1
3	11	15,7
4	3	4,3
TOTAL	**70**	**100**

Survey respondents on the travel data show that 60 % of the respondents arrived the Park by using public transport systems (i.e. bus, subway, seaway), 28,6 % by walking and 11,4 % came by car. The respondents spent on average 51 minutes to reach area and average travel cost is $2,2 (Table 3).

Table 3. Average Travel Time and Cost for Trips from Each Zone

Zones	Average Travel Time (minute)	Average Travel Cost (YTL-$)	Cost/Time ($/mn)
0	21	0,4	0,019
1	50	1,39	0,028
2	54	2,78	0,051
3	72	2	0,027
4	123	4,2	0,034
TOTAL	**51**	**2,2**	**0,03**

Breath the fresh air was stated as the reason of the visits by 55,7% of the survey participants. In addition, 11,4 % of the respondents expressed that they came Culture Park to bring their children for enjoying. 10 % of visitors expressed that they visit Culture Park for its cultural opportunities and 8,6 % for jogging and doing sports (Table 4). Only 12,9% of visitors interviewed for the survey was stated that if they did not come Culture Park they would be working and average economic loss because of the unable to work was $0,61. Average expenditure in Culture Park was $2,69. Besides, 5,7% was stressed that they considered location of Culture Park when they decided their house location.

Table 4. Reasons of Visits to Culture Park

Reasons	Number	%
Fresh air	39	55,7
Jogging and doing sports	6	8,6
Children's fun	8	11,4
Cultural opportunities	7	10,0
Zoo visit	1	1,4
Children's fun and zoo visit	4	5,7
Others	5	7,2
Total	70	100

Model Specification

We begin our analysis with reporting and discussing the results of an OLS regression. According to regression, important F and t values in statistical sense were taken into function. Within that independent variables (Table 5.);
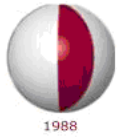
Table 5. Estimation of the Model

Model Variables	Coefficients	St. Error
Constant	6,82809	1,27145***
Total Travel Cost	-0,142213	0,0401169***
Zone	-0,703533	0,155548***
Other Cost	0,269888	0,115365**
Preferences of location of house for distance to Culture Park	1,92866	0,754029*
Are the green areas like the Culture Park effective in preventing environmental problems?	-0,820055	0,416831**
Age	0,597086	0,335527*
Education	-0,412561	1,780*
If worked in case of no visit?	-0,219106	0,130340*
Martial Status	-0,853506	0,357239**
Adjusted R-squared = 0,434743		

*Significant at * α=0.10, **α=0.05 and ***α=0.01 probability level.*

According to the results, the function was found to be significant at the level 1%. The coefficient on the "travel cost" per trip is negative (-), as expected, and it shows that there is an opposite relation between the travel costs increase, the number of annual visits decrease. . Its magnitude, approximately 0.14, implies that it takes an increase in price per trip of $0,69 to see a decrease of 14 % in expected trips. In addition, coefficient on "Zone" is negative, too. Accordingly, when increasing in the distance of the settling region to Culture Park of 1 zone, to see a decrease of 70 % in excepted trips. Increasing in "are the green areas like the Culture

Park effective in preventing environmental problems", "education", "if worked in case of no visit" and "martial status" (single=1, married=2, divorced/widowed=3) also have negative impact on number of annual trips. All of three variables ("other cost", "preferences of location of house for distance to Culture Park" and "age") have a positive relationship with the number of annual visits.

Consequently, the demand function of Culture Park was formed as follows;

V = f (TC, Z, OC, LH, K, A, E, G, M, e)

V: Number of annual visits of individual to Culture Park

Table 6. Independent Variables of Model

Variables	Description
TC	:Total travel costs (travel costs and economic losses due to no work)
Z	:Settlement region category (Zone 0, Zone 1, Zone 2, Zone 3, Zone 4)
OC	:Other cost (expenditure in Culture Park-İzmir Art-Culture Centre)
LH	:Preferences of location of house for distance to Culture Park (Yes/No)
K	:Are the green areas like the Culture Park effective in preventing environmental problems? (Yes/No)
A	:Age (0-20, 21-40, 41-60, over 60)
E	:Education (Primary School, Secondary Scholl, Bachelor Degree and Graduate Degree)
G	:If worked in case of no visit?
M	:Martial Status (Single, Married, Divorced/Widowed)
e	:Error

To estimate the consumer surplus, the following formula was used to;
For the average values of the variables, the demand model is:

Q= 113.1919 – 6.2128 P

Economic value of the Culture Park via consumer surplus:

$$CS = \int_0^{Q_0} f(Q)dQ - Q_0 P_0$$

$P_0 = 3.54$
$Q_0 = 91.198$

$$CS = \int_0^{91.198} \left(\frac{Q - 113.1919}{-6.2128} \right) dQ - (3.54)(91.198)$$

CS=672.08 YTL (466.72 \$)[1] for the sampled visitors
Recreational value per visitor was US\$ 6.67.About 938 000 persons visit İzmir Culture Park each year for only recreational usage (except for specialization fairs). Thus, it is estimated the total consumer surplus (TCS) is :
TCS=6.67 x 938 000 = US\$ 6.26 million year-1
The value of the consumer surplus represents the annual economical value of recreational use of İzmir Culture Park. In other words, the Culture Park provides a social benefit about US\$ 6.26 million each year.
About 938 000 persons visit İzmir Culture Park each year for only recreational purposes. Thus, we can estimate the total consumer surplus (TCS);
TCS = 6,667 x 938 000 = 6 253 646

The value of the consumer surplus represents the annual economical value of recreational use of İzmir Culture Park. In other words, the Culture Park provides a social benefit about \$ 6,25 million each year.

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[1] 1YTL=1.44 \$

Discussion and Conclusion

Public parks as representative of urban green areas have played an excellent role to against degradation of urban environment while keeping the rapid pace of urban growth (Iamtrakul et all., 2005). However, urban green areas are most affected sites by the urbanization and industrialization. Besides, like most environmental factors urban green areas are not based on economic value and for that reason decision making processes are not reliable. The travel cost method attempts to extract the value of recreational place on public lands through their revealed preferences (Brown and Mendelson, 1984). This paper has presented an empirical application of the travel cost model to valuing environmental attributes of Culture Park which is most visited Park of the İzmir Metropolitan Area with annual 4 000 000 visitors. For the study, we have surveyed visitors to gather information about the frequency of their trips and cost incurred. Results of surveys were used to estimate demand function and consumer surplus. According to consumer surplus, social benefits of Culture Park is about $ 6,25 million each year. These results show that ITCM can be used for estimation of value of recreational areas in Turkey. Despite of its significant problems, it can be helpful for decision makers and planners by adding economic value of recreational areas and facilities into decision support systems.

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DETERMINATION OF EXPOSURE LEVELS TO UV AND THE KNOWLEDGE OF THE PEOPLE ABOUT PREVENTIVE MEASURES IN TURKISH REPUBLIC OF NORTHERN CYPRUS

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Ultraviolet (UV) light is electromagnetic radiation with a wavelength shorter than that of visible light, but longer than soft X-rays. It can be subdivided into near UV (380–200 nm wavelength), far or vacuum UV (200–10 nm), and extreme UV (1–31 nm). [1,2,3]

The sun is the major source of UV radiation. There are also some artificial sources such as electric arc lights, welding arcs, plasma jets, and special UV bulbs. [3,4] When considering the effect of UV radiation on human health and the environment, the range of UV wavelengths is often subdivided into UVA (380–315 nm), also called Long Wave or "blacklight"; UVB (315–280 nm), also called Medium Wave; and UVC (< 280 nm), also called Short Wave or "germicidal". [1,3-9]

The sun emits ultraviolet radiation in the UVA, UVB, and UVC bands, but because of absorption in the atmosphere's ozone layer, 99% of the ultraviolet radiation that reaches the Earth's surface is UVA. [1,5,6,9]

Everyone is exposed to ultraviolet (UV) radiation from the sun. Small amounts of UV radiation is beneficial to people, and play an essential role in the production of vitamin D. However, overexposure to UV radiation is responsible for two major public health problems: skin cancer and cataract. Emissions from the sun include light, heat and UV radiation. UV radiation reaching the Earth's surface is largely composed of UVA with a small UVB component. The amount of UV radiation varies with season, time of day, latitude, altitude, and spesific atmospheric conditions. The biological effect of radiation exposure depends on the type and duration of exposure and on the amount of absorption by the organism. [3,5,6,9-11]

Depletion of the ozone layer is likely to aggravate existing health effects caused by exposure to UV radiation, as stratospheric ozone is a particularly effective UV radiation absorber. As the ozone layer becomes thinner, the protective filter provided by the atmosphere is progressively reduced. Consequently, human beings and the environment are exposed to higher UV radiation levels, and especially higher UVB levels that have the greatest impact on human health, animals, marine organisms and plant life. [6,12]

It is predicted that a 10% decrease in stratospheric ozone could cause an additional 300,000 non-melanoma and 4500 melanoma skin cancers and between 1.6 and 1.75 million more cases of cataracts worldwide every year. [3,6,13,14]

The UV index is an international standard measurement of how strong the ultraviolet (UV) radiation from the sun is at a particular place on a particular day. Its purpose is to help people to effectively protect themselves from UV light, which causes sunburns, eye damage such as cataracts, skin aging, and skin cancer [1,8,15-17]

Health Consequences

In humans, prolonged exposure to solar UV radiation may result in acute and chronic health effects on the skin, eye, and immune system. Ultraviolet photons harm the DNA molecules of living organisms in different ways. [1] As a defense against UV radiation, the body tans when exposed to moderate (depending on skin type) levels of radiation by releasing the brown pigment melanin. This helps to block UV penetration and prevent damage to the vulnerable skin tissues deeper down. Suntan lotion that partly blocks UV is widely available (often referred to as "sun block" or "sunscreen"). Most of these products contain an "Sun Protection Factor (SPF) rating" that describes the amount of protection given. This protection, however, applies only to UVB rays responsible for sunburn and not to UVA rays that penetrate more deeply into the skin and may also be responsible for causing cancer and wrinkles. Some sunscreen lotion now includes compounds such as titanium dioxide which helps protect against UVA rays. Other UVA blocking compounds found in sunscreen include zinc oxide and avobenzone. [1,13,14,18]

One in every three cancers diagnosed worldwide is a skin cancer. Most skin cancers are attributable to over-exposure to natural UV radiation. Exposure to the sun is known to be associated with different types of skin cancer, accelerated skin ageing, cataract and other eye diseases. There is also evidence that UV radiation reduces the effectiveness of the immune system. [1,3,10,13-15,19,20]

Dangers of UV Radiation Exposure
Short-term:
• Sun burn
• Suppression of the immune system
• Eye inflammation (including photokeratitis, photoconjunctivitis)
Long-term:
• Skin cancer
• Skin ageing
• Cataract [15,21]

As UV radiation can neither be seen nor felt, it is important to provide a tool to raise awareness of the problem and alert people on a daily basis to take prompt, appropriate, protective action. [10] Protective measures include administrative controls, equipment design and personal protection. Administrative actions include education and instruction of individuals who will be exposed, posting of notices, limiting access in the workplace, and regulation of exposure time. Equipment design includes placement of UV glass shields. Personal protection includes the use of shields, goggles and appropriate clothing. [3]

OBJECTIVES

The aim of this study is to determine UV light levels on a public beach and the level of knowledge of people sunbathing on the beach concerning the hazards of and ways of protection against UV light exposure.

METHODS

Ultraviolet light levels on a public beach in Turkish Republic of Northern Cyprus were measured between 17-23 August 1999. Measurements were taken on the same spot for a period of 7 days, on every hour between 9.00 to 18.00 hours for 10 minutes under direct sunlight and in the shade of an umbrella by using "UV Light Meter UVA-365 (320-390nm)" (Korins CO. Ltd., sensitivity: 99%, functionality degree: 0-50°C, functional humudity level: max. 80%).

In this descriptive study, a questionnaire which includes 19 questions was applied to 144 people who accepted to participate, sunbathing on the beach. SPSS program 13.0 was used for data entry and basic statistical analysis.

RESULTS

Mean age of the participants were 39.25±1.09 years (median=36, min-max=13-74), 50.0% were graduated from high school and 25.7% from university. Of the participants, 53.8% were males and 39.3% have stated that their skin type was dark whereas 6.4% were fair-skinned (Table 1).

Of the people who participated the study, 17.5% stated that they had speckles and 80.0% of those indicated that the number of the speckles they had, were increasing under the sunlight (Table 1). Participants were from Lefkoşa (61.1%), Güzelyurt (26,4%), Girne (8.3%), Gazi Magosa (2.1%) and from abroad (2.1%) (Table 1).

The participants stated that they they spend their summer holidays in the cities they were living (48.2%), at seaside (30.5%), upland (14.2%) or overseas (5.05). Of the participants, 51.4% spent their time on the beach at risky hours (10.00-16.00) (Table 1). Participants stated that they approximately spend 20 days at the seaside and they spend approximately three hours on the beach.

Of the participants, 91.2% took preventive measures. Participants stated that they used cream/sun oil (55.0%), umbrella (16.0%) and hat (8.7%) (Table 2). When choosing the products, they considered the preventive scale (46.5%), quality (31.5%), label (21.3%) and price (15.7) of the products (Table 2). They got the information on preventive measures from the recipe of the product (29.1%), seller (23.6%), doctor (22.0%), media (20.5%) and the previous users (14.5) (Table 2).
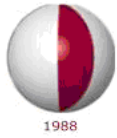
Of the participants, 13.9% stated that they had health problems due to the sun. These problems were skin problems (45.0%), sunburns/heatstrokes (20.0%), eye problems (15.0%), and headache (10.0%). The year before they also had health problems due to sunlight (Table 2). Of the participants, 57.6% thought that their knowledge on UV light and preventive measures were inadequate (Table 2).

Hourly distribution of UVA mean levels are given in Figure 1. Mean UV-A light levels were between 0.043-0,437 mW/cm^2 under direct sunlight and 0,025-0,115 mW/cm^2 in the shade of an umbrella. The highest UV-A level (0,535 mW/cm^2) was determined in August 17th. The increase in UV levels were maximum between 12.00 and 13.00. UV levels particularly decreased after 16.00 (Figure 1).

Table 1. Socio-demographic and Personal Characteristics of the Participants (Turkish Republic of Northern Cyprus, 1999)

Characteristics		n	%
Socio-demographic characteristics			
Sex (n=143)	Male	77	53.8
	Female	66	46.2
Age groups (n=138)	≤20	7	5.1
	21-30	41	29.7
	31-40	31	22.4
	41-50	24	17.4
	51-60	28	20.3
	>61	7	5.1
Mean=39.25±1.09 Median= 36 Min-max=13-74			
Education (n=140)	Primary school	12	8.9
	Secondary school	16	11.4
	High school	70	50.0
	University	36	25.7
Place of residence (n=144)	In Cyprus	141	97.9
	Overseas	3	2.1
Place of summer holiday (n=141)	City where he/she lives	68	48.2
	Seaside	43	30.5
	Upland	20	14.2
	Overseas	7	5.0
	More than one place	3	2.1
Going to the beach at risky hours (10.00-16.00) (n=144)	Yes	74	51.4
	No	70	48.6
Personal characteristics			
Skin type (n=140)	Dark	55	39.3
	Brunette	50	35.7
	Blonde	26	18.6
	Fair	9	6.4
Speckles (n=137)	No	113	82.5
	Yes	24	17.5
Change in speckles under sunlight (n=20)	Increases	16	80.0
	Doesn't increase	4	20.0

Table 2. Some Preventive Measures Taken by the Participants (Turkish Republic of Northern Cyprus, 1999)

	Characteristics	n	%
Preventive measures (n=114)	No	10	8.8
	Yes	104	91.2
Usage of preventive measures* (n=131)	Sun Oil	38	27.5
	Cream	38	27.5
	Umbrella	22	16.0
	Shadow	21	15.2
	Hat	12	8.7
	Other [1]	7	5.1
Effective factors on selection of preventive measures** (n=127)	Prevention scale	59	46.5
	Ouality	40	31.5
	Label	27	21.3
	Price	20	15.7
	Other[2]	15	11.8
Source of information ** (n=127)	Recipe	37	29.1
	Seller	30	23.6
	Doctor	28	22.0
	Media	26	20.5
	Previous user	19	14.5
	Other[3]	15	11.8
Products used for tanning*** (n=119)	No	65	54.6
	Yes	54	45.4
	Sun oil/cream	42	77.8
	Olive oil	6	11.1
	Baby oil	2	3.7
	Cola	1	1.9
	Other[4]	3	5.5
Health problems due to sunlight*** (n=144)	No	124	86.1
	Yes	20	13.9
	Skin problems	9	45.0
	Sunburns/heatstroke	4	20.0
	Eye problems	3	15.0
	Headache	2	10.0
	Hiper/hipotension	1	5.0
	Allergy	1	5.0
Health problems due to sunlight the year before*** (n=140)	No	127	90.7
	Yes	13	9.3
	Skin problems	7	53.8
	Eye problems	2	15.4
	Allergy	1	7.7
		1	7.7
	Sunburns/heatstroke		
	Headache	1	7.7
	Hiper/hipotension	1	7.7
Need for knowledge on preventive measures (n=139)	No	59	42.4
	Yes	80	57.6

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1. Olive oil, stay on the beach for a short time
2. According to the suggestions (Doctor, skin structure, suitable)
3. Social learning, parents, pharmacist
4. Yogurt, sea water, winegar

*More than one answer was given and percentages are taken on total number of preventive measures.
* *More than one answer was given and row percentages were calculated
*** Percentages are taken for the people who used products to have a tan and who had health problems

Figure 1. Hourly Changes on UV-A Mean Levels During One Week (Turkish Republic of Northern Cyprus, 1999)
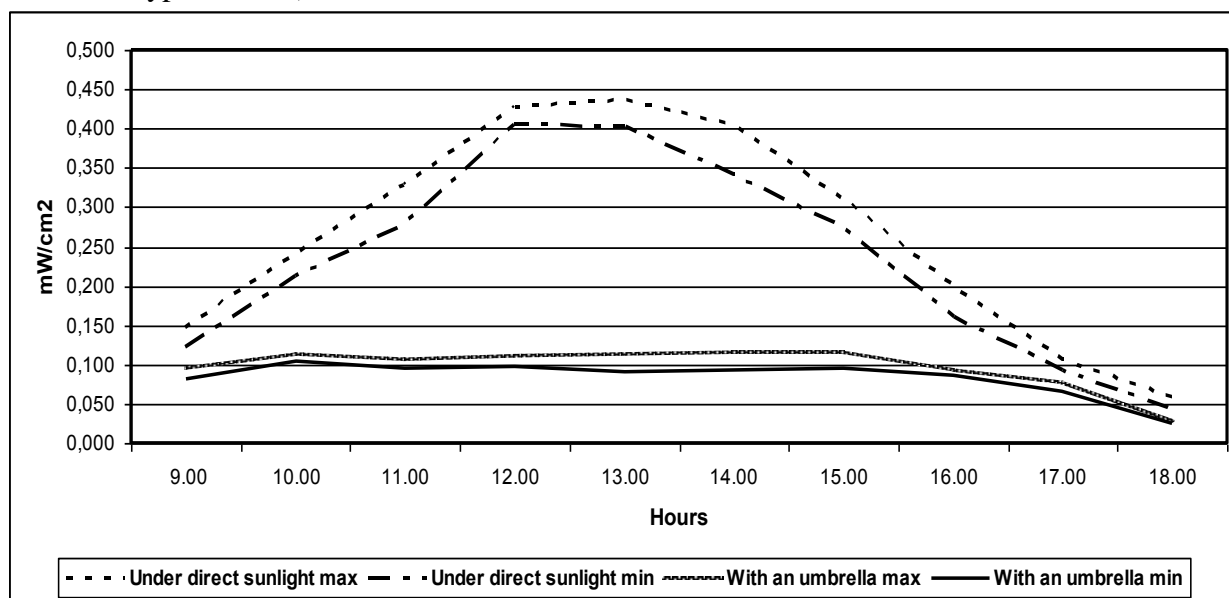
ISCUSSION

In this study we asked participants questions to determine the sociodemographic and personal characteristics. Most of the participants were living in Turkish Republic of Northern Cyprus. As the research was conducted in this country, this result was expected (Table 1).

More than half of the participants spent their time on the beach at risky hours (Table 1). It is known that exposure to the sun is maximum during peak hours (10.00-16.00) because UV rays are more intense around midday. [22] Also in our study, we found that UV-A mean levels were maximum during these hours (Figure 1) . In our study, most of the participants were blonde, brunette or fair-skinned (Table 1). The skin type is important as more than 90% of non-melanoma skin cancers occur in fair skinned people. However, even though the incidence of skin cancer is lower in dark skinned people, they are nevertheless susceptible to the damaging effects of UV radiation, especially to the effects on the eye and immune system. [10] There is no doubt that excessive UVR exposure is harmful especially to those whose sun exposure patterns are unsuited to their skin type and pigmentation. [20]

Quantitative research indicates, especially for younger people, among the prime reasons to go abroad on holiday are relaxation and to get a tan. The desire to tan on holiday is most common in younger people with over 70% of 16–24 year olds aiming to do so. The continued appeal of a tan is likely to explain the lack of transition from good intentions to actual protective behaviour. [23] In our study 82.7% of the participants stated that they tried to tan and more than half used nothing for tanning (Table 2). Some researches show that many people have high level of knowledge of the dangers of excessive sun exposure and the need for sun protection, however, this knowledge often does not transfer into behaviour, with many people, particularly adolescents, still desiring and actively seeking a suntan. [24] Evaluation of primary prevention campaigns in Germany showed that due to continuous intervention programs during the last 16 years, changes have been achieved in the ''sun-behaviour'' of the population. It is expected that this continuous programme will vigorously change behaviour of target groups and the public as a whole leading to a reduced but, due to beneficial effects, sufficient exposure to solar UV-irradiation. This will then contribute to the aim of decreasing morbidity and mortality of skin cancer. [25]

In 1999, INTERSUN's, a project which was relaunched by World Health Organization (WHO) and was expanded to cover a range of new activities, including children's health, key objective was to promote the reduction of unnecessary UVR exposure and to counter the potential threat of increased UVR exposure resulting from depletion of the ozone layer. WHO's INTERSUN activities include the development of an internationally recognized UV Index, now used in many countries around the world, to facilitate sun protection messages. All these activities encourage people to enjoy the sun safely and to protect themselves against UVR in situations where excessive exposure is likely to occur. [20]

In this study, most of the participants who stated that they had speckles, also told that these speckles increased under direct sunlight. It is known that exposure to UV radiation increases skin pigmentation and usually results in an even darkening of the skin. However, it may also occasionally lead to the development of hyperpigmented lesions due to a local overproduction of pigment. Skin pigmentation is induced both by UVB and UVA rays. [26]

According to the Global Solar UV-Index, Turkish Republic of Northern Cyprus's scale is between 3 and 7 (moderate-harm). Especially in summer, it is recommended seeking shade during midday hours, wearing sunglasses and sunscreen having SPF 15 or higher, covering the body with clothing and a wide-brim hat, and to reduce time in the sun from two hours before to three hours after solar noon. [1,21]

In a survey conducted in 1992, in United States of America (USA) nearly half of US adults were "very likely" to protect themselves from the sun by practicing at least one protective behavior (sunscreen, wearing clothing, or seeking shade). Less than one third of white adults used sunscreen, sought shade, or wore protective clothing. One-third of African Americans wore sun-protective clothing and half of them sought shade, but only one-tenth used sunscreen. [22]

In a study conducted by Evci et al. in Turkey in 1999, it was found that 74% of the participants used preventive measures, and sun oil and cream were the mostly used preventive measures. [27] In our study, most of the participants stated that they took preventive measures

such as sun oil, sun cream, umbrella and hat but only 36.5% used more than one preventive measure. The rest used only one preventive measure (Table 2). Researches show that staying out of the sun, either indoors or in shaded areas, during the risky hours when UV radiation levels are highest is an effective means of protection but it should be combined with using clothing, hats and sunglasses. Sunscreen should be applied to parts of the body that remain exposed, like the face and hands. [10]

In a study conducted by Hiom, it is found that reporting of sun protective behaviours was low, with around one-third of respondents seeking shade, covering up or using sunscreen. Statistically significant increases in knowledge that 'sunbathing using suntan lotion' and that 'using sunbeds' increase risk was noted. There was also a positive trend of increased knowledge that having had sunburnt skin in childhood increases risk, as does 'having a large number of moles on skin and 'having fair skin with freckles that burns easily', although these were not significant. [23]

In this study, we did not ask questions about SPF component of the products. However, recent research suggests that sunscreen, by itself, is not an adequate strategy for UV protection.

Many people use sunscreens if they intend to stay out in the sun for a long period of time, and they reduce the use of other forms of sun protection. They thereby receive the same or even a higher amount of UV exposure than they would have obtained during a shorter stay with no sunscreen. Some studies have shown a high incidence of sunburning despite relatively high rates of sunscreen use, which may be the result of weakened sun-protection qualities of sunscreen when inadequately or infrequently reapplied. For these reasons, although an expert group recently concluded that topical use of sunscreen probably prevents squamous cell carcinoma of the skin, the panel drew no conclusions about sunscreen's contribution to reducing the incidence of basal cell carcinoma or melanoma. The panel recommended avoiding the sun, seeking shade, or wearing protective clothing that reduces exposure to the full spectrum of UV radiation as the first line of protection against skin cancer, with sunscreen as an adjunct form of protection only. [22,28] However, sunscreen represents a last line of defence, and should never be used to prolong the duration of sun exposure. [10] Sun protection factor (SPF) is affected by application density, water resistance and other factors.

An adequate SPF for an individual should be balanced to skin phenotype and exposure habits. The correct use of sunscreens should be combined with the avoidance of midday sun and the wearing of protective clothing and glasses, as part of an overall sun protection regimen. [29,30]

In a study conducted by Moyal et al. it is determined that, when different products having the same SPF and different levels of UVA protection are compared, only sunscreen products with a high level of UVA protection show a similar level of protection against sunburn and pigmentation. Products with low UVA protection have a lower capacity of preventing induced pigmentation compared with their efficacy against erythema.

These studies have evidenced that SPF determination was not sufficient to account for the efficiency in preventing pigmentation and that UVA protection was an essential part of this prevention. [26]

Sun protection products should be well tolerated by users, cosmetically pleasant, nontoxic, equally effective against UVA and UVB, photostable, water-resistant and should have a high SPF. [31] SPF is still a critical indication of the protection against UV radiation. However, it only reflects the protection against sunburn, in which the UVA contribute for a limited part.

UVA is far prevailing in the amount of solar UV radiation reaching earth level and are the major factor of the induction of photoaging and longlasting pigmentation. [26]

Nearly half of the participants in this study stated that they concerned the preventive scale on their selection of preventive measures. Only one of them expressed that he considered the doctor's suggestions (Table 2). Nearly one-third of them got the information on preventive measures from the recipe of the product, seller or media (Table 2). In Evci et al.'s study, the results were similar. [27] This is thought-provoking as more than half stated that their knowledge on UV light and preventive measures were inadequate and they needed to get information on preventive measures (Table 2). There may be a lack of information sources. Doctors or other experts may not be well-informed or willing to give information on the issue.

Most of the health problems, the participants stated, were generally acute problems due to the sun, such as sunburns, heat strokes, skin and eye problems (Table 2). It shouldn't be forgotten that damage from sun exposure is cumulative and chronic effects of sunlight will be seen in future and are usually underestimated.

In Turnball et al.'s study, it is determined that some specific shade structures are inadequate for providing the public enough protection against damaging UV radiation and shade did not provide full protection against UV radiation. The authors suggest that prevention behaviours should include simple things such as wearing hats, appropriate clothing, sunglasses, sunscreens and seeking shade and these prevention behaviours need to be used in conjunction with one another; otherwise the full sun protective affect will not ocur. [32] Another study of Turnball et al. has also proved that the proportion of diffuse UV increases under shade structures as the solar zenith angle increases. [33]

In our study, education/training on preventive measures, not staying for long periods of time under the sunlight and protection of the environment were the recommendations of most of the participants.

As shown in Figure 1, mean UV-A light levels were between 0.043-0,437 mW/cm^2 under direct sunlight and 0,025-0,115 mW/cm^2 in the shade of an umbrella. The increase in UV levels were maximum between 12.00 and 13.00. UV levels decreased particularly after 16.00. More than half of the participants stated that they spent their time on the beach at these risky hours.

Ultraviolet A radiation has in the past been promoted as the 'safe' UVR and it has received less attention than ultraviolet B radiation as a possible aetiological factor for skin cancer.

However, the use of UVA with a psoralen (PUVA), to treat a variety skin conditions, has been associated with an increased risk of melanoma. Some even argue that UVA may be more

important than UVB for melanoma induction. Of the solar UVR energy that reaches the surface of the earth, 90-95% is UVA and, unlike UVB, it can pass through most windows. It is also estimated that more solar UVA than UVB can reach the depth of melanocytes in skin. [28] Increasing evidence of the detrimental effects of UVAs on the skin have emphasized the need to develop a new generation of suncare products which do not only protect from UVBs but also provide an effective protection throughout the UVA range. They also apply to skin care products for daily use and exposure where UVA is a major actor whatever the season is. [34]

Simple precautions will prevent both short-term and long-term damage of UV radiation exposure, while still making the time spent outdoors enjoyable. Sun protection is important in all settings, in particular at all outdoor recreation sites such as beaches and sports centres.

The basic sun protection messages which will be given to public should be simple and clear and include:
    Limit exposure during midday hours.
    Seek shade.
    Wear protective clothing. Wear a broad brimmed hat to protect the eyes, face and neck.
    Protect the eyes with wrap-around-design sunglasses or sunglasses with side panels.
    Use and reapply broad-spectrum sunscreen of sun protection factor (SPF) 15+ liberally.
    Protect babies and young children. [10,35]

LIMITATIONS

It would be better to reach more people for the research but we could only reach 144 people on the beach, in one week. Because of the limitations of resources for the research, we could not evaluate the health problems. Health effects might be evaluated not only by the statements of participants but also by observational criteria. More detailed qualitative and quantitative studies are needed.

In our study, we didn't ask questions about the content, amount and time period of usage of the preventive measures and other sun behaviours (in school, in sport centers etc.) of the people.

In the study, as the UV meter used, was not able to measure UVB levels, only UVA levels were measured. It would have been better to measure also UVB.

CONCLUSION

It is necessary to inform the public and increasing public awareness regarding this issue should be done according to the results of such measurements, based on scientific facts and employing training programmes with public participation and with materials compiled to be comprehensible for the public.

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The goal of sun protection should not be limited to protection against acute effects such as sunburns, but should include prevention of long-term skin damage and reduction in the risk of skin cancer. There is an urgent need for public education and research, which should be constituted by multidisciplinary approach, into the detrimental effects of UV and governments need to urgently regulate activities such as generalizing the use of UV Index to inform public in Northern Cyprus. In terms of public health, we must continue to raise public awareness of potential health effects from excessive exposure to UV radiation and draw attention to the hazards of excessive sun exposure, concerning the fact that global warming is a gradually increasing problem.

Key Words: UV-A, UV light exposure, level of knowledge

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ASSESSING THE OCCUPATIONAL ENVIRONMENT OF ANESTHESIOLOGY DOCTORS FROM COGNITIVE ERGONOMICS PERSPECTIVE

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Aim: We aimed to determine cognitive ergonomic status of working environment of anesthesiologists, in this descriptive study.

Material and Methods: 208 anesthesiologists, who work in three universities and nine state hospitals in Ankara, accepted to participate in the study. Data was collected via a structured questionnaire, which was designed to assess ergonomics of working environments in six dimensions

Findings: Mean age of doctors was 33.5 ± 6.1. Of the participants, 72.0% were female and 53.4% stated that they had at least one ergonomic problem in their current working station. Mean scores of the six dimensions were calculated for attendees (mean scores were between 41.9±19.0 and 62.4±20.6). Statistically significant relations were found in working environment scores between men (47.4±18.5) and women (40.5±20.5) (t=2.19; p<0.05).

Experienced doctors have lower visual alarm score (t=4.1; p<0.05) then novice doctors. The auditory alarm scores were higher for experienced anesthesiologists when compared with novice doctors (t=3.7; p<0.05).

Conclusion: Although this study is a descriptive one, it reflects assessment of cognitive ergonomic status of operation theatres which covers more then half of the major operations in Ankara.

Various factors affect the efficiency and safety of the operation. To increase the quality of surgical services and decrease the exposure to bad ergonomics, it's very important to design the working environment and medical devices appropriate for cognitive ergonomics principles.

Keywords: cognitive ergonomics, anesthesiologist, working environment

1. INTRODUCTION

The field of ergonomics contains much scientific information which can be used to characterize the design issues that affect the health and productive capacity of workers. [1] Ergonomics deals with congruency between individuals and their environment. [2] Classical ergonomics has been concerned with the integration of human subsystems and machine subsystems, and how work affects the body and the mind. There is, however, a third aspect that has gained increasing importance in recent years. That is how the mind influence work; or to be more precise, how the characteristics of human cognition affect the quality of work. Examples are found in relation to thinking, reasoning, understanding, diagnosis, cognitive control, memory heuristics, etc. The interest for this aspect of ergonomics has grown significantly over the last 20-30 years. [3]
Cognitive ergonomics is an emerging branch of ergonomics that places particular emphasis on the analysis of cognitive processes –e.g., diagnosis, decision making and planning– required of operators in modern industries. [4] Cognitive ergonomics focuses on the fit between human cognitive abilities and limitations and the machine, task, environment, etc and especially important in the design of complex, high-tech, or automated systems. [5]

Continuous work cannot be maintained indefinitely by people. Physiological processes limit the ability of muscles to sustain contraction and function under conditions of physical fatigue. In addition to physiological limitations, cognitive factors, such as boredom and mental fatigue, affect performance and especially human error. [6] Anesthesia which needs quick, essential and exact decisions for patients' survival requires simultaneous assessment of multiple alarms to determine the interventions. Anesthesiology machines (respirators, monitors) have been working with computers for several years. Anesthesia is a continuous process. The anesthetic process mainly involves a dynamic situation and the characteristics of this situation are complexity, time pressure and risks (the patient's life may be at stake). [7] From the wakeful state to the awakening state of the patient, there are series of states induced and controlled by the anesthetist directly and through instrumentation. [8] Modern anesthesia workstations and patient monitoring systems can comprise more than 30 alarms and 70 display indicators, making alarm and displaying "pollution" currently a hazard in the operating room. [9]

As Long [10] mentioned, there are three different particular scopes for cognitive ergonomics. People (their work, well-being and productivity) are the first scope (anesthesiologists in our study),. Second scope is agent(s); instrument; functions; entities; and location (arrangement of operating room and medical devices in our study). The third scope is domain of application, task, and computer interface (problems faced with during application process in our study).

The aim of this descriptive study is to determine the cognitive ergonomic status of the working environment of anesthesiologists.
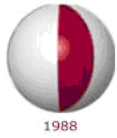
2. MATERIAL AND METHODS

208 anesthesiologists working in three university hospitals and nine state hospitals in Ankara participated in the study.

Data were collected by using a self-assessed 77-item questionnaire. This questionnaire was designed to asses some socio-demographic characteristics of attendees and ergonomics of working environments in six dimensions (Table 1). An index was developed for each dimension and scores over 100 were calculated for each of them. Higher scores indicate better ergonomics.

Duration in the anesthesiology profession of the participants is divided into two groups from the median point. According to this classification people who have 3 years or less professional experience were defined as novice anesthesiologists and other**s** as experienced anesthesiologists. The relation between sex and duration in the anesthesiology profession of the participants and ergonomics scores were evaluated by independent sample t test. All required permissions were approved.

3. FINDINGS

All participants were between 25-56 years old and mean age was 33.5 ± 6.1. Seventy two percent of the participants were female and the mean duration of working as an anesthesiologist was 6.1 ± 5.9 years.

The mean age of the devices was 3.4 ± 3.4 used by anesthesiologists in this study and the newest and the oldest ones were 1 and 22 years old respectively.

Of the participants 53.4% stated that they had at least one ergonomic problem in their current working station.

Table 1 Mean scores and standard deviations of the six dimensions of working environment ergonomics.

Dimension		n	Mean	S.D.	Min	Max
Physical Environment	Noise, illumination, temperature	205	41.9	19.0	4.0	88.0
Communication with Staff	Communicating with surgeon and other staff during operation.	204	51.6	18.9	10.0	100.0
Working Environment	Wet floor, obstacles on the floor.	202	43.0	19.6	4.0	88.0
Working Posture	Comfort of sitting posture, having trouble with reaching medicines, bad posture of spine, constraining of muscles and joints, getting tired quickly because of posture	205	47.2	20.0	2.9	94.3
Visual Alarms	ECG screen, saturation, blood pressure, capnograph, ventilator, apnea monitor, pressure, and leak alarms.	207	62.4	20.6	13.3	100.0
Auditory Alarms	ECG screen, saturation, blood pressure, capnograph, ventilator, apnea monitor, pressure, and leak alarms.	207	61.4	20.0	15.0	100.0

Mean scores and standard deviations of the participants for; physical environment were 41.9±19.0 (min=4.0, max=88.0), communication with staff were 51.6±18.9 (min=10.0, max=100.0), working environment were 43.0±19.6 (min=4.0 max=88.0), working posture were 47.2±20.0 (min=2.9, max=94.3), visual alarms were 62.4±20.6 (min=13.3 max=100.0), and auditory alarms were 61.4±20.0 (min=15.0 max=100.0). (Table 1)

The scores from six dimensions of working environment ergonomics of participants according to sex are given in Table 2

Table 2 Scores for six dimensions of working environment ergonomics according to sex.

Dimension	Men	Women	t	p
Physical environment	43.9±16.8	41.0±19.9	0.99	0.32
Communication	50.9±21.5	50.6±19.2	0.09	0.93
Working environment	47.4±18.5	40.5±20.5	2.19	0.03
Working posture	50.5±18.7	45.9±19.9	1.50	0.14
Visual Alarm	63.5±20.3	61.5±21.3	0.60	0.55
Auditory alarm	60.8±19.1	61.0±20.9	-0.06	0.95

There were no statistically significant difference between physical environment, communication, working posture, visual alarms and auditory alarms of the medical devices scores among males and females. Statistically significant relations were found in working environment scores between men (47.4±18.5) and women (40.5±20.5) (t=2.19; p<0.05).

Table 3 Scores for six dimensions of working environment ergonomics according to anesthesiology experience.

Dimension	Novice	Experienced	t	p
Physical environment	42.2±19.4	40.3±19.6	0.69	0.49
Communication	48.1±19.8	52.9±20.0	-1.74	0.08
Working environment	42.9±19.9	40.6±21.4	0.78	0.44
Working posture	45.4±18.6	47.6±21.8	-0.77	0.44
Visual Alarm	67.8±20.8	56.4±19.7	4.06	0.00
Auditory alarm	66.2±20.9	56.1±18.7	3.68	0.00

Scores for physical environment, communication, working environment, and working posture were similar for both novice and experienced anesthesiologists (p>0,05)..

Experienced doctors (56.4±19.7) have lower visual alarm score (t=4.1; p<0.05) then novice doctors (67.8±20.8). Also the auditory alarm scores were higher for experienced anesthesiologists (56.1±19.7) when compared with novices (66.2±20.9) (t=3.7; p<0.05) (Table 3).

4. DISCUSSION

Although this is a descriptive study, it reflects assessment of cognitive ergonomic status of operation theatres which cover more than half of the major operations in Ankara. The seven state hospitals evaluated in this study cover 73.7% of major operations carried out at 20 state hospitals in Ankara and the two university hospitals cover the 77.1% of all major operations carried out at six university hospitals in Ankara. [11 Anesthesiologists, working under heavy and intense conditions, stated that they have problems with cognition of visual and auditory alarms that have vital importance for patients' wellbeing. The main goal of the anesthesiologists is to ensure that the patient survives after the surgery. Anesthesiologists plan, interpret incoming information, and carry out many higher-level cognitive activities during the operations. Anesthesiologists may have lapses in concentration and fatigue and distraction may result in a failure to detect an event detrimental to patient safety. [9]

Most of patient monitoring devices- have visual and auditory alarms designed to assist users in obtaining information on the patient and life support equipment status. [9] This study's results show that anesthesiologists have better scores on visual and auditory alarms compared with other ergonomics dimensions. As in all automated systems the anesthetist's role is largely supervision. The design of interfaces for such systems must take place at a cognitive level, with the emphasis on the anesthetist's requirements for information to support his or her problem-solving and decision-making skills. [12]

Participants got the lowest scores from "Physical environment" field. Factors such as noise, illumination, and temperature have influence on the working capacity of individuals. [13] Another low scored field was "Working environment" in the study. Ergonomics scientists usually advise correct design of tools, equipment and workspace for the prevention of musculoskeletal disorders in the body. [14] "Working posture" was another field from which participants obtained lower scores. A person's working posture is a result of the requirements of the task, the design of the work space and personal characteristics such as body size, shape and eyesight. Consideration of all three components is needed in posture analysis and workplace design. [15]

Communication is a field that anesthesiologists stated they had less trouble in this study. In a study anesthetists mainly cited personnel as the main contributing factor. Error detection was examined using accident data collected through a reporting system which was developed and organized in two different anesthesia departments of university hospitals. [8] The three scopes of CE do not appear equally complete. Only the first scope people, their work, well-being and productivity makes reference to wellbeing and productivity. [16]

When the mean scores of the attendants are evaluated according to sex, men had higher scores from all dimensions except the auditory alarms. But only the working environment score is statistically significant. It's betrayed with other researches that women suffer more frequently and severely from musculoskeletal diseases. [17]

Significant differences were established between novice and experienced anesthesiologists on the meaning of visual and auditory scores. Despite this finding, the anesthesiologist's expertise, allows him/her to interpret and assemble the data in significant patterns and to select, record and emphasize relevant or important information. [7]

Beyond the complaints about medical devices, physical environment problems (noise, illumination, and floors), working environment problems (mobility), working posture problems and communication problems (with other medical staff) were standing in the forefronts which are all due to human factors.

The various problems among anesthetists decrease the efficiency and safety of the operation. To increase the quality of surgical services and decrease the exposure to bad ergonomics, it's very important to design the working environment and medical devices appropriate for cognitive ergonomics principles.

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SPATIAL DISTRIBUTION OF WELLS AND THE OCCURRENCE OF CHOLERA IN DOUALA: THE CASE OF SOME NEIGHBOURHOODS IN THE CITY OF DOUALA CAMEROON.

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This study focuses on the role of groundwater obtained through wells in the outbreaks of cholera in some neighbourhoods of Douala. Specifically, the study has analysed the possible effects of the geology of Douala on well water quality, determined the pattern of distribution of wells and pit toilets, verified the role of the level of poverty of the people in the occurrence of cholera and identified chemically the presence of Vibrio Cholerae and other substances that reduce the quality of well water in Douala.

One hundred questionnaires were distributed to members of the general public in the neighbourhoods concerned. A second category of ten questionnaires were administered to medical personnel while three were administered to Administrative authorities. The distances between wells and pit toilets were measured and 40 well water samples were collected.

The spearman's rank correlation was used to determine the correlation between poverty levels and cholera outbreaks. Also, the nearest neighbour index was used to determine the degree of nucleation of wells with respect to pit toilets. The forty well water samples were taken to the laboratory and tested for vibrio cholerae. The gram staining technique was also employed.

Results from this study show that the nature of the geology of Douala enhances the seepage of pollutants from pit toilets into wells. The study has also revealed that well water is the major source of water for the inhabitants of Douala. Furthermore, a significant positive correlation between poverty levels and cholera outbreaks in Douala was obtained. The pattern of distribution of wells with respect to pit toilets assumed a nucleated pattern.

Out of the forty wells sampled, two in Nylon, one in Bonassama and one in Bependa tested positive for vibrio. Some wells had sucrose and Non-Sucrose fermenting organisms, others had gram-negative and gram-positive bacteria. The general implication of these results is that the quality of water in most wells in Douala does not meet international standards and remain potential sources of future cholera outbreaks if efforts are not intensified to treat the wells properly.

(1) OVERVIEW

Water remains the most important resource to man after air. An average man requires about 1.5 litre of water daily. According to Vinci (1999) "water is the driver of nature". Ajaga (2004), reaffirms this when he states, "No one can ignore the fact that water is the source of life. Without it there can be no plants, no animals nor humans. The pattern of human settlements, the way of life of a people and their world view is often influenced by the quantity and quality of water at their disposal".

Therefore, if the planet earth has to be sustained, water has to be properly managed. Paradoxically, our global water resources are being degraded in a geometric rate and such degradations are anchored on anthropogenic sources. The repercussions have been a keledoscope of epidemics such as cholera, typhoid inter alia.

(2) STUDY AREA

The study area is part of the Douala sedimentary basin. It is found in the littoral province of Cameroon.

Relatively, the littoral province is bordered to the North by the Western province, to the West by the South West Province, to the South by the Atlantic Ocean and the Southern Province and finally to the East by the Centre Province.

Absolutely, Douala lies between longitudes 9o 40' E and 9o 50'E of the prime meridian and within latitudes 4o 00' N and 4o 54' N of the equator. The Figure below shows the location of Douala and the sampling stations.

(3)   STATEMENT OF PROBLEM

Douala is the economic capital of Cameroon. It is a coastal wetland with huge amounts of water resources ranging from wells, pipe borne water, and numerous streams and rivers.

The daunting question now is "why so much talk about water in Douala when water resources tend to be so "abundant"? However, the problem lies in the quality and not the quantity. To go by Coleridge's verse, "water, water everywhere, not a drop to drink". This is true with Douala as sources of water are abundant yet the quality remains a salient constraint in the consumption of water from these sources.

The roots of the crisis are anchored in the fact that Douala is a millionaire city with a population of about 3 million people. This has led to the mushrooming of slums and squatter settlements. Studies on slums, the underprivileged urban-dungeons seen to be very limited in developing countries where as such areas epitomized urban health (Fombe, 2005). Common within these slums is poor planning seen or epitomized in poor an inappropriate location of wells and pit toilets.

The repercussions of the antagonistic location of wells by pit toilets have been the declining water quality of groundwater obtained mainly through wells in Douala. This declining well water quality is a call for concern because CAMWATER cannot meet the city's demand for portable water. Of Douala's 3 million inhabitants, CAMWATER has only 60000 subscribers. The city needs 200000 cubic metres of the "brown version" of CAMWATER'S "portable water". CAMWATER can only supply 115000 cubic metres of water.

The repercussions of these disparities are obvious. The rich buy bottle water and some use pipe borne water. The majority of the poor masses resort to the most readily available source of water- that is well water. Large scale consumption of this has provoked cholera since the wells are closely located by pit toilets and this enhances the degree of seepage of pollutants from the toilets into wells.

(4)   RESEARCH HYPOTHESES

1)   Well water quality is a corollary of the underlying geology.
2)   The location of wells by pit toilets will result in the seepage of pollutants from the toilets into the wells which thus constitute potential sources of cholera outbreaks.
3)   The poverty levels of the inhabitants of Douala constitute a significant positive correlation with increased incidence of cholera outbreaks.
4)   Population perceptions of well water quality are similar to the results of chemically tested well water samples.

(5)   OBJECTIVES

1)   Analyse the possible effects of the constituent geology of Douala on the quality of well water.
2)   Determine the pattern of distribution of wells and pit toilets.
3)   Determine the role of the level of poverty of the people in the occurrence of cholera outbreaks in Douala.
4)   Identify the presence of Vibrio, sucrose and non-sucrose fermenting organisms, gram positive and negative organisms in well water samples which serve as indicators of possible water borne diseases including cholera outbreaks.
5)   Make recommendations for an ideal water supply for Douala and proposals on the role of all stakeholders in combating cholera in Douala.

(6)   MATERIALS AND METHODS

Here, emphasis has been laid on primary and secondary sources of data collection and their analyses.

DATA COLLECTION

Here, the paper lays emphasis on primary and secondary data collection.

PRIMARY DATA COLLECTION

I this phase, three categories of questionnaires were administered. The first category of 100 questionnaires were administered to members of the general public in the study matrix made up of Bepanda, Nylon, Makepe and Bonassama. The second categories of 10 questionnaires were administered to administrative authorities.

The next phase of fieldwork involved the measurement of distances between wells and pit toilets in Bepanda, Nylon and Makepe. This was used to determine the degree of nucleation between wells and pit toilets.

Finally, a total of 40 well water samples were collected in groups of 25 for all the 4 neighbourhoods in January 2006. This temporal bias was based on the premise that past epidemics had their highest tolls at this time and this period also experiences wide scale water deficits since its part of the dry season. The samples were collected in 250ml sterile containers and transported to the laboratory in an ice packed box. In the presence of ice the enzymes in the organisms become inactive and this keeps them alive during transportation.

SECONDARY DATA COLLECTION

This part of the paper laid emphasis on past works in the area of water quality, poverty and settlements (see references).

DATA ANALYSES

The questionnaires were analysed using the SPSS package. This enabled this study to establish a relationship between poverty and cholera possibilities. The Spearman's rank correlation was used to verify this.

Secondly, the nearest neighbour index was used to determine the degree of nucleation from the distances between wells and pit toilets.

Finally, the water samples were taken to the laboratory and cultured on alkaline peptone water with pH 8.6. On the second day, the samples were further sub-cultured on Thiosulphate Citrate bile salt sucrose agar (TCBS). All culturing was done at 37oC. After culturing on TCBS, the pattern of growth of organisms was observed as + scanty, ++ moderate, +++profuse. The colonies that harbours either sucrose-fermenting or Non-Sucrose fermenting organisms were fixed and smeared on slides and subjected to gram staining. Colonies that had vibrio cholerae were gram negative, had non sucrose fermenting organisms were highly motile and oxidase positive.

(7)   FINDINGS

Geology and Well Water Quality

This study has demonstrated that the nature of the geology of Douala greatly influences the quality of water in wells. As seen on Table 2 below, most of the rocks in the aquifers are highly porous. Most wells are hand dug within the Pleistocene alluvium aquifer. This aquifer is susceptible to leachates from the near by pit toilets which are very close by. The table below illustrates this.

Determination of Degree of Nucleation or Dispersion Between Wells and Pit Toilets

The pattern of distribution of wells and pit toilets in the study area has a strong effect on the quality of well water. Tables 1,2 and three below show the degree of nucleation. The figures are obtained from the distances measured between the wells and pit toilets in metres.

Table 3: Distances between sampled wells and pit toilets for Makepe in September 2005.

WELLS No	1	2	3	4	5	6	7	8	9	10	Mean distance
Distances from pit toilets	10	1	1.4	1	0.7	2	1	0.5	1	3	2.16

Table 4: Distances between sampled wells and pit toilets for Bepanda in September 2005.

WELLS No	1	2	3	4	5	6	7	8	9	10	Mean distance
Distances from pit toilets	1	4	1	3	0.5	1	2.1	1.0	1.2	1	1.58

Table 5: Distances between sampled wells and pit toilets for Nylon in September 2005.

WELLS No	1	2	3	4	5	6	7	8	9	10	Mean distance
Distances from pit toilets	1	2	0.7	1	5	1.5	2.1	1.1	9	1	2.44

From the tables above we observe that the mean distances between wells and pit toilets for the three neighbourhoods Makepe, Bepanda and Nylon are 2.16, 1.58 and 2.44 respectively. This shows that the wells are generally closely located by pit toilets. To confirm this further, the nearest neighbour technique has been used to determine the degree of nucleation. However, the map below has been used to calculate the areas.

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1988

Calculation of Nearest Neighbour Index for Makepe
Area in which ten wells are found (A) = 1.7km x2.3km
$$= 3.9km2 \text{ or } 39.00m2$$
Rn = 2d $\sqrt{n/A}$ = 2 (2-2) $\sqrt{10/3900}$ = 0.22
Calculation of Nearest Neighbour Index for Bepanda
Area in which ten wells are found (A) = 1.4km x 2.3km
$$= 3.2km2 \text{ or } 3200km2$$
Rn = 2d $\sqrt{n/A}$ = 2 (1.6) $\sqrt{10/2700}$ = 0.18
Calculation of Nearest Neighbour Index for Nylon
Area in which ten wells are found (A) = 1.5 km x 1.8km
$$= 2.7km2 \text{ or } 2700m2$$
Rn = 2d $\sqrt{n/A}$ = 2(2.4) $\sqrt{10/2700}$ = 0.29

Interpretation of Results.
From the values obtained above, there is a tendency towards Nucleation. However, the situation of Nylon tends to be outstanding as seen from a value of 0.29. This can be correlated with the figure below which shows that in January 2004, Nylon had the highest number of cholera cases of 41.

Determination of Degree of Correlation between population perceptions of cases of cholera and number of persons in each income group.
From the analysis of the questionnaires using SPSS statistical package for the social sciences, the following data was obtained.

Table 6: Correlation Between Income Groups and Cases of Cholera

Income levels/Monthly FCFA	No in income groups	X	Rank X	No affected by Cholera due To well water Y	Rank Y	Rank differences D1	Rank differences square D12
5-20.000	57	32	5	5	0	0	
20.000-50.000	28	15	4	4	0	0	
50.000-100000	2	0	1	1.5	0.5	0.25	
100000-200000	7	0	3	1.5	1.5	2.25	
Above 200000	6	0	2	1.5	0.5	0.25	

$\sum D12 =$ 2.75

From the above data and rankings, we have our summation of rank difference square ∑D12 of 2.75. We now use our formula for spearman's correlation. Note that income levels represent poverty levels.

RS = $\dfrac{6\sum D12}{n(n2-1)}$

RS   = $\dfrac{6(2.75)}{5(52-1)}$

RS   =   0.86

From the above value of 0.86 or 86% we can conclude here by saying that a perfect positive correlation exist between poverty levels and cases of cholera. In other words, low income earners are poor and are more likely to use contaminated well water because they cannot buy bottled water or pipe borne water. The data on table 6 above can be plotted on figure 9 below.

As seen above, for the income level 5-20000 FCFA, 32 cases are reported, at income level 20000-50000FCFA 15 cases are reported. Therefore, if income levels represent poverty levels then, low income levels represent high poverty levels. At high poverty levels, the number of victims of cholera are higher.

Results of Analysis of Well Water Samples

Tables 10b,10c, 10d, and 10e that are found in appendix 1 represent the results of the laboratory analysis of well water.
The results for Bepanda show that out of the ten wells sampled only one sample had vibrio that causes cholera. In Nylon two samples had vibrio (samples 4 and 5). In Makepe non of the samples had vibrio. Finally, in Bonassama only one sample (sample 4) had vibrio.

Though the concentration of vibrio is 4/40, we should note that by virtue of the fact that over 80 people use one well a day, the matrix still stands at a lot of risk of cholera outbreaks. Again, Nylon has the highest number of contaminated wells. See appendix 1 below.

(8)   RECOMMENDATIONS AND CONCLUSION

RECOMMENDATION

The following measures can help reduce future cholera outbreaks:
1.   Increase sterilization of wells with chlorine twice every month.
2.   Government should increase the population access to pipe borne water by harnessing other streams and reducing the cost per cubic metre of water.
3.   There should be poverty reduction. This should involve the public sector, private sector, the local communities, International Organizations and NGO's. Poverty reduction policies should be based on good policies that are marked oriented, environmentally friendly and pro-people. A sound policy environment is based on:

PE = (C + P + PW) X RB
Where PE = Policy Environment
       C = Commitment
        P = Participation
       PW = Political Will
       RB = Resource Base
4.   Finally, personal sanitation and urban planning and control of fragile neighbourhoods occupied by the poor should be controlled.

CONCLUSION

Water remains a very important resource to man. As such, inspite of the low degree of occurrence of vibrio, we should note that the occurrence of other substances such as sucrose and non-sucrose fermenting organisms, gram negative and gram positive bacteria all go to indicate that the quality of water needs much to be desired. According to the United Nations Manual on Standards of good quality water, good water should have no taste, no ordour and no smell. This is not the case in all the wells that were tested.

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A STUDY ON THE KNOWLEDGE, OPINION AND BEHAVIORS ABOUT CRIMEAN-CONGO HAEMORRHAGIC FEVER AMONG HEALTH CENTER ATTENDANTS

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Crimean-Congo hemorrhagic fever (CCHF) is an acute illness affecting multiple organ systems and characterized by extensive ecchymosis, visceral bleeding, and hepatic dysfunction; and it has a case-fatality of 8% to 80%. This fatal viral infection described in parts of Africa, Asia, Eastern Europe and the Middle East. [1] The virus belongs to the genus Nairovirus in the Bunyaviridae family, and causes severe disease in humans. [2]

Humans become infected through the bites of ticks, by contact with a patient with CCHF during the acute phase of infection, or by contact with blood or tissues from viraemic livestock. [3] Changing social, economic and climatic conditions such as increased travel, bio-terrorism and ecological disruption may increase the possibility of the introduction of VHF-associated viruses into new areas or increase the incidence in endemic areas. [4]

To our knowledge, CCHF has not previously been reported in Turkey, although epidemics have been reported in neighboring countries. Cases infected with CCHF virus were first reported in Turkey in 2002 [5-7], although epidemics were reported before 2003 in neighbouring countries. This infection is an important public health issue in Turkey because of its high case fatality rate. Since 2002, 815 cases of CCHF have been reported to the Ministry of Health of Turkey, and 43 (5.3%) of these cases died. [8] Since there is no effective treatment for this illness, means of prevention, therefore public's information on this disease is crucial.

OBJECTIVES

The aim of this study is to determine the knowledge, opinion and behaviors about Crimean-Congo Hemorrhagic Fever (CCHF), of the adults who admitted to a health center in Ankara between 31 July-9 August 2006.

METHODS

In this descriptive study, a questionnaire with 27 questions was administered to 205 adults who accepted to participate. The participation rate was 96.3%. Data collection was completed by face to face interviewing technique. Questions on knowledge were scored as "1" (correct) and "0" (false) and the knowledge level was evaluated according to this score. SPSS program 13.0 was used for data entry and statistical analysis.

RESULTS

In this descriptive study, a questionnaire including 27 questions was administered to 205 adults who admitted to a health center and accepted to participate the study in Ankara. The participation rate was 96.3%.

Mean age of the adults were 39.0±14.8 years (min-max=18-73, median=37), 72.7% were female, 55.1% were graduated from primary or secondary school. Of the participants, 77.6% were married, 82.0% were not working and 78.0% were living in an apartment (Table 1).

Table 1: Characteristics of Participants

Characteristics	n	%
Age		
18-29	70	34,1
30-39	45	22,0
40-49	32	15,6
50 and above	58	28,3
Mean: 39,0 years Min.:18 Max.:73 Sd:14,8		
Sex		
Male	56	27,3
Female	149	72,7
Education		
Not literate	8	3,9
Literate/not graduated from primary school	22	10,7
Primary School	76	37,1
Secondary School	37	18,0
High School	46	22,4
University/Academy	16	7,8
Current marital status		
Married	159	77,6
Single	27	13,2
Divorced or widowed	19	9,3
Working status		
Currently not working	168	82,0
Currently working	37	18,0
Health insurance		
Social Security Organization	86	42,0
Government Employees Retirement Fund	44	21,5
Social Security Organization for Artisans and the Self-Employed	24	11,7
Active civil servant	12	5,9
Greencard	11	5,4
None	28	13,7
House type		
Apartment	160	78,0
Slum house	28	13,7

Detached house   17   8,3

Total   205   100.0

Of the adults, 92.7% were dealing with activities, which have risk for CCHF, including agriculture, livestock, and gardening (Table 2).

Of the participants, 84.9% ever heard of CCHF when the name of the disease or the ticks was mentioned. Of them, 81.0% were able to recognize the tick when the pictures shown among the other insects.

Table 2. Job Related Risk Characteristics of Participants for CCHF

Risk characteristics (n=205) n   %
Involved in agriculture, livestock, and gardening
Yes   15   7,3
No   190   92,7
Staying in rural areas during spring or summer
Every year   36   17,6
Sometimes   49   23,9
Never   120   58,5

There was no statistically significant relation between the sex of the adults and the knowledge about the disease (p=0.503). Adults who have secondary school or higher education level ever heard the disease more than the adults who have lower education level but there was no significant association (p=0,0663). Age was found to be associated with knowledge. Adults of 50 years age and older knew the disease less, compared to others (p=0,001). Also working status was found to be associated with knowledge (p= 0,020) (Table 3).

Table 3: Associations Between Knowledge of Disease and Some Selected Characteristics of Participants (%)

Characteristics (n = 205)	Knows the Disease	Do not Know the Disease
Sex		
Male	82,1	17,9
Female	85,9	14,1
Total	84,9	15,1
$\chi^2 = 0,449$ p = 0,503		
Age		
18-29	88,6	11,4
30-39	97,8	2,2
40-49	90,6	9,4
50 and above	67,2	32,8
Total	84,9	15,1
$\chi^2 = 21,457$ p = 0,000		
Education		
Secondary school or less	81,8	18,2
High school or more	91,9	8,1
$\chi^2 = 3,449$ p = 0,0663	84,9	15,1

Work status
Currently not working   97,3   2,7

Currently working   82,1   17,9
Total   84,9   15,1
$\chi 2 = 5,425$ $p = 0,020$

Most of the adults knew that disease was spread by ticks (94.3%) and caused fever (84.5%) (Table 4), and more than half knew there were preventive measures for the disease (59.2%). Eighty percent of the adults stated that they have learned the disease from television.

Table 4: Knowledge of Participants on Some Characteristics of CCHF (%)*

Disease characteristics**(n =174)	Yes	No	No idea
Mode of Transmission			
Tick bite	94,3	1,1	4,6
Direct contact with patient's blood	59,8	15,5	24,7
Dirty water	28,7	42,5	28,7
Direct contact with infected animal's blood	70,7	7,5	21,8
Unwashed vegetables/fruits	36,2	50,0	13,8
Infected animals			
Livestock-small cattle	75,9	14,4	9,8
Fish	4,6	81,6	13,8
Tick	97,1	0,6	2,3
Snake	26,4	51,7	21,8
Bird	46,0	32,2	21,8
Dog	70,7	14,9	14,4
Symptoms			
Fever	84,5	1,1	14,4
Infertility	5,2	49,4	45,4
Hair loss	6,9	51,7	41,4
Bleeding	46,0	25,9	28,2
Lassitude	80,5	2,3	17,2
Putting on weight	2,3	60,3	37,4
Headache	71,8	4,6	23,6

* Row percentages
**More than one correct answer

Mean knowledge score was found to be 22,3±6,2 (min-max=4-32, median=23). There were significantly positive associations between the knowledge score with age (50 years old and older, p=0.001), sex (female, p=0.018), education (high school and higher education level, p=0.001), and work status (working adults, p=0.003) (Table 5).
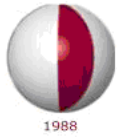
Table 5: Associations Between Knowledge Scores and Some Selected Characteristics of Participants (%)

Characteristics (n = 174) Total		≤14 %*	≤14 %**	14 – 22 %*	14 – 22 %**	23 – 26 %*	23 – 26 %**	≥27 %*	≥27 %**	Total %**
Age group	18 – 29	9,7	28,6	24,3	25,9	29,0	40,9	37,1	45,1	35,6
	30- 39	9,1	19,0	45,5	34,5	25,0	25,0	20,5	17,6	25,3
	40 – 49	10,3	14,3	20,7	10,3	17,2	11,4	51,7	29,4	16,7
	≥50	20,5	38,1	43,6	29,3	25,6	22,7	10,3	7,8	22,4
	Total	12,1	100,0	33,3	100,0	25,3	100,0	29,3	100,0	100,0

p = 0,001

Sex										
	Male	2,2	4,8	30,4	24,1	30,4	31,8	37,0	33,3	26,4
	Female	15,6	95,2	34,4	75,9	23,4	68,2	26,6	66,7	73,6
	Total	12,1	100,0	33,3	100,0	25,3	100,0	29,3	100,0	100,30

t = 2,389   p = 0,018

Educational status										
	Secondary school/lower	17,9	100,0	36,8	74,1	22,2	59,1	23,1	52,9	67,2
	High school/higher	0,0	0,0	26,3	25,9	31,6	40,9	42,1	47,1	32,8
	Total	12,1	100,0	33,3	100,0	25,3	100,0	29,3	100,0	100,0

$\chi 2 = 17,545$ p = 0,001

Working status										
	Currently not working	0,0	0,0	19,4	12,1	33,3	27,3	47,2	33,3	20,7
	Currently working	15,2	100,0	37,0	87,9	23,2	72,7	24,6	66,7	79,3
	Total	12,1	100,0	33,3	100,0	25,3	100,0	29,3	100,0	100,0

$\chi 2 = 14,236$ p = 0,003

*Row percentage
**Column percentage
***Scoring for knowledge: "1" (correct) and "0" (false).

Most of the adults (93.7%) stated that they would refer to a doctor or a health center if bitten by a tick and nearly one fourth (24.1%) stated they would remove the ticks by tweezers.

DISCUSSION

Crimean-Congo haemorrhagic fever (CCHF) is a fatal viral infection described in parts of Africa, Asia, Eastern Europe, and the Middle East. The disease was first characterized in the Crimea in 1944 and given the name Crimean hemorrhagic fever. It was then later recognized in 1969 as the cause of illness in the Congo, thus resulting in the current name of the disease. The CCHF virus may infect a wide range of domestic and wild animals. Many birds are resistant to infection, but ostriches are susceptible and may show a high prevalence of infection in endemic areas. Animals become infected with CCHF from the bite of infected ticks. Humans who become infected with CCHF acquire the virus from direct contact with blood or other infected tissues from livestock during this time, or they may become infected from a tick bite. The majority of cases have occurred in those involved with the livestock industry, such as agricultural workers, slaughterhouse workers and veterinarians. [8-15]

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In this study it was conducted to determine the knowledge, opinion and behaviors about Crimean-Congo Hemorrhagic Fever (CCHF), of the adults who admitted to a health center in Ankara, 205 people accepted to participate. Nearly eighty percent of the participants were females as most of the people referring to the health center were mainly housewives who brought their children for vaccination. Men were probably at work and often didn't refer to the health center (Table 1).

Age and work status were found to be associated with knowledge (p=0,001 and p= 0,020 respectively) in our study (Table 3).

Most of the adults stated that they have learned the disease from television. This result showed that television is important to inform public about the diseases. Number of people who were informed by web was not high in this study. This result probably may be due to the educational status of the participants.

Most of the adults knew the transmission ways of CCHF, this result is important as people can protect themselves from the disease by this. Most of the adults knew that CCHF causes headache, fever and lassitude. This knowledge is helpful to be protected from the disease, and also for early diagnosis and treatment of CCHF.

It is known that people living in endemic areas should use personal protective measures that include the avoidance of areas where tick vectors are abundant, particularly when they are active; regular examination of clothing and skin for ticks, and their removal; and the use of repellents. People who are exposed to potentially viraemic animal blood should take practical measures to protect themselves, including the use of repellents on the skin and clothing and wearing gloves or other protective clothing to prevent skin contact with infected tissue or blood. [8,9,12,16] In our study, most of the adults stated that they would refer to a doctor or a health center if bitten by a tick but only one fourth of them stated they would remove the ticks by tweezers.

Mean knowledge score was found to be 22,3±6,2 (min-max=4-32, median=23). There were significantly positive associations between the knowledge score with age (50 years and older, p=0.001), sex (female, p=0.018), education (high school and higher education level, p=0.001), and working status (working adults, p=0.003) (Table 5). This age difference is thought to be associated with education status of the participants or communication difficulties with older people. As females were in majority in the study, sex was also found to be associated. Education also affects the knowledge of adults.

Crimean-Congo haemorrhagic fever (CCHF) is an often fatal viral infection described in about 30 countries, and it has the most extensive geographic distribution of the medically important tick borne viral diseases. Clinical features commonly show a dramatic progression characterized by haemorrhage, myalgia, and fever. Simple barrier precautions have been reported to be effective. [8-16].

Results of this study show that public need to be informed more about the disease for means transmission and prevention. This will increase the chance of early diagnosis and treatment of the disease.

CONCLUSION

It was found that people referring to the health center did not have enough knowledge on CCHF. There should be cooperation with Provincial Directorate of Agriculture and veterinary surgeons to inform public about the disease.

KEY WORDS: Crimean-Congo Haemorrhagic Fever, Tick, Knowledge-Opinion and Behavior, Health Center

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ATMOSPHERIC POLLUTERS RELEASED FROM INDUSTRIAL PLANTS FACTORS OF RISK PERTAINING TO CANCER

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Industrial plants may exert different effects upon the environment during their operation. The risks are associated with release of polluters in the air or the water, storing and transportation of waste material.

Transportation, dispersion, settlement, accumulation, chemical reactions and release of polluters can affect the human health, the vegetation and the other elements of the ecosystem.

The main path of exposure to the effects of atmospheric polluters is through inhalation. The transportation mechanisms, the atmospheric chemistry, the transformational processes, the data on settlement and accumulation, the epidemiological data, the synergetic effects etc. contribute to the uncertainties in the evaluation of the risk. Presented further will be the transportation and the paths of effect of the atmospheric polluters like: sulphuric dioxide, nitrogen oxides, particles, traces of metals and organic substances.

The consideration of the effects upon health are based mainly on data from the WHO instructions referring to the quality of air. It is assumed that there is no threshold for the values of the cancerogenic effects and risk. The risk assessment is made by realistic scientific judgment.

The selection of the atmospheric polluters that are taken into account has been made based on the instructions on air quality, the intensity and the frequency of harmful effects upon health, the presence of the polluter in the environment, its persistence in the environment, exposed groups of populations as well as sufficiency of data on the effects.

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1. INTRODUCTION

The release of polluters from industrial plants into the air or water is presented in Fig. 1 which provides an insight into which operations are involved in the process of transmission and which in the process of emission.
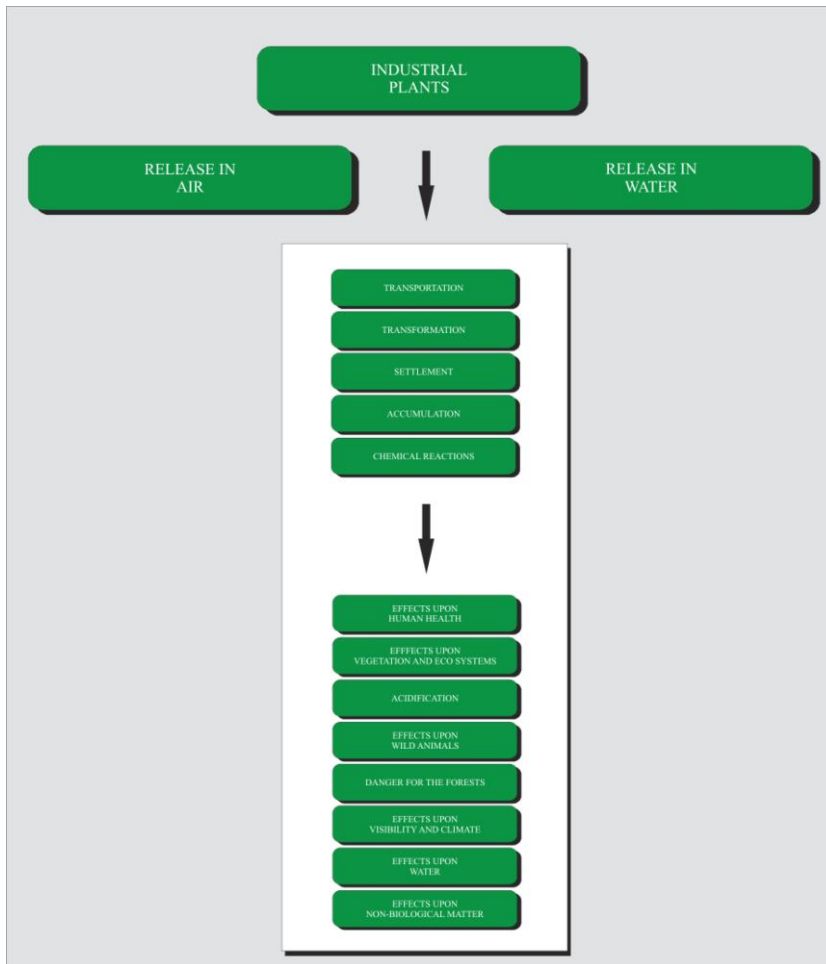
Figure 1. Industrial release and its effects

The description of the transportation and the paths of effects of atmospheric polluters is presented in Fig. 2.

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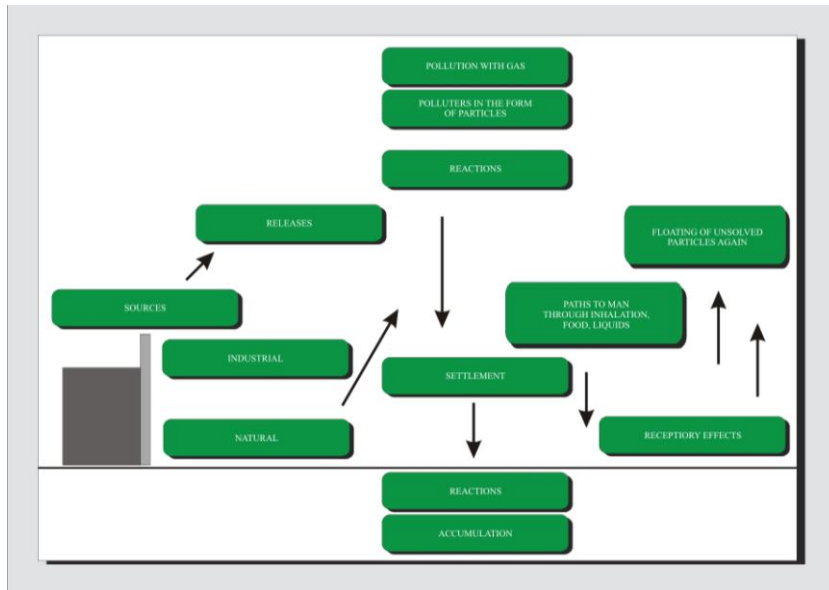
Figure 2. Transportation and paths of effects of atmospheric polluters

Considerable effects upon the environment can also be exerted by many atmospheric polluters during their release. These could be: sulphuric dioxide, nitrogen oxides, particles, traces of metals, organic substances, etc. Table 1 shows typical data on release carried by air for the main atmospheric polluters from industrial plants [1, 7].

	COAL INDUSTRY	PEAT FACILITY	FACTORY FOR SULPHATES AND CELLULOSE
UNUT FOR ENERGY /FUEL	25 Mj/kg	10-20Mj/kg	
FUEL/A	2000000-3000000 t/a	4000000 t/a	
ASH %	10-15%	3%	
RELEASE	kg/GWa	kg/GWa	kg/500000 t
			CORE
SO_2[1]	30000000[1]	6000000[1]	1500000
NO_x[2]	10000000	6000000	1500000
PARTICLES[3]	5000000	2000000	500000
As	300	300	10
Cd	60	30	40
Cr	1600	300	2000
Hg	30	30	5
Mn	1600	1600	
Ni	1600	600	1000
Pb	1600	3000	500
V	600	1600	
BaP	30	30	30
BENZENE	30000	30000	
TOULENE	30000	30000	
CO	30000000	30000000	500000
H_2S			500000
[1] There is no desulfurization of gas from an outlet = FGD, with FGD release being about 10 times lower			
[2] Thee is no reduction of release			
[3] Electrostatic flow – filters are assumed to be installed.			

Table 1. Typical data on release of atmospheric polluters from industrial plants

The dispersion conditions necessary for the computations are taken as long-term (a year) or short-term (for example, 24 hours) depending on the time period in which the concentrations are analyzed.

The consideration of the effect upon health caused by the polluters is mainly based on data from the WHO Instructions for Air Quality [2, 3, 4, 5, 6, 7]. The atmospheric effects along with the climatic, meteorological factors, the configuration of the terrain, the population, the cultural habits, the industrial compounds, etc. affect the health status and the mortality of the population. The urban distribution, the inappropriate industrial facilities and other factors potentially affect the health of the population. Chronic respiratory diseases are present among the population equally throughout all the months of the year. In addition to these diseases, atmospheric effects double many other chronic diseases that assume the use of antibiotics. Of particular concern is also the increase of malignant diseases of the type of cancer of stomack, respiratory system and leukemia. The data on the location of living, the exposure and the effects upon certain group of people can be taken as a risk factor. As to the acute and chronic diseases, the cancers and leukemia caused by atmospheric polluters, the most important are the genetic factors. The genetics is the one that decreases or increases the risk level for all these diseases caused by atmospheric polluters. Important for the occurrence of these diseases are also decennial pollutions caused by industrial plants, the gases released from vehicles, the frequent occurrence of fog, the bad circulation of air with absence of winds, etc. It is assumed that there is no threshold for the values of the cancerogene effects and the risk factors pertaining to excessive mortality. The risk assessments are made by realistic scientific considerations.

As to the non-cancerogene effects, the following factors were taken into account from the WHO instructions: the time of exposure, the lowest observed levels of harmful effects (LOAEL) and the safety factors. The values given in the instructions do not guarantee absolute exclusion of harmful effects below some values or in other words, these represent unnoticeable levels of harmful effect (NOAEL) only in the light of the present scientific knowledge. The connection between the concentration in the air and the toxic effect is usually estimated with difficulty.

2. RISK FACTOR TECHNIQUE

The risk factor technique represents a rough and approximate method. A great uncertainty can be involved in the evaluation of the risk factors. Still, approximate risk factors (risk pertaining to exposure to some concentration in a unit of time) are used in the computations of potential effects upon human health.

The risk factors that have been used in this paper are given in Table 2.

POLLUTERS	RISK FACTOR RF (cases.µg/m3 per annum)
ARSENIC, As	$8*10^{-5}$
BENZENE, C_6H_6	$8*10^{-8}$
CADMIUM, Cd	$4*10^{-5}$
CHROMIUM, Cr	$8*10^{-4}$
NIKEL, Ni	$8*10^{-6}$
MATERIAL PARTICLES	$\sim 5*10^{-7}-10^{-6}$

Table 2. Risk factors pertaining to cancer

The average risk factors pertaining to excessive mortality for particles of sulphur dioxide are given in Table 3 [3, 4, 5, 7].

POLLUTERS	EXCESIVE MORTALITY (cases µg/m3 per annum)
SULPHURIC DIOXIDE, SO$_2$	~ 5*10^{-6}
MATERIAL PARTICLES	~ 10^{-5}

Table 3. Average risk factors

The effects upon health that contribute to the annual exposure might not refer to a particular year, but could be distributed throughout the life time of the individual. For each hazardous material, an average risk factor has been selected. The effects upon health in certain environmental areas can, in that case, be computed by multiplying the concentration in respect to the population by the time of exposure and the risk factor pertaining to health.

3. COMPARISON WITH THE VALUES GIVEN IN THE INSTRUCTIONS

The adverse effects (noncancerogene risks) have been treated by comparison of the concentration of the polluters with the values given in the instructions. Adverse effects can involve diseases, death, etc. The typical values given in the instructions [2] are given in Table 4.

POLLUTERS	CONCENTRATIONS ACCORDING TO INSTRUCTIONS µg/m3	
	ANNUALY	DAILY
CADMIUM, Cd	0.01-0.02	
SULPHURIC MONOXIDE, CO		10000(8h)
SULPHUR HYDROGENE, H$_2$S		150
PLUMBUM, Pb	0.5-1	
MANGANESE, Mn	1	
MERCURY, Hg	1	0.3
SODIUM OXIDE N0$_2$, NO$_X$	50-100	150
MATERIAL PARETICLES	50	120
SULPHUR OXIDE, SO$_2$	50	120
TOULENE		8000
VANADIUM, V		1

Table 4. Values given in the instructions

4. APPLICATION OF MODEL

The harmful effects of typical releases from industrial plants are of a special concern (Table 1). The results are presented as follows:

- Assessment of individual and collective risk, and
- Comparison of the computed concentrations with the values given in the instructions.

There is not much difference among the power supply plants (regarding the released quantity and the immediate surrounding). The effects of cellulose plants are somewhat lower.

The computed approximate risk values are given in Table 5. The individual risk pertaining to cancer at distance of 1 km amounts to 10^{-5} annually, while the individual risk pertaining to excessive mortality amounts to 10^{-3}-10^{-4} annually. It is estimated that most of the adverse effects upon health occur at distance of 0.5 to 500 km. The computed number of cancer cases can be about $1 - 3$, while the value for the excessive mortality due to the annual releases can be about $10 - 100$. The assessed risks and the corresponding cases of excessive diseases will most probably be 10 to 50 times greater.

	ASSESSMENT OF INDIVIDUAL RISK		EFFECT UPON HEALTH OVER SURFACE OF 0.5 TO 500 km	
	CANCER	EXCEEDING MORTALITY	CANCER	EXCEEDING MORTALITY
ENERGETIC COAL FACILITY	0.000002	0.001	3	100
CELLULOSE FACTORY-500000 TONS OF CELLULOSE	0.000001	0.0001	<1	10

Table 5. Individual (at distance of 1 km) and collective assessments of risk related to annual releases

The comparison between the computed concentrations and the values given in the instructions leads to the following conclusion (Fig. 3 – Fig. 5 and Fig. 6 – Fig. 8):

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- The annual concentrations are usually bellow the values given in the instructions with the exception of the sulphur dioxide in the vicinity of the source and the particles of nitrogen dioxide, which are quite close to the values for the vicinity of a source given in the instructions, and,
- the daily concentrations are often much above the values given in the instructions for the vicinity of a source, for example in the case of sulphur dioxide, particles and nitrogen dioxide.

In the examples, it is assumed that the effective height of the release is about 80 m. With a higher point of release (in practice, the effective height of the release is usually 100 – 200 m), it is possible to decrease the concentrations in the vicinity of the source and in this way approach the values from the instructions.

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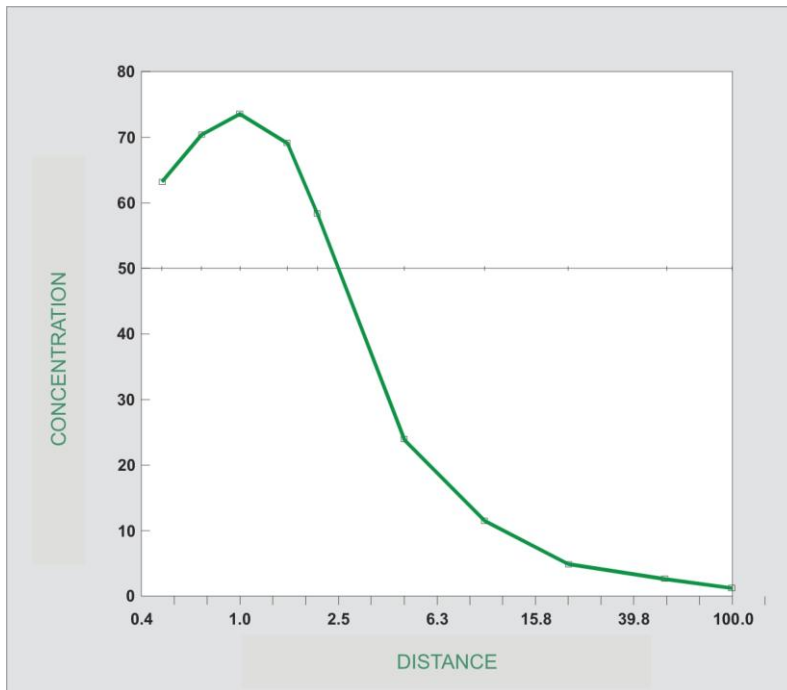
Figure 3. Coal power plant, the height of the release is he = 80 m. Long-term average concentrations of SO_2
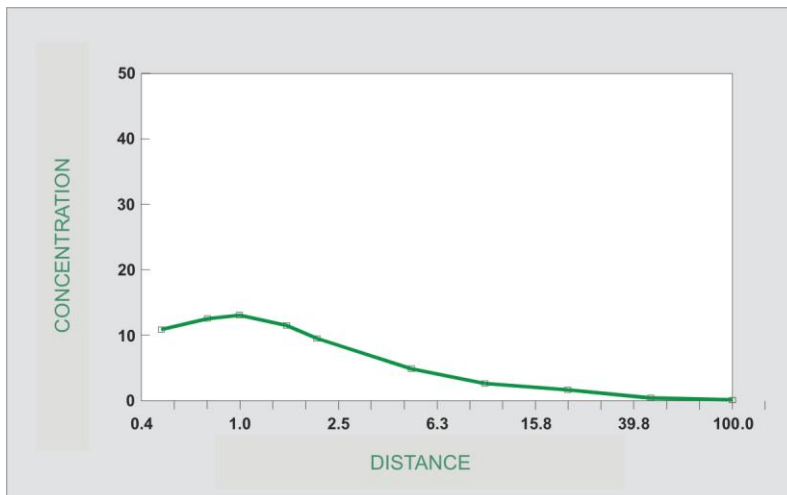
Figure 4. Coal power plant, the height of the release is he = 80 m. Long-term average concentrations of particles

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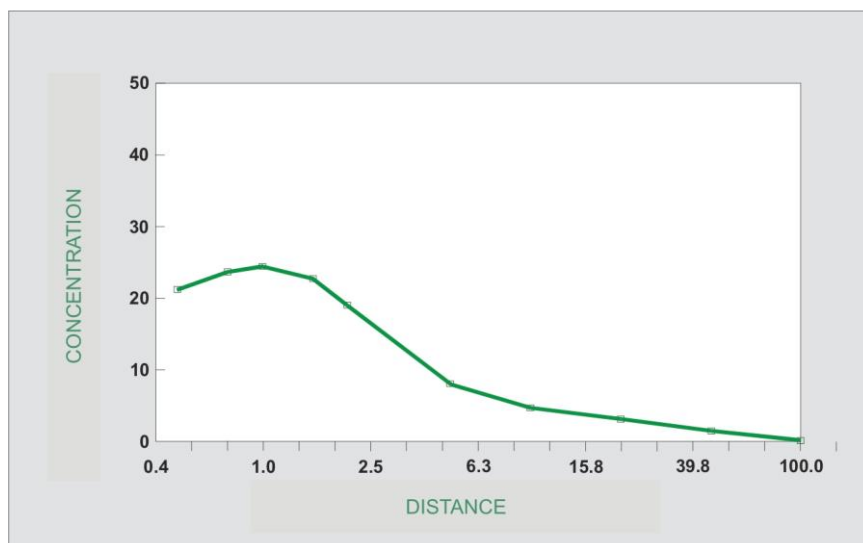
Figure 5. Coal power plant, the height of the release is he = 80 m. Long-term average concentrations of NO_2
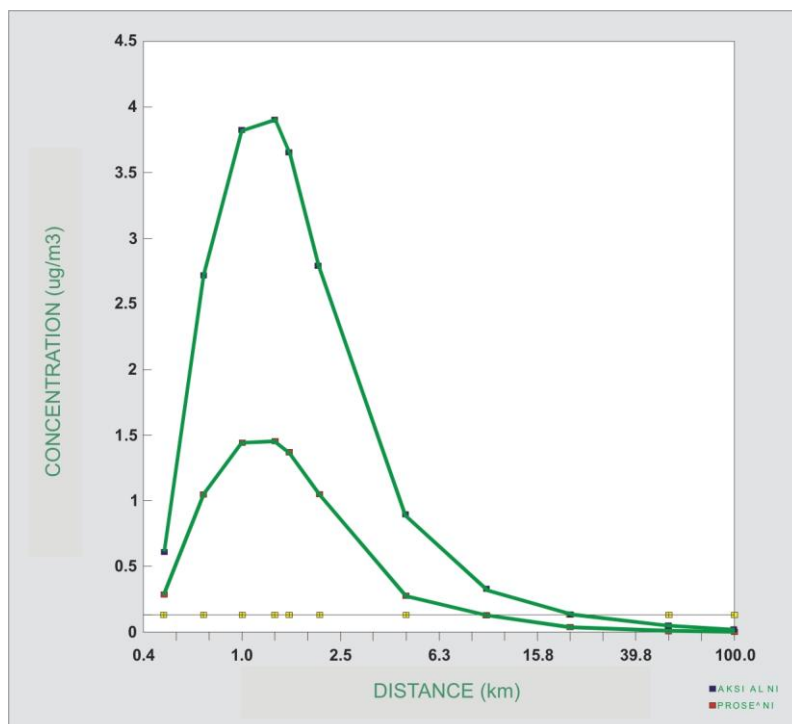
Figure 6. Coal power plant, the height of the release is he = 80 m. Short-term average concentrations of SO_2

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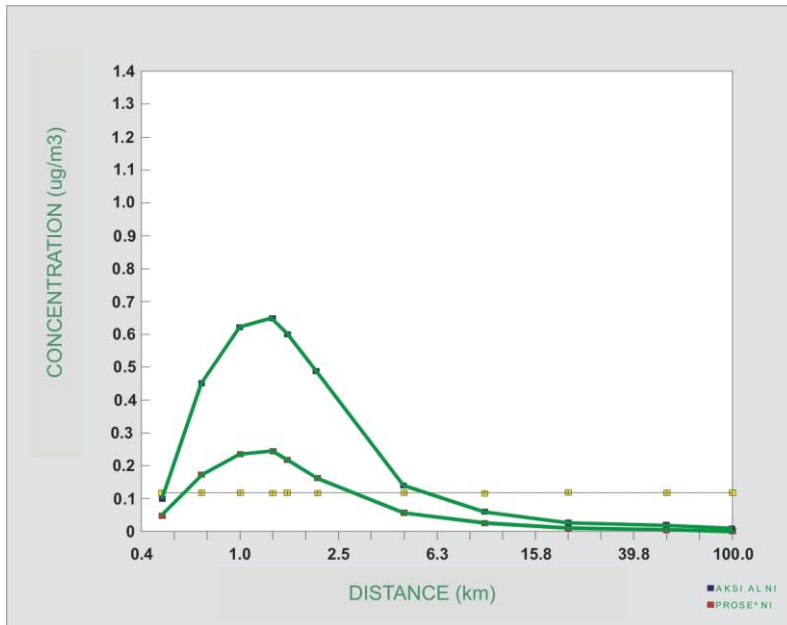
Figure 7. Coal power plant, the height of the release is he = 80 m. Short-term average concentrations of particles
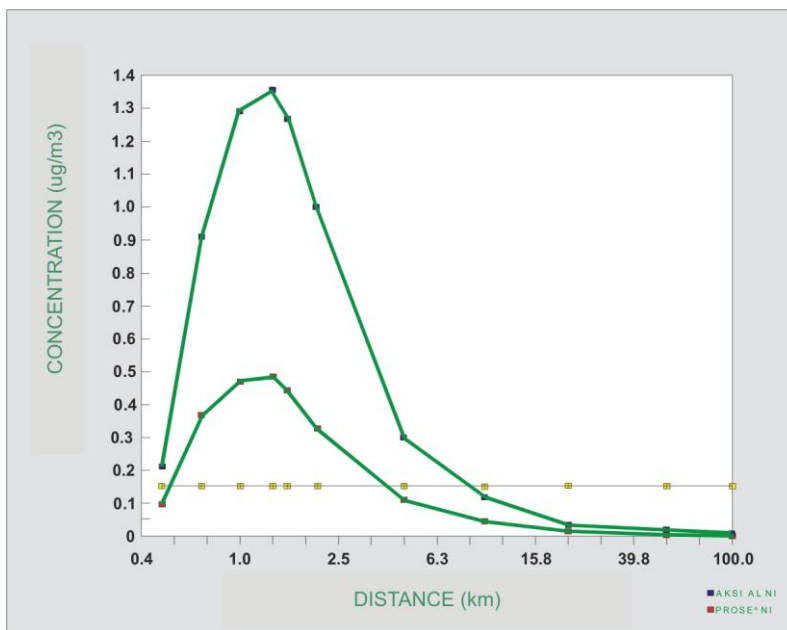
Figure 8. Coal power plant, the height of the release is he = 80 m. Short-term average concentrations of NO₂

5. CONCLUSIONS

The selection of atmospheric polluters that have been taken into account has been made based on reference [27]. In these instructions about the quality of air, the selction of the polluters has been based on:

- intensity and frequency of harmful effects upon health;
- presence and aboundance of the polluter in the environment;
- possibilities for transformation and changes of the form of the chemicals with great toxic potential,
- persistance in the environment;
- exposure of populations, and
- sufficiency of data on the effects.

The results point out a general level of risks induced by atmospheric polluters. In future, it is necessary to perform much more investigations in this field.

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INFLUENCE OF HIGH ENVIRONMENTAL TEMPERATURE ON THE LEVEL OF SOME HORMONES IN RATS

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Among the various physical environmental stressors, "temperature is ecologically the most important, for it is a factor that is all-pervasive and in most environments, lacks spatial or temporal constancy" (Cossins et all, 1987). The high environmental temperature is a stress for homoeothermic organisms in all levels of their biological organization and results with activating defensive and adaptive mechanisms for survival in the newly conditions. According to Collins and Weiner (1968), the physiological responses to heat exposure, may be primary (nervous reflexes) and secondary (adaptive changes caused by endocrine glands) depending on its duration.

The chronicle exposition to moderate heat reduces the pituitary mass and the level of adenocorticotropic hormone -ACTH (Rousset et al., 1974, Mitev, 1983), as well as the mass of adrenal glands and corticosteroids concentration (Buzalkov, 1979; Mitev 1983) and gonades and their hormones (Mitev, 1983; Bogomilov, 1986). This certainly speaks for functional changes in the mentioned endocrine glands that result with metabolic disorders.

The aim of the study was to see the effects of short and long exposure to moderate heat (35±1 C°) on the level of ACTH, corticosterone, insulin and testosterone in rats.

MATERIALS AND METHODES

Experimental animals: Adult *Wistar* male rats (n=40), weighing 160-210 g, housed in cages by 4-6, consuming water and food *ad libitum*, were used in this study. A special warm chamber, with a constant temperature (35±1°C), relative humidity (30-40%) and daylight period (12hrs) helpt as a high temperature environment (*Department of experimental physiology, Institute of Biology, Skopje*).

Rats were divided into 6 groups according to the duration of stay in hyperthermic environment: 0 (control euthermic group), 4, 7, 14, 21 and 30 days.

Hormone analysis: After ether narcosis, rats were victimized by laparathomy and blood was taken from *a.abdominalis*. We essayed the concentration of ACTH, corticosterone, insulin and testosterone, using RIA methods (*CIS bio international, France*).

Statistical analysis: Results are presented as means ±SD. Data were statistically analyzed using Analysis of variance (*Newman-Keuls Multiple Comparison - Quikstat*), with significance p<0.05. The correlation coefficient was determined using *Statistical Graphics System* package, with significance limit p<0.05.

RESULTS:
Level of ACTH:
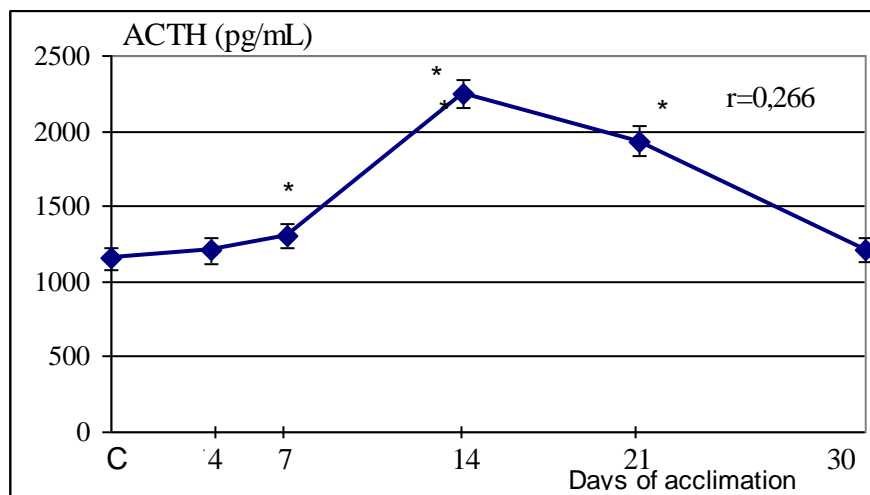
Fig.1. *Level of ACTH in rats during acclimation in hyperthermic environment*
*C-control group (20±1 C°), *****-p<0,05 in relation to the control group, **r**- correlation*
coefficient

	C:4	C:7	C:14	C:21	C:30
P <	n.s.	0,05	0,05	0,05	n.s.
%	5,7	12,4	93,7	66,4	9,9

Exposition to high environmental temperature up to 4 days leads to non significant changes on the level of ACTH (C:4 p-n.s.), whilst the prolonged stay shows tendency of increase with a pick at the 14th day (C:7 12,4%; C:14 93,7%; and K:21 66,4%, all p<0,05 Fig.1). By the end of acclimation period the concentration of this hormone is being normalized (C:30 p-n.s.).

Low, but significant positive correlation (r=0,266) between changes of ACTH-concentration in relation to the duration of exposure was found.

Level of corticosterone:

Changes in the level of corticosterone in rats roomed in a heat chamber are shown on Fig.2. These changes can be divided in three phases. Significant elevation of its level registered up to the 7th day (C:4 6,7% and C:7 21,8%, p<0,05). The second phase is characterized with decrease of corticosterone concentration that is significant on the 21st day (C:14 -3,3%, p-n.s. and C:21 -55,5%, p<0,05). The end of the acclimation period leads to normalization almost to control level, since non significant changes between these two groups were found (C:30, p-n.s.).

This is confirmed with the significant negative correlation coefficient r=-0,369, p<0,05).
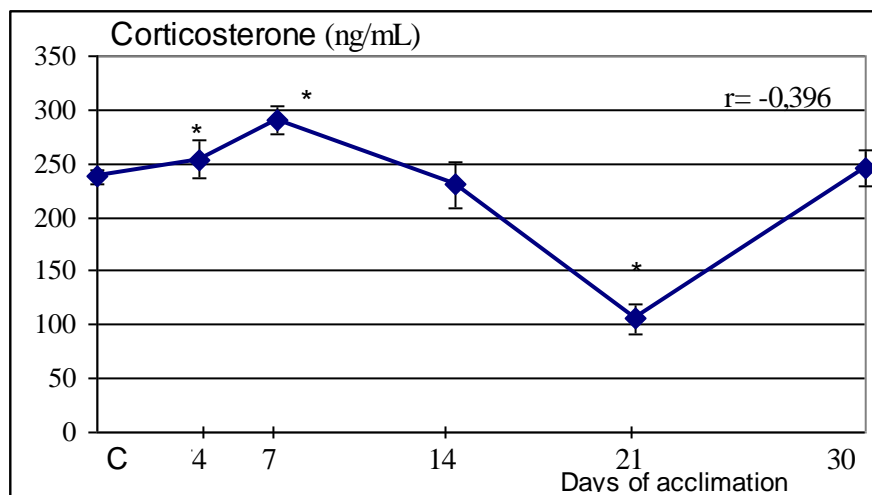
Fig.2. *Level of corticosterone in rats during acclimation in hyperthermic environment*
C*-control group (20±1 C°),* *******-p<0,05 in relation to the control group,* ***r****- correlation coefficient*

	S:4	S:7	S:14	S:21	S:30
P	0,05	0,05	n.s.	0,05	n.s.
%	6,7	21,8	-3,3	-55,5	/

Level of insulin:

In the first four days of stay at 35±1°C there is significant decrease of the insulin level (C:4 14,8%, p<0,05), but up to the 7th day it comes almost to the control level (C:7 p-n.s.; fig.3). The further period of acclimation is characterized with continuous increase of insulin concentration (C:14 44,1%; C:21 70,1% and C:30 81,4%, all p<0,05).

The obtained results for the changes of the insulin level during acclimation in high environmental temperature are acknowledged by the high positive statistically significant correlation coefficient in function of time (r=0,888, p<0,05)

Fig.3. *Level of insulin in rats during acclimation in hyperthermic environment*
C*-control group (20±1 C°),* *******-p<0,05 in relation to the control group,* ***r****- correlation coefficient*

	S:4	S:7	S:14	S:21	S:30
P<	0,05	n.s.	0,05	0,05	0,05
%	-14,8	/	44,1	70,1	81,4

Level of testosterone:
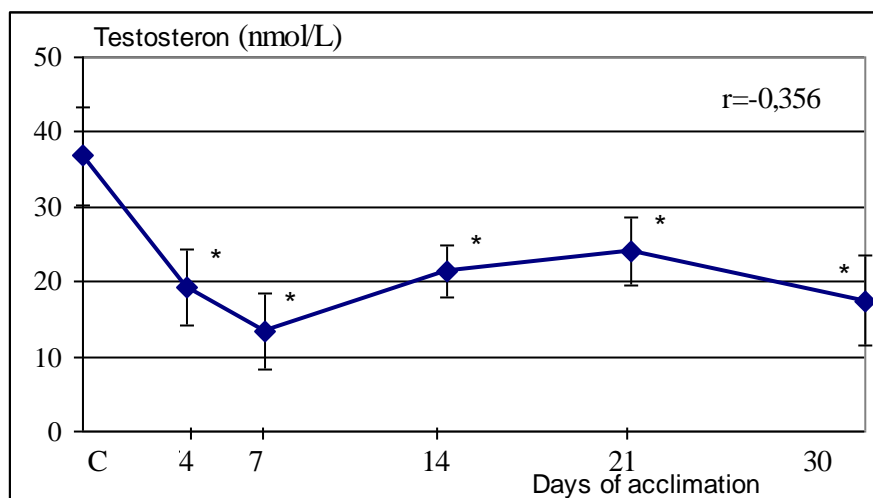
Fig.3. *Level of testosterone in rats during acclimation in hyperthermic environment*
C-control group (20±1 C°), **-p<0,05 in relation to the control group,* *r- correlation*
coefficient

	S:4	S:7	S:14	S:21	S:30
P<	0,05	0,05	0,05	0,05	0,05
%	-47,5	-63,6	-42,1	-34,5	-52,4

Both acute and chronic heat reduces the concentration of testosterone in rats, which can be seen at Fig.4, since there is a continuous significant drop of its level during the whole acclimation period (C:4 -47,5%; C:7 -63,6%; C:14 -42,1%; C:21 -34,5% and C:30 -52,4%, all p<0,05).

The linear correlation coefficient of testosterone level in function to the duration of stay in hot environment is relatively low, but still statistically significant (r=-0,356, p<0,05).

DISCUSSION:

The high environmental temperature is a stress-factor at all levels of biological organization of homeothermic organisms that activates complex regulatory mechanisms (nervous, endocrine, motor), with only one aim –to preserve the homeostatic stage (Collins and Weiner, 1968; Mitev, 1983; Hochachka and Somero, 1984; Katsumata et al., 1990; Zhao et al., 1995). The diapason of the qualitative and quantitative changes depends on intensity and duration of exposition to the hyperthermic environment.

One of the main responses in stress conditions is activation of steroidogenesis in the adrenal cortex (Mc Cance, 1996). In order to have an insight to the work of the pituitary-adrenal axis in condition of moderate heat, we examined the concentration of ACTH and corticoserone. Our results show that in rats exposed to 35±1 C° the level of ACTH is increasing with a pick on the 14th day. By the end of the acclimation period of 30 days it drops to a control level (fig.1). The concentration of corticosterone increases up top the 7th day, after which it significantly decreases (14th and 21st day) and normalizes (30th day) (fig.2).

Elevated concentration of corticosterone during acute heat exposition is related to the stress effect of the hyperthermic environment (Mitev, 1983; Gwodsdow et al., 1985; Cure et al., 1989) as a result of direct stimulation of the adrenal gland, increased secretion of ACTH and its disturbed hepatic inactivation (Barlow et al., 1956).

The chronic heat exposition leads to opposite changes in the regulatory mechanisms of adrenocortical activity – decreased levels of ACTH and corticosterone (Mitev, 1983) owed to the lower adrenal activity (Cure, 1989). Same experiments (Buzalkov et al., 1970; Gwodsdow et al., 1985; Cure et al., 1989) point out that during a prolonged stay in high environmental temperature, rats show spontaneous malnutrition, which might be one of the reasons for reduced hormonal level, or/and rapid catabolism of corticosterone in these conditions (Itoh and Nishimira, 1963).

The new concepts of stress induced metabolic changes in subcelular level present the rapid synthesis of heat shock protein (hsp) stimulated by corticosteroide hormones (Kasambalides et al., 1983, Baez et al., 1987, Sawka, 1996). The main role of hsp is to activate the inactive corticoid receptors and to inhibit the dissociation of hormone-receptor complex (Matic et al., 1989), which would be essential for the process of adaptation.

All changes that occur in the level of ACTH and corticosterone during acclimation to hot environment are temporary, since at the end of the acclimation period (30 days) we registered non-significant changes in relation to the control group.

Data for the effect of the hyperthermic environment to the level of insulin are lacking and often contradictory. Some find increase of insulin level during acute exposure to heat (Torlinska et al., 1987), some show decreased level (Sasaki, 1988) while some find non-significant changes of insulin concentration at these conditions (Rousset et al., 1984).

We found that acute heat exposure (up to 4 days) lowers the insulin level for 14%, but the prolonged stay is characterized with increased insulin concentration with a pick at the 30th day (81,4%).

Researches about the role of endocrine pancreas in the process of thermal acclimation (Doi et al., 1982) show that the level of glucagon decreases while of insulin increases in warm acclimated rats. Their results suggest that the endocrine pancreas might be tightly related to the metabolic acclimation, mainly directing the metabolic processes towards anabolism during warm acclimation.

This is explained with the well-known fact that insulin inhibits the activity of glucose-6-phosphatase (Spagnoli et al., 1983; Gardener et al., 1993), mostly its catalytic sub-unit (Lange et al., 1994). Warm-acclimated rats have increased insulin and low glucagon level (Doi et al., 1982) which induces low glucose-6-phosphatase activity and increased concentration of glucose-6-phosphate and glycogen in the liver of warm-acclimated rats.

Acclimation to high environmental temperature is followed by significant decrease of testosterone level during all 30 days (fig. 4). A possible reason for the low level of this hormone in hot environment might be the elevated concentration of corticosterone (fig. 2). According to Chrousos and Glod (1992), corticosterone has inhibitory effects over the testosterone secretion through suppression of secretion of follicle stimulating hormone – FSH and luteinizing hormone – LH, which leads to hypogonadism. This has been proved with the experiments of El Hani et al. (1980) and Mitev (1983) in which testectomy results with increase of the mass of adrenal gland, but testosterone treatment significantly lowers it. This effect of the testosterone is also supported with the fact that the adrenal mass in male is always lower than in female rats (Mitev, 1983).

CONCLUSIONS:

A general conclusion based on the data obtained during this experiment would be that acclimation of rats in the zone of moderate hot environment brings up significant changes on the level of the above mentioned hormones. The physiological responses to prolonged heat exposition include adaptive reactions induced by endocrine glands (Collins and Weiner, 1968) which mainly can be noticed by the distribution of the plastic and energetic potentials of the organism (Mahmudov et al., 1980)

Increased insulin concentration found in our experiment on one side, and decreased levels of its antagonists –ACTH, corticosterone and testosterone on the other, let us conclude that all metabolic processes during acclimation are directed to anabolism and low endogenous worm production. This is confirmed with increased content of the liver glycogen and decreased concentration of blood glucose (Mitev, 1983; Dinevska-Kofkarovska, 1998; Miova, 2003, Gjuladin, 2004). This is probably due to the influence of insulin, since it directly affects the key enzymes of carbohydrate metabolism e.g. inhibition of glucose-6-phosphatase activity and stimulation of glycogen-synthase activity (Stallmans et al., 1987).

Taking into consideration the global Earth warming and its influence over the living organisms, these kinds of researches would be a must in future, especially for patients with chronic diseases. High temperature is also used in radiotherapy of tumors and in treatment of tissues before transplantation, so understanding its influence would open new horizons in finding out new and more efficient medical methods.

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HEALTH STATUS OF PRE-SCHOOL CHILDREN LIVING IN UST-KAMENOGORSK BIOGEOCHEMICAL PROVINCE

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Today problems of environment's influence on health are very actual, because it became very difficult to find a territory, that is absolutely out of technogenic influence. [1,2,3] . According to A.S. Dusembayeva' data (1999), in Republic of Kazakhstan there are more than 22 cities and industrial centers with unfavorable ecology, including Eastern Kazakhstan, especially Ust-Kamenogorsk city, which's environment is polluted with heavy metals (lead, zinc) from lead-zinc factory.

As children's health is an adequate marker of unfavorable ecological situation, we've chose an aim of our study work – investigation of children's mortality and pre-school (aged 0-5 years) children's health status in Ust-Kamenogorsk city.

Investigation was lead within ISTC Project K229B "Mortality and sick rate for children aged from 0 to 5 years in conditions of environmentally unfavorable city in the region affected by Semipalatinsk A-Bomb Test Site (Ust-Kamenogorsk as example)".

Epidemiological approach was used. 103 children, aged from 0 to 5 years old, lived near lead-zinc factory in Ust-Kamenogorsk city, and 106 children of the same age, lived in Orbita district, Almaty city – control region, have been observed.

In this article results of deep medical one-stage observation of selected representative group (10%) are provided. Group includes: in Ust-Kamenogorsk city (territory near lead-zinc factory) - 103 children, aged from 3 months till 5 years old, within 55(51.7%) boys and 48(48.3%) girls, and in Almaty city – 103 children.

With the aim of children's mortality risk factors investigation, expert evaluation of children's death cases (at the age of 0-5 years old) was provided: 250 cases in Ust-Kamenogorsk city (for 2003, 2004, 2005 years) and 255 cases in Almaty city (for 2003 year). All resident children's death cases were analyzed, excluding non-residents. Either medical documentation on dead children and their mothers was analyzed.

Medical observation included: deep medical observation, electrocardiography, echocardiography, Doppler echocardiography, ultrasound investigation of abdomen and urinary system. Next equipment was used: Cardiovit – AT7, portative ultrasound scanner Aloka-500 (Japan), SIEMENS SI-450 (Germany), SONOACE – 6000 (South Korea) with colored Doppler carting with standard method. Also information from ambulance cards and statistic talons was considered.

Anthropometric measurements of weight, height, thoracic ratio were implemented according to unified method with standard measuring kits. Centile method was used for individual evaluation of physical development [4]. The method is based on the principle of variability, considering percentage rate of the sign's frequency.

In order to get quantitative characteristic of the observed parameters and complex health estimation, all children were divided into several health groups. The first health group included children with none health deviations by all criterions. The second health group included children with risk factors in anamnesis and functional deviations in health. In third group – children with chronic diseases and congenital development abnormalities in subcompensated stage. In the fifth group – children with chronic pathology in decompensated stage.

Also medical observation included evaluation of connective tissue dysplasia (CTD) by Fomina's special estimation card (2000), where all CTD signs were estimated in points: I-st degree (normal) – points sum less than12, II-nd level (easy and moderate) – from 12 to 23 points – so-called non-differential CTD, and III-rd level – more than 23 points – differential CTD (syndrome variant).

Results and discussion. Demographic rates' dynamics at whole in Ust-Kamenogorsk city within 2001-2005 years reflects unfavorable situation in residents' health.

High rates of children's mortality are observed (17-23‰). Within studied years in Ust-Kamenogorsk city the total mortality rate increased from 13‰ to 14.6‰. In country at whole the rate remained relatively stable (10.0-10.4‰).

Quantitative distribution on age of dead children in Ust-Kamenogorsk city is next: till 1 year – 231 cases (93%), among them till 1 month – 189 (75%), within them till 7 days – 154 (61%). At the age of 1-5 years - 19 cases (7.6%).

In Almaty city: till 1 year – 243 cases (95%), within them till 1 month – 207 (81%), till 7 days – 165 (64%). From 1 to 5 years – 12 cases (4.7%).

Children's death cases analysis according to expert evaluation data (243 death cases in Almaty city and 231 – in Ust-Kamenogorsk city) showed, that extensive parameters (%) on some death causes in both cities did not have any differencies. So, status, appeared in perinatal period was in 66% and 65%, congenital development abnormalities (CDA) – in 27% and 26%, infectious diseases - in 2.8% and 3%, accordingly.

But the part of infants, died from respiratory diseases, was 1.88 times higher in Ust-Kamenogorsk city, than in Almaty city – 3% and 1.6%, accordingly.

In structure of early neonatal and neonatal mortality the part of death cases, caused by CDA, was a little bit above in Ust-Kamenogorsk city, than in Almaty city - 19% against 15% and 23% against 21% - accordingly, caused by infectious diseases much higher in Ust-Kamenogorsk city – 21% against 5.4% in early neonatal period and 33% against 9% - in neonatal period..

Factorial determination of children's mortality in Ust-Kamenogorsk city in comparison with Almaty city was studied on the basis of expert evaluation of death cases according to medical documentation (birth-history, newborn-history, disease history of dead children) (table 1).

Table 1. Statistically significant risk factors of high children's mortality rate in Ust-Kamenogorsk city

Risk factors	Ust-Kamenogorsk city		Almaty city (control)		RR*	TC*	t	p
	amount (250)	%	amount (255)	%				
Mother's age (years)								
30-34	44	17,6	36	14,1	1,29	1,25		
Mother's social status								
Employee	75	30	49	19,2	1,8	1,56	2,8	<0,01
Mother's family status								
Unmarried	33	13,2	12	4,7	3,08	2,8	3,37	<0,001
Diseases during the pregnancy								
Sexual infections	15	6	3	1,17	5,36	5,13	2,92	<0,01
Birth complications								
Prompt birth	15	6	5	1,96	3,19	3,06	2,32	<0,01
Obstetric manuals								
Covyalov's manuals	28	11,2	3	1,17	10,59	9,57	4,76	<0,001
New-born weight								
Less than 1,5 kg	33	13,2	4	1,56	9,54	8,46	5,1	<0,001
1,5-2 kg	51	20,4	32	12,5	1,79	1,63	2,38	<0,05
P.S.: RR – Relative Risk TC – Truth Coefficient								

In age aspect in Ust-Kamenogorsk city the possibility of child's death at women, aged 30-34 years old, according to the relative risk (RR) made 1.29. High children's mortality rate in this town was connected with higher rate of employee mothers (p<0,01, RR – 1.8, truth coefficient (TC) – 1.56).

Child's death risk at women-workers and students was also higher in Ust-Kamenogorsk city, than in Almaty city (RR – 1.83 and 1.29,accordingly, TC – 1.8 and 1.29, accordingly). These data do not exclude ecological determination of higher children's mortality rate in Ust-Kamenogorsk city.

One of the most important conditions of high risk of children's death was a factor of incomplete family, when mother is unmarried (RR – 3.08, TC – 2.8).

In cases of children's losses at age the part of women with chronic (gynecological and extragenital) diseases was higher in Almaty, than in Ust-Kamenogorsk (81.1% and 61.6%, accordingly). The part of women with acute respiratory viral infection (ARVI) and other viral diseases, anemia, arterial hypertension was also higher. It is possible, that such situation is connected with better diagnostics and dispensary observation of pregnant women with chronic pathology in Almaty city.

Share of sexual infections at women of Ust-Kamenogorsk city was higher, than in Almaty – 6.0% against 1.17%, accordingly (RR – 5.36, TC – 5.13).

We can not ignore the possibility of ecological determination of such factors, as low Apgar scale points (from 3 to 7 points) and low birth-weight (less than 2 kg). Relative risk was 1.19 and 1.71, 9.54 and 1.79, accordingly. The risk of prompt birth was higher at women in Ust-Kamenogorsk (RR – 3.19, TC – 3.06).

Differences in structure of congenital abnormalities (defects) of development were established. In Ust-Kamenogorsk city multiple defects, not compatible to life, have prevailed – 27%. In Almaty city congenital heart defects take first place in structure of CDA – 44%. In Ust-Kamenogorsk city defects of central nervous system are prevailing – hydrocephaly, microcephaly (11.3%). Among children, died from CDA in Almaty city, such pathology was not revealed. Determined differences in structure of CDA in studied regions and significant share of death of children with low birth-weight testify the ecological determination of their formation.

According to S.M. Grombah (1987), one of the main relatively stable criterions of children's health status is their physical development, that means "a set of morphological and functional attributes in their interrelation and dependence on environment, which characterizes maturation and functioning processes of organism at present time". Comparative characteristics of physical development, that estimated by proportionality index, revealed low level of normal harmonic physical development in both zones, but more appreciable in experimental zone (46.6% of children, as though in control zone – 51.89%). There were more children with asthenic constitutional type in experimental zone – 66.3%, as though in control zone – 53.8% (12.5% less).

In either zone, with small overweight in experimental zone, the highest rates of diseases were determined in next systems: gastrointestinal tract (32% in experimental and 26% in control zone), respiratory system (16.5% and 17.7%), nervous system (7.1% and 6.4%, accordingly).
It is necessary to note, that comparison of the above mentioned parameters in studied regions did not reveal any contrast differences, excluding gastrointestinal diseases, in particular caries of teeth and functional deviations of gastrointestinal tract. Among 38 (36.9%) children with caries in experimental zone, 23 (60.5%) have caries of high activity (4 and more carious teeth), as though in control zone – among 27 (25.5%) only 12 (44.4%) have it. It is well-known, that early caries and generalized paradontosis are explained now by dentists as a disturbance of fibrillogenesis.

Health groups analysis in studied ecozones allowed to reveal the prevalence of 3-rd and 4-th health groups (children with chronic pathology in different stages of compensation) in experimental zone - 2.5 times higher than in control (table2).

Table 2. Children's distribution according to health groups in studied regions.

Ecozones	Ust-Kamenogorsk			Almaty		
		(n=103)			(n=106)	
Health group	Totally	boys	girls	Totally	boys	girls
I	-	-	-	16,0	64,7	35,3
11	52,4	51,9	48,1	66,0	50,0	50,0
111	46,6	54,2	45,8	17,9	36,4	63,2
IV	0,97	100,0	-	-	-	-

According to results of investigation, in basic group of experimental zone 72 (70%) children had mild and moderate level of CTD expression (12-23 points), in control zone – 69 (65%). There were no children with severe level of CTD.

Phenotypical signs of CTD had a tendency to increase according to child's age (in experimental zone: till 3 years – 50.1%, at 4 years -52.4%, at 5 years – 83.8%, as though in control zone – till 3 years – 50.0%, at 4 years – 53.6%, at 5 years – 70.6%), symptoms' expression and residential area.

High level of stigmatization was determined in 42% of boys and in 40.6% of girls without authentic difference in ecozones. Next signs were met more frequently: paleness of integuments (79,4 %), "fossa" on a breast bone (42,1 %), flat thorax (38,3 %), anomaly of an occlusion (37,3 %), bridged ear lobules of ears (34,4 %), high palate (26,8 %). Hypermobility of joints with estimated 3-5 points was met at 18.5% of boys and with 6-9 points – at 25%, as though as at 30% and 40% of girls , accordingly.

CTD of heart (HCTD) was met on 11.2% more often in experimental zone (table 2).
Attributes of HCTD on 11,2 % were revealed more often in experimental zone. In Ust-Kamenogorsk city 1 case of congenital heart defect (CHD) - defect of interventricular septum (DIVS). It is interesting, that external morphological attributes of dysplasia were defined in all cases echocardiographically verified syndrome of HCTD.

By results of research the oxalic nephropathy was taped at 19 (18,4 %) children in experimental zone and only at 9 (8,4 %) - in control zone.

Universal participation of vegetative nervous system in regulation of physiological and pathological processes is well-known and certain as an adaptationally-trophic. Disturbance of vegetative regulations underlies of some pathological conditions and chronic diseases.

Dynamics of vegetative parameters advances a clinical-laboratory picture, and consequently registration of these changes and their correct interpreting allow us to diagnose disease in preclinical stages, that is very important for prevention of the disease and its complications.

During the research of vegetative nervous system features (VNS) at surveyed children, its functional condition, based on the clinical-experimental approach, was determined. The

approach's essence is based on functional-dynamic research of an initial vegetative tonus (IVT) on heart rhythm, which is an effective indicator of neuro-humoral regulations [5].

The condition of parameters of regulation mechanisms of children's heart in compared regions was studied.

As follows from table 2, at children of 2-5 years in Almaty city the condition of satisfactory adaptation was characterized with a statistically authentic centralization of management, intensifying of activity of sympathetic branch of vegetative nervous system and subcortical nervous centers. In our research at a relative constancy of parameter $_{Mo1}$ (0.61 sec) the strain of compensatory mechanisms, a high level of functioning of sympathetic branch of VNS ($_{AMo1}$ 50,4 %) and central contour of a regulation of heart rhythm ($_{ИN1}$ 330,0 un.) were marked.

Table 3. Initial values of cardiointervalography (CIG) at children, aged 2-5 years old, in Ust-Kamenogorsk and Almaty cities (M±m).

Cardiointervalography				
City	A Mo_1,%	Mo_1 sec	Δx_1 sec	$ИN_1$ units
Ust-Kamenogorsk	58,6 ±1,6	0,59± 0,01	0,16 ± 0,01	450,0 ± 1,7
Almaty	50,4±16,36	0,61±0,08	0,13±0,09	330±163,6

Results of investigation of episegmental part of VNS at children of Ust- Kamenogorsk city during cross-section comparison in statistical treating, were analyzed. Difference in index, reflecting the central contour of regulation of cardiac activity, has been noticed constantly in same stationary phases (tab. 3). So, if average parameter $_{ИH1}$ at children of ecologically polluted region has made 450,0 un. and above, at children of control region (Almaty city) it has made 330,0 un.(p<0,05). A degree of variability of cardiointervals, mode amplitude, that reflected stabilizing effect of centralization of heart rhythm management, had no authentic differences in comparison with control group of children.

Thus, during CIG analysis at pre-school children, namely from 2 till 5 years, living in a zone of increased concentration of lead and zinc, the most expressed frustration were taped in the central contour of regulation of heart rhythm, mainly in increase of strain index, reflecting high level of functioning of central contour of heart rhythm regulation. It testifies a strain of simpatico-adrenergic mechanisms. As it is known, such mechanisms of heart rhythm regulation are imperfect; children with such morphophenotype are much more often have disturbances in cardiovascular system's rhythm regulation.

Reduction of possible range of adaptive reactions, presence of the phenomena of dysregulation, disharmony of nervous and humoral influences on heart at children of 2-5 years in Ust-Kamenogorsk city are proved also by electrocardiographic data. First of all, it concerns to registration of disturbances of conduction function, which can develop as a result of cardiovasotoxic actions of exogenous chemical substances on conduction system of heart [6,7].

Atrioventricular conduction and electric systole of heart (Q-T) have been investigated at observed children.

Duration of electric systole of ventricles (interval Q-T) at children of both regions did not differ (0,32±0,003 in Ust-Kamenogorsk and 0,32±0,002 in Almaty city, accordingly).

At the same time atrioventricular conduction value, estimated by duration of interval P-Q (R), at children of ecologically adverse zone has made 0,11±0,002, that authentically distinguished it from the value in control group (0,13±0,001).

From references [8,9] it is known, that in etiology of shortening of interval of atrioventricular conduction great value can have congenital or got anatomic changes in myocardium (as a result of blood supply disturbance in conductive system of heart) due to different chemical or radiological influences. There are data in literature about variability of heart rhythm at children with truncated interval of atrioventricular conduction, connected with a strain of sympathetic influences during depression of parasympathetic. It corresponds with our results of CIG, which have been found out at children of Ust-Kamenogorsk city (Vasenko J.J., 1999).

Today the shorting of an atrioventricular conduction interval has got special importance in pediatric practice, as prevention and well-timed treatment of possible disturbances in heart activity are urgent measures of prophylaxis of basic cardiovascular diseases.

Thus, results of the deep medical observation of children have taped, that the basic deviations of health status at either studied ecozones were changes in digestive, respiratory and nervous systems. Apparently, greater frequency of gastrointestinal diseases mostly is caused by use of contaminated foodstuff and potable water. High rate of respiratory diseases probably should be bound to the basic barrier function of lungs for damaging factors of environment, and also with the influence of air pollution in ecologically unsuccessful region. High level of nervous deviations, possibly, is caused by impurity of water and ground with salts of heavy metals (lead, zinc).

In experimental zone an oxalic nephropathy was taped almost 2 times oftener. It is known, that oxaluria a sign of increased ejection of the oxalic acid, representing an end-product of some bonds metabolism (glycin, serine, oxyproline), playing an important role in connecting tissue metabolism. It corresponds to O.A.Ignatova's indications /2003/, that children with oxaluria often enough have signs of CTD.

Also, high level of external signs and anomalies of heart connective tissue skeleton was expressed oftener in experimental zone (62.1 %). In opinion of many researchers [10-13], it is necessary to well-timely detect CTD. It is proved either with high frequency of its prevalence in population (20-40 %) or with special morphogenesis of connective tissue – it participates in formation of heart skeleton practically at all stages of ontogenesis. Influence of a damaging factor in any gestational time can lead to various disturbances of its formation and cause CTD, that increase risk of serious complications (disturbances of heart rhythm, sudden death, disturbances of cerebral circulation).

Increase of frequency and expression of phenotypical signs of CTD and it's dependence on child's age testify progradient process and emphasize importance of children observation in

dynamics. According to WHO definition, the prevalence of children of II-nd and III-rd health groups confirms ecological trouble in occupied districts, which takes special place in our experimental region. Results of the lead investigation testify, that ecological negative factors directly or indirectly negatively influence the health status of children. Described worse health status of children from Ust-Kamenogorsk biogeochemical province confirms the statement, as it was estimated by E.Veltishev (1996) as a syndrome of an ecological disadaptation. Acknowledgements. Investigational group is thankful to professors epidemiologists from Oklahoma University (USA): Nurtan A.Esmen and Thomas Hall for rendered consultant support at the planning stage of this investigation. Also, investigational group brings deep gratitude to parents of the observed children for the given opportunity to observe them and participation in questioning.

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BACILLUS SUBTILIS MZ-7 WITH ANTAGONISTIC ACTIVITY AGAINST NOSOCOMIAL CLINICAL ISOLATES

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Antibacterial activities were detected in thirty-six bacteria from 12 soil samples. One strain Mz-7 produced an inhibitory substance which was active against a number of gram-positive bacteria as well as clinical isolates obtained from a local hospital. Strain Mz-7 was identified as Bacillus subtilis by 16S rRNA sequence analysis. Maximum production was observed at mid of stationary phase slightly before sporulation took place. Optimum conditions for growth were standardized. The antibiotic product was purified by chloroform precipitation and detected by polyacrylamide gel electrophoresis and mass spectrometry. It was proteinous in nature and did not lose its activity on treatment at different pH values, temperatures and enzymes. The pronounce activity against multidrug resistant clinical isolates and the favorable biochemical properties of this novel antibiotic from the newly isolate strain suggest a new and effective agent against uprising resistance in pathogenic microbes.

Keywords:*Bacillus*, Antibiotic, Characterization, Resistance, Nosocomial

1. Introduction:

Bacillus subtilis is an aerobic, endospore-forming, rod-shaped, gram positive bacterium commonly found in soil, water sources and in association with plants. *B. subtilis* and its close relatives are an important source of industrial enzymes (such as amylases and proteases), much of the commercial interest in these bacteria arises from their capacity to secrete these enzymes at several grams per liter concentrations. *B. subtilis* has been used for the study of protein secretion and for development as a host for the production of heterologous proteins [1]. Under conditions of nutritional starvation, *B. subtilis* stops growing and initiates responses to restore growth by increasing metabolic diversity. These responses include the induction of motility and chemotaxis, and the production of macromolecular hydrolases (proteases and carbohydrases) and antibiotics. The concern that pathogenic bacteria are quickly becoming resistant to commonly used therapeutic agents [2] has been exacerbated by the downward trend in discovery of novel antibacterial [3], hence, the search for new antibiotics remains very important [4]. While several strategies exist for the discovery of antibiotics, much of the work still consists of screening naturally occurring sources like the soil, which is the major repository of microorganisms that produce antibiotics capable of inhibiting the growth of other microorganisms. Over 8000 antibiotics and over 12000 metabolites from bacteria are known and hundreds more are discovered yearly. Few, however, prove to be commercially useful [5]. In the search for new antibiotics, the genus *Bacillus* is an excellent place to look. *Bacillus* species produce a large number of antibiotics representing at least 25 different basic chemical structures [6]. Of the antibiotics produced by *Bacillus* spp., most are active against gram-positive organisms. However, compounds such as polymyxin, colistin, and circulin are also active against gram-negative organisms [7].

Some peptides produced by *Bacillus* spp., mainly the lipopeptides, demonstrate antifungal properties [8], examples include iturins [9], bacillomycin D [10], mycosubtilins [11], bacillomycin L [12] and bacilysocin [13]. Interestingly, some of the peptide antibiotics produced by *Bacillus* species not only demonstrate antimicrobial properties but are excellent surfactants. In some cases, peptide antibiotics that demonstrate surface active properties (biosurfactants) may even be useful to the petroleum industry [14]. The chemical and physical diversity of peptide antibiotics makes them ideal candidates not only for therapeutic applications but also for other areas, especially in the agri-food industry such as preservatives [15].

2. Materials and methods

2.1. Screening and isolation

Soil samples from a drainage bank, University of the Punjab, Lahore, were screened for antimicrobial exhibiting bacteria. Crowded plate method was employed at different dilutions and zones of inhibitions were observed. Part of each colony was streaked on fresh media plates and allowed to grow overnight of which one plate was left as a reservoir. A thin layer of soft Nutrient agar 0.8% [16] seeded with a selected clinical isolate was overlaid onto plates and incubated at 37 °C for 12 to 24 h, to screen for antagonistic bacteria. Isolates that caused inhibition of growth of the overlaid bacteria were considered. Eventually selected candidate were collected from the reservoir plate and rechecked for their activity.

2.2. DNA extraction PCR and Ribotyping

Genomic DNA was extracted from overnight incubated bacterial culture in Luria Bertani LB-broth [16] at 37 ºC with 120 rpm. The extraction was carried out by using gene extraction kit (Biorad, UK). PCR amplification of 16S rDNA was performed successfully following the method described by [17] with forward primer 27f (5-AGAGTTTGATCCTGGCTCAG) and reverse primer 1522r (5-AAGGAGGTGATCCA(AG)CCGCA) [18]. To 0.5-0.1 ng of chromosomal template DNA, 0.25 µM each primer, 200 µM deoxynucleoside triphosphate and 1 unit of *Taq* polymerase were added. Solution was heated to 94 °C for 5 min and passed through 29 cycles as follows: denaturation for 20 s at 94 °C, primer annealation for 20 s at 50 °C and extension at 72 °C for 2 min. Final extension was at 72 °C for 5 min. The product was purified using Aqua pure extraction kit (Fermantas, UK) and sequenced using both 27f and 1522r primers by automatic sequencer (Applied Biosystems, USA).

2.3. Antimicrobial substances (AMS) assay:

Samples of culture supernatant containing the antibiotic were assayed for activity using an agar-well diffusion assay [19]. Fifty µL of *Bacillus fusiformis* liquid culture of 0.3 OD_{600} was spread onto the surface of LB-agar plate [16]. A well was made in the center of the plate using a sterile cork borer and 50 µL antibiotic sample was transferred into the well. Sample was allowed to diffuse into the agar, the plate was then inverted and incubated at 37 °C until a lawn of the indicator bacteria appeared on the plate (approximately 8-10 h).

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2.4. Spectrum of activity:

The following 17 different bacterial strains were tested for their sensitivity to the antibiotic using the agar-well diffusion assay: *Escherichia coli* C600, *Escherichia coli* DH5α1, *Bacillus subtilis* PY49, *Bacillus subtilis* 92, *Bacillus subtilis* 29, *Bacillus cereus* F, *Bacillus cereus* 92, *Bacillus fusiformis*, *Ochrobacterium intermedium* (our own lab. collection) and 8 clinical isolates of *Klebsiella spp*. (collected from Children Hospital, Lahore, Pakistan). Aliquots of an overnight culture of the bacteria being assayed for sensitivity to the antibiotic were added to sterile LB-broth blanks to yield a bacterial suspension with a final optical density (600 nm) of 0.5. Fifty μL of the bacterial suspension was spread onto an agar plate and used in the agar-well diffusion assay as described above. Fifty μL culture supernatant obtained from incubation of producing strain at 37 °C for 36 h with 120 rpm, was transferred into the well, zone of inhibition were observed and measured.

2.5. Bactericidal Assay:

Culture filtrates were checked for anti- Gram positive activity with *B. fusiformis* as test organism. Fifty μL of bacterial suspension of 1 $OD_{(600)}$ prepared from an over night culture of the test organism, was added to three 100 ml flasks containing 10 mL LB-broth. The three preparations were two replicas and one control. Exponential phase was achieved after approximately 6 h of incubation at 37°C with 120 rpm. After a proper dilution (1:100), one ml of bacteria supernatant filtered sterilized containing the antibiotic, was mixed to each dilution. 10 μL from each mixture was washed and plated on LB-agar plates. Plates were incubated and the No. of colonies was counted.

2. 6. Preliminary characterization:

Procedures employed here were in accordance to Yamazaki et al. [20]. To determine the effects of enzymes (amylase, trypsin and proteinase) on the inhibitory activity, culture supernatants (180 µL) were incubated with 20 µL of each enzyme solutions [10 mg/ml in 50 mM phosphate buffer (pH 7.0)] at 35 °C for 6 and 12 h then boiled for 5 min. The concentration of proteinase was doubled to determine the proteinous nature of the AMS. For thermal stability, culture supernatants were heated for 15 and 30 min at 80, 100 and 121 °C. Finally, the effect of different pH values on AMS activity was determined by adding 100 µL of the cell supernatant to 900 µL of distilled water adjusted with NaOH or HCl to pH 2, 4, 7, 9 and 11 values. All treated samples and their replicas were assayed for residual activity by agar well diffusion method.

2. 7. Isolation of AMS:

The bacterium was incubated for overnight on LB-agar plate at 37 °C and a loop full was suspended in autoclaved distilled water, the optical density was adjusted to 1 at 600 nm. One mL from the suspension was aseptically added to 200 mL LB-Broth (1000 mL flask) and placed on a rotary shaker at 140 rpm for 48 h. To the supernatant, obtained from centrifugation at 2000 xg for 15 min, an equal volume of chloroform was added [21]. The separating funnel was shaken well and left to clear turbidity. A thin layer of antimicrobial substances (AMS) was formed at the interface which was collected.

All three phases were tested for activity. For purification the precipitate was redissolved in water and reprecipitated by chloroform several times. Finally homogeneity was checked on TLC silica plate (Merck Co.) and by Native PAGE. Product was analyzed by PAGE [22] with an 18.5% acrylamide resolving gel. The gel was fixed in 20% isopropanol–10% acetic acid and washed in deionized water as described by Bhunia et al. [23]. The gel was then placed in a Petri plate and overlaid with Muller Hinton soft agar containing *B. subtilis* strain 92 as a test organism.

2. 8. HPLC-MS Analysis:

Bacterial supernatant was extracted with equal volume of ethyl acetate. The organic layer was reduced by rotary evaporator. The extract was analyzed by HPLC/MS monitored at 220 nm. Scan was taken in positive-ion mode over the *m/z* range from 600 to 1600 as described in [24].

2. 9. Antimicrobial production and growth kinetics:

Antimicrobial activity was monitored during the growth cycle of strain Mz-7 in LB-broth. Every 6 hours viable cell and spore (recovered by heat treatment at 80 ºC for 10 min) counts along with the antibacterial activity of the supernatant were recorded. Supernatants collected were tested for activity on indicator lawn. Activity was determined by the highest dilution giving an inhibitory zone around the well. Arbitrary units (AU) per milliliter were defined as the reciprocal of the greatest dilution of the supernatant that showed a zone of inhibition multiplied by 1000, divided by the volume of supernatant applied to the well [25].

2.10. Optimization of production conditions:

The strain was grown in aerobic conditions at 37 °C for 48 h in five different media: brain–heart infusion (BHI), trypticase soya broth (TSB) glucose broth [26], Luria-Bertani (LB) broth and Landy broth [27]. The later was also supplemented with 1% of asparagine, glutamic acid, arginine, cysteine, glycine, casein, yeast extract, glucose, fructose, sucrose and lactose to test the influence of growth media on the production of AMS. The LB medium was used to grow the producer strains for 48 h, at different temperatures (28, 35 and 42 ºC), pH (5, 6, 7, 8 and 9) and aeration conditions (70 and 140 rpm) in order to determine the best conditions for the production of the antimicrobial compounds. After incubation of the producer strain in those different conditions, each culture was then centrifuged (2000 xg for 15 min) and then tested for the variation in the inhibitory activity.

3. Results:

3.1. Novel Bacillus strain:

Among many strains exhibiting antimicrobial activity isolated from soil samples few, however, were having intense activity against the tested clinical isolates. One of the most active strains designated as Mz-7 is reported in this paper. Sequencing result of 16S rRNA was analyzed using NCBI web site and showed 94% homology with *Bacillus subtilis* HJ11 (AY176764). The result was submitted to Genbank and accession no. DQ327713 was obtained. The phylogenetic relationship of strain Mz-7 with other related bacteria is given in Fig. 1. to confirm the novelty of this strain.

3.2. Antimicrobial spectrum and mode of action:

The culture supernatant inhibited the growth of most of the tested strains including the clinical strains (Table 1). Pronounced activity was observed on Gram positive strains. Partially purified product was able to produce approximate 95% killing of the tested strain to show bactericidal action (Table 2).

3.3. Biochemical characterization:

The inhibitory activity was not destroyed by trypsin and proteinase K, however, activity was partly blocked by increasing the concentration of Proteinase K to two fold (80% of residual activity) Fig. 2a. Other enzymes, such as amylase and RNase did not affect the activity. Inhibitory activity of cell free supernatant remained stable after 30 min at 100 °C but was completely inactivated at 121 °C for 15 min Fig. 2b. The activity was completely stable at pH 4 to 8 but reduced at pH values of 2, 3, 9, 10, 11 showing (44, 91, 82, 75 and 64 % of residual activity respectively) Fig. 2c.

3.4. AMS evaluated by Tricine-PAGE and HPLC-MS analysis

Bacillus strain Mz-7 was able to secrete inhibitory peptide to the growth of test bacterium. It was determined when developed on TLC to show a typical blue colour reaction in the chlorine/ o-dianisidine test for peptides. The isolated peptide visualized by its activity on Tricine-PAGE presented an inhibitory activity in a region of the gel of lower molecular mass than 3.2 kDa (Fig. 3). For more accurate analysis the extract was submitted for HPLC-MS and showed by (+)-ESI HRMS a component with molecular mass *m/z* 1008.66668 and two further homologues with *m/z* 1022.68307 and 1036.69997 for the $[M+H]^+$ *quasi*molecular ions (Fig. 4), corresponding to the formulas $C_{51}H_{89}N_7O_{13}$, $C_{52}H_{91}N_7O_{13}$, and $C_{53}H_{93}N_7O_{13}$.

3.5. Antimicrobial activity during growth and relation with sporulation:

Changes in cell and spore numbers as well as the released antimicrobial activity (AU ml^{-1}) were recorded during the growth cycle. Antimicrobial activity did started earlier as logarithmic growth phase of cells, reached to the peak at the start of sporulation and maintained till the fourth day (Fig. 5).

3.6. Influence of growth conditions on the production of AMS:

Five different media (GB, BHI, TSB, LB and LN) were first used to screen the antimicrobial activity and the best results corresponding to the highest suppression effect on the indicator strain were obtained from BHI and LN medium. Clear zones bigger than 3 cm were observed when BHI and LN were used. Amongst the supplements LN broth glutamic acid, asparagine, casein hydrolysate, glucose, sucrose, lactose were giving larger zones while the rest of supplements gave slightly larger or equal zone of inhibition to LN broth itself. LB was elected as the medium for further tests being easier to handle compared to LN that requires strict pH adjustment. The influence of temperature, aeration and pH was considered for the determination of the best conditions for the production of AMS in LB medium. Supernatants

showing inhibitory activity were obtained when the strain was grown in a range of pH ranges from 6 to 8 at temperatures of 30 ºC and 37 ºC and at two shaking speed (70-140 rpm) shaking cultures. Maximum antimicrobial activity was observed when the strains were cultivated as shake cultures at pH 8 and 37 ºC regardless of the shaking conditions. Increased temperature (up to 42 ºC) did not interfere much with the antimicrobial production. After 3 days of incubation in all these different conditions, the final pH was measured in supernatants and it varied from 8.0±0.2 to 8.9±0.2, regardless of any conditions for growth.

4. Discussion:
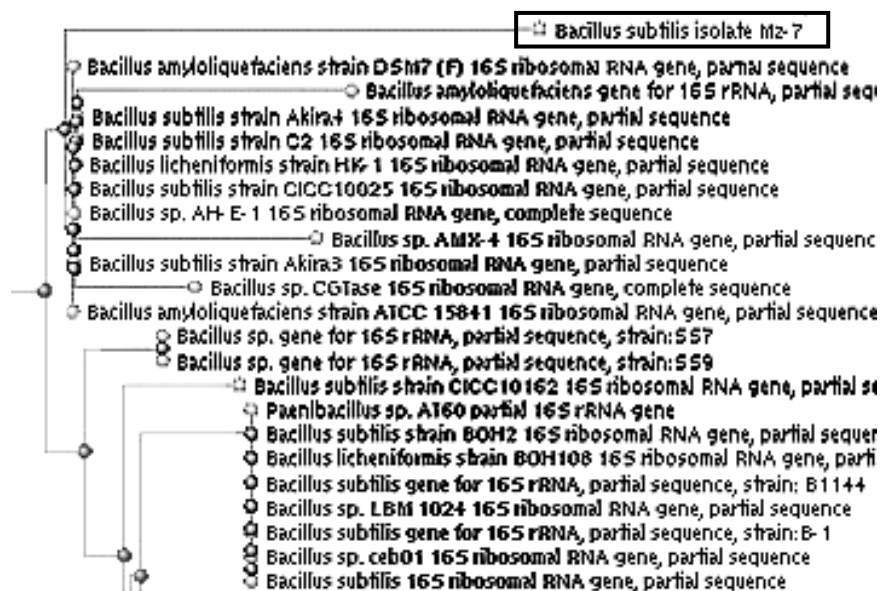
Fig. 1. Relationships between strain Mz-7 and several other *Bacillus species* based on their 16S rDNA sequences. Bootstrap values from 1000 replicates are included
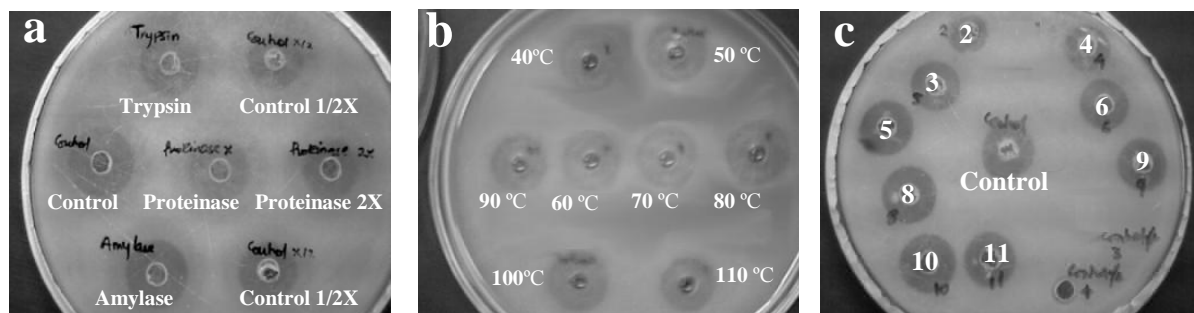
Fig. 2: Product characterization (a) Effect of different enzymatic treatment along with control. Stability towards different (b) temperatures and (c) pH. See the text.
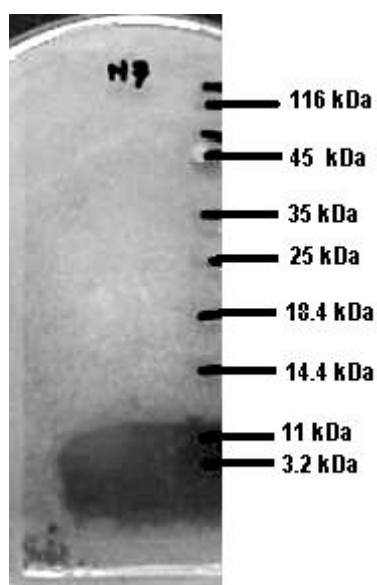
Fig. 3: Bioassay for antibacterial activity after Tricine-PAGE. The numbers on the right indicate the positions of molecular weight markers while the inhibitory zone indicates the position of active peptide.

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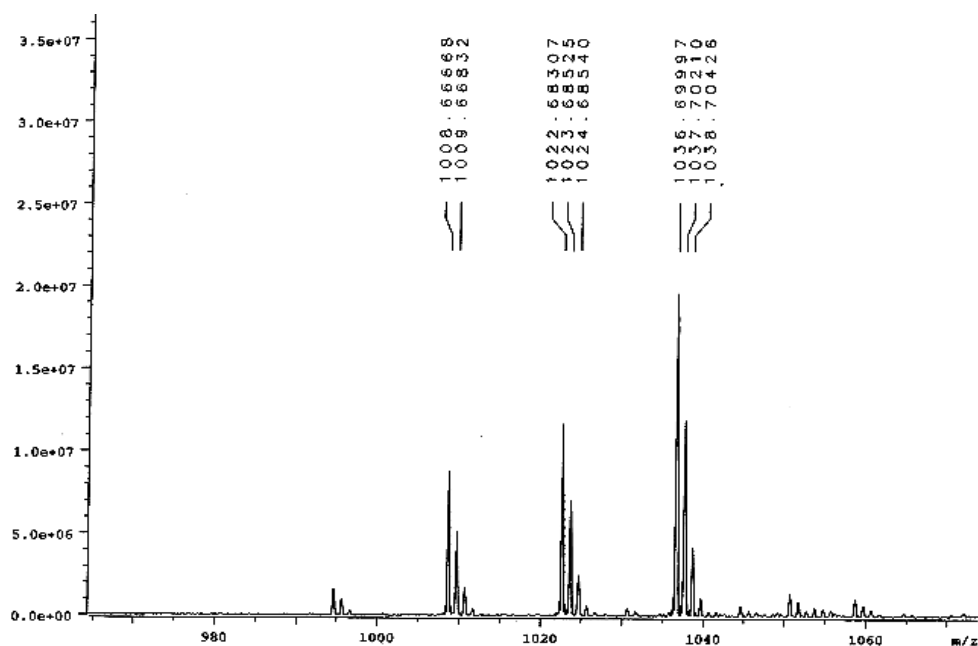
Fig. 4**:** HPLC/MS profile of organic extract of *Bacillus subtilis* Mz-7**.**
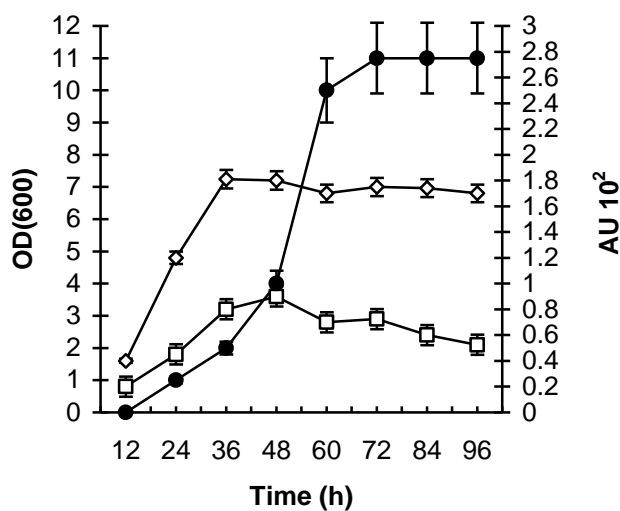
Fig. 5: Growth (□), inhibitory activity (◇) and sporulation (●) relationship of strain Mz-7 grown in 200 mL LB medium at 37 ºC at 140 rpm.

Table 1. Spectrum of activity: The zones of clearing ranged from nonexistent (-) to a diameter of >2.0 cm (++++).

Test organism	Activity expressed by diameter of inhibitory zone
Escherichia coli C600	+
Escherichi coli DH5α1	+
Bacillus subtilis PY79	+++
Bacillus subtilis 92	++++
Bacillus subtilis 29	+++
Bacillus cereus F	+
Bacillus cereus 92	++
Bacillus fusiformis	++++
Ochrobacterum intermedium	-
*Klebsiella spp.*1	+
*Klebsiella spp.*2	++
*Klebsiella spp.*3	+
*Klebsiella spp.*4	+
*Klebsiella spp.*5	+
*Klebsiella spp.*6	++
*Klebsiella spp.*7	++
*Klebsiella spp.*8	++

Table 2 Bactericidal assay, the Killing % was determined to be equal to (CFU Control-CFU Sample) X 100/ CFU Control. Three replicas were used in each assay.

Supernatant (ml)	Test strain	Control CFU	Replica 1 CFU	Replica 2 CFU	Replica 3 CFU	Killing %	Result
2	*B.fusiformis*	400±10	19	19	20	95.1%	Cidal
1	*B.fusiformis*	400±10	22	23	26	94%	Cidal

Almost 4% of the 4.2-Mbp *Bacillus subtilis* 168 genome codes for proteins similar to the proteins involved in the biosynthesis of antimicrobial metabolites [28]. However, *B. subtilis* 168 produces only a few antibiotics because several of the biosynthetic pathways are not functional, most likely because of the X-ray mutation of the original Marburg strain [29]. In contrast, various other *B. subtilis* wild-type strains produce characteristic cocktails of numerous peptide antibiotics [30, 31]. It is well documented that different *Bacillus* species are able to produce extracellular substances with antimicrobial activity against a wide variety of microorganisms. Many of them are indicated as preservatives in food systems and beverages [32; 33], as biological control agents against phytopathogens and as antibiotic producers [34]. Strains of *Bacillus* were proposed as corrosion protectors in biofilms, where antimicrobial peptides such as indolicidin and gramicidin S are produced [35].

The properly identified and tested nontoxic strains are most frequently used as animal probiotics [36]. *Bacillus subtilis* strains produce a broad spectrum of bioactive peptides [37] with great potential for biotechnological and biopharmaceutical applications. A well-known class of such compounds includes the lipopeptides/ surfactants; surfactin [38; 39; 40], fengycin [41] and the iturin compounds [42], which are amphiphilic membrane-active biosurfactants and peptide antibiotics with potent antimicrobial activities. All these agents occur as families of closely related isoforms which differ in the length and branching of the fatty acid side chains and in the amino acid substitutions in the peptide rings [43; 44]. Many of the potential applications that have been considered for biosurfactants could be due to several advantages over chemical surfactants such as lower toxicity, higher biodegradability and effectiveness at extreme temperatures or pH values [45]. In this study Antimicrobial substances (AMS) produced by *B. subtilis* strains, isolated from soil were tested. Revealed by the analysis the active peptide is of 1036.6 m/z, a search in AntiBase [46] suggested three nearest possibilities: Esperin, Surfactin C and Pumilacidin B. These are cyclic depsipeptides with a heptapeptide skeleton and cyclized through a β-hydroxy fatty acid to form a lactone.

A minute inactivation of bacteriocin activity by amylase might be an indication that beside proteinaceous subunit, some carbohydrate components are involved in the overall antibacterial activity as well. For additional information about their structure, more detailed examinations have to be made, particularly in view of the fact that some authors have expressed that antibacterial substances produced by *B. subtilis* strains might be not identical.

It is well known that bacteriocins produced by lactic acid bacteria are very often sensitive to trypsin, while the sensitivity to other enzymes varies [47]. AMS presented in this study were not typical in this respect, as it was not sensitive to trypsin in tested concentrations but was partially inactivated by proteinase K in a higher concentration to that reported by Yamazaki et

al. [20]. Tested AMS produced by *B. subtilis* Mz-7 showed variable stabilities at a wide range of pH values from pH 3.0–11.0 at 30 °C. This is different from nisin, which is unstable at neutral and alkaline pH values [48]. In comparison with some of the bacteriocins produced by lactic acid bacteria, *B. subtilis* AMS was fairly heat stable too.

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MEDICAL WASTE SURVEY IN A UNIVERSITY HOSPITAL: DO INTERN DOCTORS AND EMERGENCY NURSES KNOW AND PAY ATTENTION TO SEGREGATION OF WASTES?

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Medical wastes are of public health concern in both developed and developing countries being costly in disposal and carry risks of infection or physical injury and of exposure to potentially harmful pharmaceuticals. This study aimed to determine the knowledge and attitudes of intern doctors and emergency nurses in a university hospital and conducted in Gazi University Hospital in April 2006. One hundred and thirty one intern doctors and 27 emergency nurses are targeted to be reached for March-April 2006 period. A questionnaire form was filled out for each participant. Nurses have undergone training programs on medical wastes and waste segregation (50.0%) significantly more than the intern doctors (19.3%). The knowledge of the medical wastes that must be disposed in "red coloured plastic sacks" were known by almost all (98.6% of intern doctors, 100.0% of emergency nurses) participants (p>0.05). Wastes which must be disposed in "blue coloured plastic sacks" and "black coloured plastic sacks" were known better by nurses (85.0% and 85.0%) than intern doctors (60.5% and 58.2%) (p<0.05). Intern doctors and emergency nurses are found as a group of high risk and the appropriate training programs in terms of timing and content will be effective.

INTRODUCTION

Medical wastes are of public health concern in both developed and developing countries being costly in disposal and carry risks of infection or physical injury and of exposure to potentially harmful pharmaceuticals although they constitute a relatively small percentage of all wastes(1,2).

World Health Organization (WHO) supports clssification of the medical wastes in hospitals as special wastes, and United States Environmental Protection Agency (EPA) defines these wastes as hazardous (3). For this reason; segregation, temporary storage, recycling, transportation and ultimate demolition require attention (4). In Turkey, these applications are regulated by a legislation: Ordinance for Control of Medical Wastes dated 20th May 1993 and published in Official Gazette number 21586 (5). This legislation was renewed and the new one is put inforce on 22nd of July, 2005 (Official Gazette No:25882) (4).

In both of the ordinances, wastes in health facilities have been grouped into three as: domestic waste, recyclable waste and medical waste. Medical waste is defined as the infectious, pathological and sharp wastes generated trough the observational, diagnostic, research, therapeutic and rehabilitative services of medical establishments. Due to the older ordinance, domestic waste must be disposed in black and recyclable waste in blue plastic sacks whereas in the new ordinance the domestic waste, recyclable waste and medical wastes must be disposed in black, blue and red coloured plastic-sacks respectively for which the properties they must carry are described.

Infected and pathological wastes must be collected in red plastics sacks and sharps must be collected in rigid bin made of either carton or plastic as before (4).

Health care facilities in which the medical wastes are generated are responsible for establishing a system to minimize the generation of these wastes and their demolition due to the ordinance. So, physicians, nurses, midwives, dentists, laboratory tecnicians and other staff involved in the observational, diagnostic, research, preventive, therapeutic or rehabilitative health care services are expected to segregate the wastes where they are generated (4).

Several studies have investigated the quantity and quality of hospital wastes, their transport and destruction (3,6-10) but researches conducted among health-care personel are limited in number(11,12).

University hospitals are large size health care facilities and classified as health facilities producing large quantity of medical wastes(4). These facilities also serve for education and training purposes for medical faculties and schools for nurses and midwives. As in other medical faculties in Turkey, medical students rotate in different departments of hospitals for different time periods. Most of these departments are the wards and outpatient clinics in which a high quantity of medical wastes are generated. Although they are involved in many applications and interventions as injection, wound-care, blood collection etc. They do not have a detailed training about the medical wastes, their segregation and their risks in our university. The only source of information is the 5th year Public Health stage and health care workers with whom they work in wards or outpatient cinics. For the academical year of 2006-2007 a clinical skill laboratory has been scheduled for 1th year medical students which is conducted through an audiovisual training for 20 minutes. For intern doctors, when the shortness of the period they spent in each ward/outpatient clinic and diversity of the medical interventions they carry out are considered, they should be accepted as an important target group who may have a failure in waste segregation.

In the emergency wards of hospitals, there is a intensive application of patients accompanied by an intense diagnostic interventions, and a need for quick and effective patient stabilization (13). When the workload and work description is considered, emergency nurses may be concerned as another risk group who may fail to segregate wastes.

For these reasons, this study aimed to determine the knowledge and attitudes of intern doctors and emergency nurses in a university hospital.

MATERIALS AND METHODS

This study is conducted among intern doctors and emergency nurses in Gazi University Hospital in April 2006. One hundred and thirty one intern doctors and 27 emergency nurses are targeted to be reached for March-April 2006 period. Seven nurses and 12 intern doctors could not be reached due to the maternity and annual leaves and rotational training in a maternity hospital respectively. As result, 119 (%90.6) intern doctors and 20 (574.1) nurses were included in the study.

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A questionnaire form including questions about some sociodemographical properties, knowledge and attitudes about medical wastes and their segregation was filled out by face-to-face interviewing technique for each participant.

Plastic or laminated carton bins for sharps were defined as "safe disposal bins" while knowledge about medical wastes is evaluated. Answers as "safe disposal bins" for sharps, "red coloured plastic sacks" for other medical wastes, "blue coloured plastic sacks" for recyclable waste and "black coloured plastic sacks" for domestic wastes were regarded as correct.

Data analysis was performed by SPSS 10.0 statistical package program. Descriptive statistics (median (min-max), percent distributions) are computed and Fischer's exact chi-square test is performed. Probability values less than 0.05 is regarded as "statistically significant".

RESULTS

A total of 139 (85.6 % intern doctors, 14.4 % nurses) participants were evaluated. Fifty six point one percent of them were female. Thirty seven percent of the intern doctors were practicing in clinical wards, 23.5% in outpatient clinics, 18.5% in emergency unit, 15.2% in public health department, 5.0% in intensive care units and 0.8% in operating theatres.

Age, time spent in current position, daily and weekly working hours of the intern doctors and emergency nurses are shown in Table 1.

Table 1. Age, time spent in current position, and daily and weekly working hours of the intern doctors and emergency nurses, Gazi University, Ankara, 2006

	Intern Doctors		Emercency nurses	
	Median	**(Min-Max)**	**Median**	**(Min-Max)**
Age (year)	24	(23-33)	28	(23-33)
Time spent in internship/profession (month)	10	(4-10)	72	(7-132)
Time spent in current unit (month)	2	(1-2)	12.5	(2-132)
Daily working hours	9	(5-16)	8	(8-12)
Weekly working hours	60	(25-99)	40	(40-48)

Previous trainings for medical wastes and waste segregation and knowledge about waste segregation of the participants are shown in Table 2. Nurses have undergone training programs on medical wastes and waste segregation (50.0%) significantly more than the intern doctors (19.3%) (p<0.05). The knowledge of the medical wastes that must be disposed in "red coloured plastic sacks" were known by almost all (98.6% of intern doctors, 100.0% of emergency nurses) participants (p>0.05). Wastes which must be disposed in "blue coloured plastic sacks" and "black coloured plastic sacks" were known better by nurses (85.0% and 85.0%) than intern doctors (60.5% and 58.2%) (p<0.05).

The knowledge of the participants about classification of different kinds of wastes and in which coloured sacks they must be disposed are shown in Table 3. There is no statistically significant difference between the level of knowledge of intern doctors and emercency nurses for the kinds of wastes to be disposed in red and blue coloured plastic sacks. Intravenous catheters are classified better by nurses than intern doctors (p<0.05). Wastes which must be placed in black plastic sacks are better classified by nurses (p>0.05).

Table 3. The knowledge about the classification of different kinds of wastes by intern doctors and emergency nurses, Gazi University Hospital, Ankara,2006

	Knowledge about classification of different kinds of wastes						
	Intern Doctors(n=119)		Emergency Nurses(n=20)			Total (n=139)	
	No	%*	No	%*	p	No	%*
Wastes that must be disposed in safe disposal bin							
Injectors	84	70.6	17	85.0	**0,278**	101	72.7
IV catheters	33	27.7	12	60.0	**0,008**	45	32.4
Sharps	59	49.6	14	70.0	**0,145**	73	52.5
Wastes that must be disposed in red-coloured plastic sacks.							
Urine bags and appendices	110	92.4	20	100.0	**0,357**	130	93.5
Flacons	87	73.1	12	60.0	**0,286**	99	71.2
Laboratory wastes	108	90.8	19	95.0	**1,000**	127	91.4
Nasogastric catheter	113	95.0	20	100.0	**0,593**	133	95.7
Surgical wound care wastes	109	91.6	20	100.0	**0,357**	129	92.8
Patient care unit wastes	102	85.7	18	90.0	**1,000**	120	86.3
Tracheostomia canule	101	84.9	19	95.0	**0,309**	120	86.3
Foley catheter	105	88.2	20	100.0	**0,221**	125	89.9
Blood and blood products	99	83.2	18	90.0	**0,740**	117	84.2
Dialysis wastes	102	85.7	20	100.0	**0,132**	122	87.8
Wastes that must be disposed in black-coloured plastic sacks.							
Kitchen wastes	69	58.0	17	85.0	**0,025**	86	61.9
Food and their packages	51	42.9	15	75.0	**0,014**	66	47.5
Wastes that must be disposed in blue-coloured plastic sacks.							
Office wastes	53	44.5	5	25.0	**0,141**	58	41.7

* Percent of right answers for each question
Reasons for failure to segregate the wastes declared by the participants are shown in Table 4.

Table 4. Reasons for failure to segregate the wastes declared by the participants, Gazi University Hospital, Ankara 2006

Reasons for failure	Intern Doctors (n=119)		Emergency Nurses (n=20)		Total (n=139)	
	No	%*	No	%*	No	%*
Not all colours of plastic sacks are present in every room	65	54.4	4	20.0	69	49.6
Not enough time during intervention	49	40.0	17	85.0	66	47.5
Usage of the sacks is not practicle	47	39.4	6	30.0	53	38.0
Usage of the sacks is not necessary	15	12.5	2	10.0	17	12.2
Lack of training	4	3.4	-	-	4	2.9
Not all colours of sacks are present in outpatient clinic	1	0.8	-	-	1	0.7
Carelessness-Tiredness	-	-	1	5.0	1	0.7

* Percent of declaration of each reason by the participants.

The most prevalent reason declared was "Not all colours of sacks are present in every room" by 49.6% of the participants. The second most prevalent reason was "Not enough time during intervention" (47.5%) and the third prevalent was "Usage of the sacks is not practicle".

The leading reason for failure was "Not all colours of sacks are present in every room" among intern doctors (54.4%), while it was "Not enough time during intervention" (85.0%) among emergency nurses.

Presence of bins with coloured plastic sacks in the units in which the participants currently work are shown in Table 5.

Table 5. Presence of waste bins with coloured plastic sacks in the units in which the participants currently work , Gazi University Hospital, Ankara 2006

	Declaration about presence of bins for medical waste disposal (%)				
	Absent	Sometimes present	Usually present	Always present	No idea
Unit*					
Out patient clinics (n=28)	53.6	14.3	14.3	17.9	-
Clinical wards(n=44)	-	15.9	52.3	27.3	4.5
Intensive care units (n=6)	-	-	66.7	33.3	-
Operating theatres(n=1)	-	-	-	100.0	-
Emergency (n=42)	2.4	19.0	23.8	54.8	-

* Since 18 intern doctors in public health department are not involved in medical waste generation process during their rotational period, they are not involved in analysis.

Fifty three point six percent of the participants declared that bins for medical waste disposal were not present in outpatient clinics. Hundred percent of the intern doctors declaring this reason were in internal medicine&cardiology, 50.0% of them in psychiatry and 50.0% of them in pediatrics.

The utilization of bins for medical wastes and attituted towards notifying others for their use, are shown in Table 6.

Table 6. The utilization of bins for medical wastes and attituted towards notifying others for their use, Gazi University Hospital, Ankara 2006

	Intern Doctors (n=119)		Nurses (n=20)		Total (n=139)	
	No	%	No	%	No	%
Frequency of usage of medical waste disposal bins						
Never	25	21.0	-	-	25	18.0
Sometimes	18	15.1	1	5.0	19	13.7
Frequently	57	47.9	8	40.0	65	46.8
Always	19	16.0	11	55.0	30	21.6
Notification of others for usage of medical waste disposal bins						
Never	40	33.6	1	5.0	41	29.5
Sometimes	43	36.1	6	30.0	49	35.3
Frequently	25	21.0	6	30.0	31	22.3
Always	11	9.2	7	35.0	18	12.9

% column percent

Twenty one percent of the intern doctors declared that they never used medical waste disposal bins. Fifty five percent of the emergency nurses declared that they use the medical waste disposal bins regulary, while only 16% of the intern doctors are regular users.

DISCUSSION

Healthcare establishments comprising observational, diagnostic, research, therapeutic and rehabilitative services are among the largest generators of solid waste on a per capita basis. A portion of their wastes are considered as potentially dangerous because it may possess pathogenic agents and can cause undesirable effects on human health and environment (3). The segregation process of the wastes is shown to be important to prevent the injuries and decrease the infection risk (14).

In the present study, knowledge and attitude of intern doctors and emergency nurses about medical wastes were evaluated in a university hospital. Half of the nurses have got a formal training about medical wastes while only one out of five intern doctors were trained. The content and frequency of the in-service training for nurses was not evaluated deeply but it is learned that the issue of waste segregation was being covered for a one hour course. For intern doctors there is no formal tarining but the topic is covered during fifth year public health stage as a one hour course. Emergency nurses knew the recent revisions in the ordinance significantly better than the intern doctors. This difference is attributed to the in-service trainings for the nurses. Likewise, in another study conducted by Dinç et al in hospitals in the center of Manisa province, it is reported that the trained nurses were more successful than the untrained ones (12).

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In the present study, the utilization of the appropriate bins and sacks for medical waste disposal was found higher among nurses. As the level of knowledge for segregation, this is also attributed to the in-service training of the nurses. Nurses are also the group of personel who are somehow more stable in the current position and the ones leading the other staff about the segregation process (12).

The absence of the bins for medical wastes in outpatient clinics is one of the most common reasons declared by the intern doctors. This is an issue that must be addressed by the personel responsible for waste management process. The idea behind may be that there is not e need for their usage, but still,provision of them in every outpatient clinic may be encouraging and increase attention.

The low level of knowledge of the intern doctors and attitudes towards not paying so much attention to segregation of wastes demonstrated that, this group should be considered as a risk group. In-service training programmes for this group before they are involved in medical waste generation process is essential. These training should be up to date. And also it will be very helpful if they are informed about the location of safe disposal bins, bins with different colours of plastic sacks during their first day in that specific ward or outpatient clinic.

In conclusion, intern doctors and emergency nurses are found as a group of high risk and the appropriate training programs in terms of timing and content will be effective.

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ULTRAVIOLET AND SKIN CANCER

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Skin cancer is the most common type of human cancer in countries with predominantly Caucasian population around the world. The term "skin cancer" usually describes the three commonest types of skin cancer. These cancers are basal cell carcinomas (BCC), squamous cell carcinomas (SCC) and cutaneous malignant melanomas (CMM). BCC an SCC also referred to, collectively, nonmelanoma skin cancer. There is persuasive evidence that each of the three main types of skin cancer is caused by ultraviolet (UV) radiation from the sun exposure. They are more frequent in sun-sensitive people with high sun exposure and occur mainly on sun-exposed body sites. Recent studies provided direct evidence that sun exposure is the cause of mutations in critical tumour suppressor genes in BCC, SCC and CMM. In the USA alone 1.2 million new cases of skin cancer are identified each year and this accounts for 40% of all new cancer cases that are diagnosed. The incidence of skin cancers are dramatically increasing and thus pose a threat to public health. Its incidence is doubling every 15-20 years likely because of an aging population, changes in behaviour towards sun exposure, and increased UV light fluency at the earth surface due to ozone depletion. Therefore, it is very important to educate the population about the dangers of UV exposure and teach them how to protect their skin from the sun. Dissemination of educational materials and public awareness programs are very important for this purpose.

Introduction

Solar radiation consists of visible light and invisible radiation. Invisible radiation consists of infrared radiation, which generates heat, and ultraviolet (UV) radiation which is not warm and cannot be seen or felt. UV is a part of the spectrum of electromagnetic radiation with wavelengths between 200 nm and 400 nm. It is divided into three further components depending on the wavelength, UVC (200–280 nm), UVB (280–320 nm) and UVA (320–400 nm) (1). The major source of UV is solar radiation or sunlight, although exposure to artificial sources in tanning salons is becoming more important in terms of human health effects (2). A number of different factors affect UV radiation levels and may make a considerable difference to the risk of sunburn and skin damage. High UV is associated with time of the year (summer), time of the day (10 am to 3 pm), position on the earth (close to the equator), low cloud and low ozone level, high altitude, and light reflecting environment (snow, water, white painted buildings) (3,4).

UV is the most prominent and ubiquitous physical carcinogen in our natural environment. It is highly genotoxic but does not penetrate the body any deeper than the skin. Our skin shows an impressive variety of passive and active protective features, but it may still develop blistering sunburn hours after being exposed to the sun's UV radiation.

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This demonstrates that our background level of UV radiation can evoke substantial toxic reactions (5). UVC is close to the maximum absorption spectrum of DNA to initiate photochemical reactions therefore it is highly mutagenic and toxic to the cells. However solar UVC is completely absorbed by the ozone in the stratosphere and can not reach to the surface of the earth. Therefore it is not playing a role in the pathogenesis of solar-induced cutaneous carcinogenesis (1,6). UVB radiation is only partly absorbed by the atmospheric ozone layer, and UVA radiation is not absorbed at all (7). The composition of sunlight on a sunny day is approximately 90% to 95% UVA and 5% to 10% UVB (8). Nevertheless, the residual UVB radiation that reaches ground level can still be absorbed by proteins and DNA, and is suffcient to kill unprotected cells. UVA is not strongly absorbed by the proteins and nucleic acids and does not produce erythema on moderate exposure as UVB does. Notably UVB and, to a much lesser extent, UVA are responsible for inducing various skin disorders including the generation of skin cancer (photocarcinogenesis) and premature skin aging (photoaging), suppression of the skin's immune system with negative consequences for malignant as well as infectious disease (photoimmunosuppression), and the triggering of photodermatoses (9).

Stratum corneum absorbs large amounts of UVB radiation before it reaches the DNA molecules in the viable cells. However UVB which passes through the stratum corneum is absorbed by the proteins and nucleic acids of keratinocytes and melanocytes. In the wavelength range of UV radiation, the photons of light are highly energetic. Absorbing the energy of the photons by the biological molecules changes the distribution of electrons in the molecule and creates the excited singlet state. In this state, the molecule becomes chemically reactive and may be modifed or damaged or may undergo a photochemical reaction to form photoproducts. Chromophores represent UV absorbing biomolecules. In the skin they include melanin, DNA, amino acids, caroten, and urocanic acids. DNA is the most critical chromophore in the skin for UVB. Melanin is an important chromophore that acts as a filter by absorbing the UVB, UVA, and visible spectrum, therefore the level of melanin in the epidermis which determines the skin type is the main determinant of sun sensitivity (7).

About 90% of all requisite vitamin D has to be formed in the skin and solar UV-B is crucial in the synthesis of vitamin D. Some recent studies suggest that vitamin D may potentially reduce risk of colon, prostate, and breast cancers. People receive sufficient vitamin D from incidental exposure to sunlight during normal day-to-day activities, therefore it is not necessary to tan for vitamin D synthesis (10). Both UVB and UVA induce skin cancer by absorption by DNA and by provoking formation of reactive oxygen species (ROS) leading to mutations, and immun supression.

UVB

The bactericidal effect of UV radiation corresponded to the absorption by DNA (5). The role of UV-B in skin cancer is well established. UVB is strongly absorbed by DNA. Once absorbed, UVB induces the formation of cyclopyrimidine dimers (CPDs) in DNA strands. It has been found that CPDs are the "imprint" that UVB leaves on DNA, which is the most common abnormality. Later studies identifed pyrimidine 6-4 pyrimidone photoproducts, as the second most prevalent DNA lesions due to UVB. UVB also induces non-dimer photoproducts such as cytosin photohydrates, purine photoproducts, and single-strand breaks in DNA (6-8).

CPDs were removed by what is called `nucleotide excision repair' which entailed `unscheduled DNA synthesis' to fill in the gaps left after excision of the oligonucleotides containing the dimers. The sensitivity of the somatic cells to UV is due to the defects in the repair mechanisms. The importance of nucleotide excision repair for prevention of UV induced skin cancer is well documented by an extremely high occurrence of skin cancer on sun exposed areas in xeroderma pigmentosum patients who have defective nucleotide excision repair. CPDs and pyrimidine 6-4 pyrimidone photoproducts produced by solar UVB radiation are mostly repaired effectively without mistake, but incorrect repair of these lesions rarely induces mutations. When these mutations affect the function of oncogenes (activation), tumor-suppressive genes (inactivation), and important housekeeping genes that control cell cycling, malignant transformation of the keratinocytes and the melanocytes occurs (5-8).

Cancer is now considered to be a disease stemming from disturbances in signalling pathways that control the cell cycle and differentiation. Synthesis of dysfunctional signalling proteins due to mutations leads to proliferation and such defects are passed on to daughter cells.The tumor-suppressor genes regulate normal cellular growth and differentiation. Several tumor-suppressor genes are involved in photocarcinogenesis such as p53, p16, and PTCH genes. Proto-oncogenes also play role in the growth and differentiation of normal cells. Mutations confer a malignant potential on proto-oncogenes and therefore they become oncogenes. Several proto-oncogenes are involved in photocarcinogenesis such as bcl-2, ras, and c-fos genes. Main mutated pathways in skin cancer include (a) mutated PTCH (in the mitogenic Sonic Hedgehog pathway) and mutated p53 in basal cell carcinomas (BCC), (b) an activated mitogenic ras pathway and mutated p53 in squamous cell carcinomas (SCC), and (c) an activated ras pathway, inactive p16, and p53 in cutaneous malign melanoma (CMM) (5-7).

UVA

Since more than 90% of the solar radiation reaching the earth's surface is UVA, in recent years the role of UVA in skin carcinogenesis has begun to be appreciated. UVA actually penetrates to the deeper layers of skin and damages the dermis. This causes skin to age prematurely. Although the photons in UVA waveband are much less energetic than those of UVB, they can still produce mutations. Several studies have found that nonmelanoma skin cancer (NMSC) and CMM can be induced by UVA (8,11). In the Monodelphis domestica opossum model, UVA was as effective as UVB in the induction of melanoma (12). It has become clear that UVA accounts for at least 10% of the carcinogenic dose of the sunlight. UV irradiation to skin results in erythema, edema, sunburn cells, hyperplasia, immunosuppression, photoaging and photocarcinogenesis (8,11).

However, the mechanisms by which UVA induces its carcinogenic effects are different. UVA must react with photosensitizers such as melanin to create ROS, which in turn cause DNA damage. Low-dose UVA exposure also induces an immunosuppressive effect which contributes to the pathogenesis of skin cancer formation. Furthermore, UVA was also shown to induce CPDs and DNA breaks in the melanocytes. An increased incidence of both CMM and NMSC were observed patients who were exposed to high levels of UVA and psoralen, beginning 15 years after first treatment, but more so among patients who receive 250 treatments or more. SCC is by far the most increased cancer after UVA and psoralen treatment (8,11).

ROS as promoter in UV-carcinogenesis

In addition to its direct effects on DNA, UV may cause DNA damage by indirect stress via ROS. UV light is absorbed by endogenous (or exogenous) sensitizers that are excited and their further reactions lead to formation of ROS. UV radiation is a potent inducer of superoxide radical ($\bullet O_2-$), hydrogen peroxide ($\bullet H_2O_2$) and hydroxy radical ($\bullet OH$). These highly reactive species can interact with cellular macromolecules such as DNA, proteins and fatty acids causing oxidative damage. Direct and indirect injuries result in a number of harmful effects such as ultrastructural changes, attack on the regulation pathways and, alterations in the differentiation, proliferation and apoptosis of skin cells. Processes like these can lead to sunburn, immunosuppression, photoaging, gene mutation, and development of cutaneous malignancies. Possible prevention of UV-induced skin cancer by feeding or topical use of antioxidants, such as polyphenols, vitamin C, and vitamin E, is still being investigated (13,14).

Immunosupression

Immunosuppressed patients have increased rates of skin cancer, suggesting immunologic involvement in regulation of cutaneous oncogenesis in humans. SCCs are 65 to 250 times more frequent than in the general population. Often these patients suffer from a second and third lesion, and they appear to be more aggresive. The number of BCCs is only increased by a factor of 10 in transplant recipients. On the other hand, the number and behaviour of the CMMs do not seem to be altered in these patients. UVB irradiation of mice causes local and systemic immune supression that can be detected either by suppression of the immunologic rejection of UV-induced tumors or contact hypersensitivity. This immun suppression is transiently following acute irradiation, but becomes irreversible in the chronically photodamaged skin of both mice and man, when it becomes a prerequisite for skin cancer promotion. Exposure to UV in vitro alters the ability of epidermal cells and Langerhans cells to present tumor antigens. Keratinocytes alter their secretion of specific cytokines after exposure to UV and are induced to produce immunosuppressive factors most notably interleukin 10 (IL-10). The final step of this immun suppression is associated with the generation of antigen-specific regulatory T cells within the tumor-bearing hosts, which inhibit immunologic recognition of the tumor. As a whole, data suggest a role for the immunologic effects of UVB and UVA in the pathogenesis of skin cancer and pale skinned people have increased susceptibility to the immun supression of UV than dark skinned ones (15-18).

Skin Cancer

Skin cancer is the most common type of human cancer. The term "skin cancer" usually describes the three commonest types of skin cancer. These cancers are BCCs, SCCs and CMMs. BCCs and SCCs account for approximately 80% and 16% of all skin cancers, respectively, whereas CMMs account for only 4% of all skin cancers. BCC an SCC also referred to, collectively, NMSC.

There is persuasive evidence that each of the three main types of skin cancer is caused by UV radiation from the sun exposure. Although an epidemiologic connection between skin cancer and sun exposure was first reported in 1875, the association was finally proven in the early 1990s by establishing a UV-indicative signature of the mutations in the p53 tumor supresor gene. In the USA alone 1.2 million new cases of NMSC are identified each year and this accounts for 40% of all new cancer cases that are diagnosed. The incidence of skin cancers are dramatically increasing and thus pose a threat to public health. Its incidence is doubling every 15-20 years likely because of an aging population, changes in behaviour towards sun exposure, and increased UV light fluency at the earth surface due to ozone depletion (8,11,17,19). Well-pigmented skin is clearly better protected than white Caucasian skin. The sun-seeking habits of white Caucasians in developed countries are likely to have contributed strongly to the increase in skin cancer observed over the last century. Very high incidences that observed in U.S.A. and Australia appears to be the result of an `unnatural displacement' of fair-skinned people to sub-tropical regions (5).

NMSC accounts for 1300 to 2300 deaths per year, most from metastatic SCC. The estimated lifetime risk of developing BCC is 28% to 33% and SCC is 7% to 11%. SCCs are invasive and approximately 10% of these cancers metastasize. On the other hand, BCCs do not metastasize but can be locally invasive and destructive (8,11,17,19). In the year 2006, 62 190 newly diagnosed cases of CMM, resulting in 7910 deaths are expected to occur while 2800 deaths are expected to occur from non-epithelial skin cancers (20).

SCC

These tumors represent neoplasms of the keratinocytes that arise on the background of sun-damaged skin. SCC is clearly related to total chronic cumulative sun exposure: these tumours occur on the most regularly exposed skin (face, neck and back of hands) and the risk goes up with life-long accumulated exposure (2,5). SCCs start as disordered keratinocytes which progress to actinic keratoris. Actinic keratoses are very common lesions on sun-exposed areas of Caucasians. Various studies have shown that progression of AK to invasive SCC is between 0.025% and 16% (7,8). With reference to this it is not surprising that UV-type p53 mutations are frequently found in AK (21).

In the most recent meta-analysis of patients with psoriasis who have been treated with psoralen and UVA radiation, it was found that the incidence of SCC was 14-fold higher among those with high-dose therapy. Dose-dependent increases were also noted (22).

BCC

BCC are the commonest form of skin cancer. They lack the capacity to metastasise, but can be very invasive locally, destroying cartilage and even bone; for this reason they are also called as rodent ulcers (23). The BCC cells may arise from interfollicular basal cells, hair follicles, or sebaceous glands, thus from a deeper zone than the SCCs. Although BCC do occur on the most regularly exposed skin (80-90% on the head), they hardly ever occur on the backs of the hands (relatively more on the trunk). BCC appear to show a predilection for certain sebaceous skin areas. Therefore, its relationship with UV exposure seems to be different from the SCC's relationship (5).

Several recent studies suggested that it is the infrequent, intense, and intermittent pattern of sun exposure and not the chronic cumulative UV exposure that plays a role in BCC contrary to SCC. It is also shown that intermittency of exposure in the teenage years or earlier perhaps have a strong effect on the incidence of BCC (2,8).

CMM

CMM, a malignant neoplasm of melanocytes, is the most deadly form of skin cancer. It arises either de novo or in association with pre-existing nevi. CMM accounts for about 4% of skin cancer cases, but causes about 79% of skin cancer deaths. Due to dramatic increases in incidence of CMM, it is important to elucidate the pathogenesis of this malignancy in an effort to stem the rise. The major environmental risk factor for CMM is solar UV exposure, and the principal modifying factor for the effect of this exposure is individual susceptibility as indicated by skin pigmentation level. A role for solar UV in the etiology of CMM is supported by a variety of evidence including latitude gradient, CMM in xeroderma pigmentosum patients, and the mutational spectrum of CDKN2/p16 gene (2,7,8).

There are 4 main subtypes of CMM. 1. Superficial spreading melanoma is the by far the most frequent subtype in Caucasians; 2. Nodular melanoma subtype has the worst prognosis; 3. Acral-lentiginous melanoma is the most common subtype in Asians and Africans. UV radiation does not appear to be a significant risk factor for this subtype. 4. Lentigo maligna melanoma usually develops on the face of elderly people and associated with cumulative UV exposure like SCC (24).

Individuals with light skin, hair, and eye colour are consistently found to be at elevated risk of CMM in virtually all epidemiologic studies. The presence of either freckling or acquired melanocytic nevi substantially increases risk, and a synergistic effect of these two factors also reported. UV exposure, specifically intense and blistering sunburns in early years of life, is closely associated with the development of CMM in Caucasians. Another risk factor for Caucasians is family or personal history of CMM. Overall, the results of the studies indicate that intermittent solar exposure is strongly associated with an increased risk of CMM, while total or cumulative exposure appears to be weakly related to risk, although this result must be treated with some caution. And early life exposure seems to be important in relation to later risk of CMM (2,7,25).

Sunbeds (Artificial UV)

Tanning lamps and booths (solariums) are another source of UV radiation. They predominantly emit UVA, which is thought to be the least damaging of the UV spectrum. However, as mentioned before UVA is not an innocent form of radiation. It causes skin cancer, immun supression and particularly to photoaging. In addition, tanning lamps also emits small amounts of UVB. The primary long-term risk to tanners is the development of skin cancer and photoaging. Many teens and young adults, particularly girls, are using these devices for a healthier and attractive appearance; as a result the total lifetime UV exposure is increasing. The prevalence of solarium use has increased dramatically over the last 10 years (8).

Mixed evidence does exist in relating indoor tanning equipment to CMM. Some of the first and foremost case-control studies did not find any association is subject to recall bias. These studies compared those who were exposed to sunlamps to those who were never exposed. Exposed contains variations in the number and duration of visits. It was noted that in several studies, only a small proportion of the participants had used tanning lamps. Finally, considering that the initial induction of carcinogenic effects and the final progression to CMM takes several years, these studies would not be able to measure the long-term effects of use of sunlamps. The number of years required for expression of full carcinogenic potential may mask the real impact (8,26).

The most recent work has come from a prospective study from Norway and Sweden. The women were between the ages of 20 and 40 and were using tanning facilities 12 or more times a year. This group of women was shown to have a 10-fold increase in occurrence of CMM (27). A recent meta-analysis was conducted in an attempt to summarize current knowledge (28). The analysis suggests that the use of sunbeds and sunlamps does increase risk of CMM. As a result children or individuals with very fair skin, freckles, many naevi and/or family history of skin cancers should be discouraged from using sunbeds. Unfortunately fair skinned people are using the solariums most, to tan their pale skin (28, 2).

Because of the previously listed limitations, mixed evidence also exists in the literature concerning artificial tanning and NMSC. A strong association was found (relative risk 13.42) between use of a long-tube sunlamp and SCC (29). Support for risk of BCC has also been found. In addition, the most recent study has found that use of a tanning lamp may contribute to the incidence of NMSC. The use of tanning devices was associated with an odds ratio of 2.5 for SCC and 1.5 for BCC (30).

Prevention

Examination of the literature reveals a common set of desired behavioral outcomes to inhibit the initiation of cancer development. Sunscreens are the most popular form of sun protection, however they should not be the first choice nor should it be used as the only method for sun protection. The guidelines to protect the skin must include reducing sunbathing, sunburn, and indoor tanning, while increasing the frequency of sunscreen use; wearing protective clothing such as long sleeved shirts, and a broad brimmed hat; seeking shade; and avoiding the sun during peak periods (10 am to 3 pm) (31).

Dermatologists started skin cancer prevention and detection public education programs about 25 years ago. However the problem is not the ignorance, educational attempts have not resulted in reduction in the incidence of sunburns or persuasiv change in attitudes about tanning, furtherfore skin cancer incidence continued to increase. Recent articles in the medical literature demonstrate that numerous segments of the public including college students, medical students, nurses, and physicians are appropriately aware of the dangers of UV exposure but continue to purposely subject themselves to it regardless. People opt for the bronzed look since the public's perception is that people with a tan are sexier, more successful, and healthier. This inevitably means that skin cancer incidence will continue to rise as average population age increases. Furthermore studies suggest that the majority of the population views sunscreens more as tanning aids than as a means of limiting UV exposure.

They use the sunscreens to spend more time under sun without burning. This is truly a pity, since skin cancer is one of the best understood cancers in terms of etiology and potentially the easiest to prevent. Those who tan for primarily cosmetic reasons may be more likely to respond to recommendations to use self-tanning or bronzing products instead of tanning via the sun and UV radiation lamps (9,31,32). It should also be emphasized that tan is not a sign of healthy skin, it is a sign that the skin is trying to protect itself from UV damage. From this point of view, it is similar to a callus which is a sign that skin is trying to protect itself from chronic physical trauma.

Sunscreens are barriers that absorb or reflect the UV radiation. Sunscreens have to carry a SPF (sun protection factor) label between 4 and 30+. SPF is a ratio derived in a laboratory by measuring the increased amount of UVB necessary to cause erythema, compared to when it is not used. The SPF number is a guide to relative strength of the sunscreens. Hovever how long a person will take to burn depends on multiple factors such as the skin type, time of day, the time of year, the amount of UV reflection in addition to SPF of the sunscreen used. It is recommended to use maximum strength SPF 30+ water resistant sunscreen and to reapply at least every two hours. To be effective, sunscreen must be applied generously. Applying too little sunscreen results in 50–80% less SPF than that specified on the product label. Sunscreen should be applied 20 minutes before going in the sun, which allows sunscreen to bind to the skin for maximum effectiveness. Recent evidence suggests that UVA contributes to photoimmunosuppression and photocarcinogenesis in addion to its wellknown photoaging features. Therefore a broad-spectrum sunscreen is recommended which also absorbs UVA (33,34).

As a result all forms of UV radiation play role in the pathogenesis of skin cancer. It is very important to educate the population about the dangers of UV exposure and teach them how to protect their skin from the sun. Dissemination of educational materials and public awareness programs are very important for this purpose.

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EFFECTS OF LOCAL CURRENTS ON THE DISTRIBUTION OF FECAL POLLUTION IN THE SOUTH –EASTERN BLACK SEA

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The Eastern Black Sea has been exposed to severe coastal erosion and shoreline recession for the last 30 years. One of the most important reasons for this is the response of the coast to man-made activities. It is well known that most of the domestic wastewater especially in the small cities and towns at the Black Sea Region were directly discharged to the nearer streams. For this reason, the rivers starting from their origins loaded with different amount of domestic wastewater and ended up at the discharge site the Black Sea.

The ability to detect fecal contamination of water is a prerequisite to the maintenance of public health. The bacterium *E.coli* is universally preferred as an indicator of possible fecal pollution. Aim of this research is to investigate the water quality of surface waters in the South-eastern Black Sea coasts. 11 stations were chosen to conduct measurements in every summer between 1997 and 2004. Physical and bacteriological properties of samples were analyzed. Results were tested against WHO's Water Quality Criteria.

As a result of this investigation, it's found that this region faces anthropogenic pollution. The results illustrated that existing pollution in this area is above the given criteria's for aquaculture, fisheries and recreational activity.

Although, rim current of South-eastern Black Sea is from west to east, local currents show different eddies, this, of course, effects (esp. anthropogenic and bacterial) the pollutant distribution as seen from results. As a result of this study, effects of local currents on fecal pollutant indicator and reasons for differences in the distributions of bacteria during summers were shown.

Key words: *Fecal pollution, Local currents, South Eastern Black Sea.*

Introduction

Waters, which carry pollutant materials, reach the seas either directly or via fresh waters. About water pollution, the most pollutant sources are pollutions due to agricultural activities, urbanization, and industry. Using the natural water resources to eliminate the wastes like this effects the natural ecosystem and human health in a negative way. The main goal of asking for the protection of the sea environments from such pollutants is firstly to prevent people form infectious diseases, and then to protect the quantity and quality of sea products (Sivri et al., 2003).

Bacteria represent the largest living surface in the marine environment and they have a central role in the bio-cycles of aquatic environments. Depending on the anthropologic factors, the level of bacteria can rise, and pathogen bacteria can grow.This situation is important in ecosystems and thus in human health. Besides, these organisms that come from the living bodies carrying the disease and then moving into the water may be in the soil and also may be participate directly in sea ecosystems through organisms' feceses, which are well-known (Logan 1994). The traditional way of assessing the number of living bacteria is based on their ability to grow in culture media. Instead of conducting separate tests for pathogen bacteria, like *Salmonella, Escherichia coli* 0157, *Vibrio cholera*, determination of indicator bacteria using ordinary analytical methods is a classic approach in aquatic microbiology (APHA 1998). Fecal coliform bacteria are microscopic organisms that live in the intestines of warm-blooded animals. They also live in the waste material, or feces, excreted from the intestinal tract. When fecal coliform bacteria are present in high numbers in a water sample, it means that the water has received fecal matter from one source or another. Although not necessarily agents of disease, fecal coliform bacteria may indicate the presence of disease-carrying organisms, which live in the same environment as the fecal coliform bacteria. Unlike the other conventional water quality parameters, fecal coliform bacteria are living organisms. They do not simply mix with the water and float straight downstream. Instead they multiply quickly when conditions are favorable for growth, or die in large numbers when conditions are not. Because bacterial concentrations are dependent on specific conditions for growth, and these conditions change quickly, fecal coliform bacteria counts are not easy to predict. For example, although winter rains may wash more fecal matter from urban areas into a stream, cool water temperatures may cause a major die-off. Exposure to sunlight (with its ultraviolet disinfection properties) may have the same effect, even in the warmer water of summertime.**Eastern**

Black Sea region which is a region of the coastal areas is preferred because the settlements and urbanizations are intensively near coastal areas, and its geography is mostly rough. In regard to its feature on urbanization near seaside, the big city centers almost have been aligned side by side on seaside (Fig1).
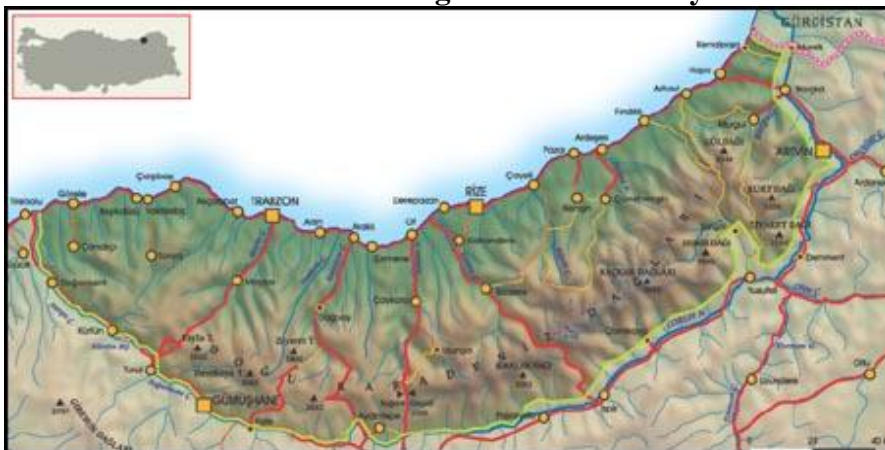
Fig 1.The centers existing in the borders of Trabzon Province

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Therefore, the highways, which unite centers to each other, pass near seaside (Çelikkale et al. 1997). Until the last years, due to anthropogenic wastes reach the seas directly or indirectly;

The Eastern Black Sea ecosystem which is nourished by a lot of large and small fresh waters, has been affected in very negative ways (Sivri et al.2003).

Trabzon, which is one of the most important cities in Eastern Black Sea Region, has been affected in its province borders through 10 streams that have high flow-speed. All of these streams attrack the attention with their anthropogenic loads. It increases this effects of misuse of herbicides or pesticides are also seen in the sea ecosystem as well (Sivri 1999).

Materials and Methods

This study is based on the data obtained from the research for fecal contamination on Trabzon shores in the years from 1997 to 2004 summers at 12 different stations. Process in this study, especially, having samples from the part, where the stream is not under the effects of the sea, has been targeted. Consequently the sample(s) 500 m away from the junction point between the stream and the sea were taken. For each stream's identification, the initial letter of its name was used.**The samples were generally picked up in every third week of each month, and in a cloudless and bright day. During the sampling, the physical measurements have been designated in the categories of temperature, pH, dissolved oxygen (DO) (in situ), and also during bacterial sampling, the bacteriologic sampler bottles in the volume of 250 ml were used. The bacteriological analyses started within 2 hours after being received, and after the multiple tube fermentation test, for the detailed analyses, the standard water and wastewater methods were applied (APHA ,1998).**

Results

Sea discharge systems which are constructed on the Trabzon shore are mainly near the much of domestic wastewater and the first one is in Yomra region.
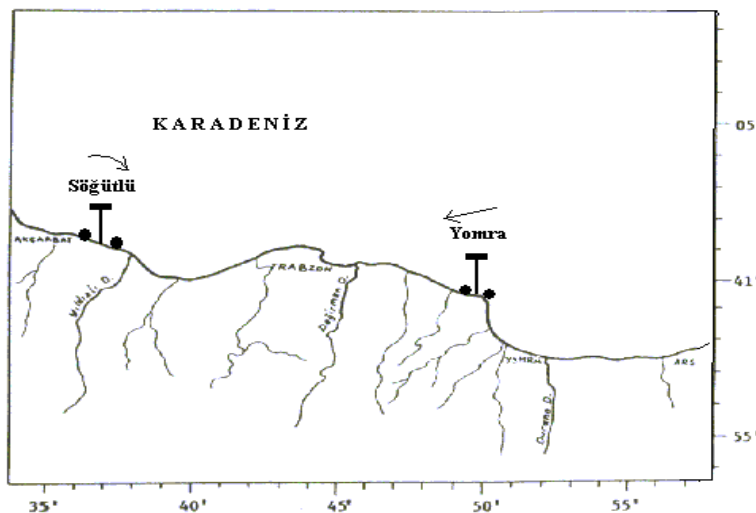
Figure 2. Discharge systems and stream directions

Yomra that coordinates with 40° 59' 31'' N, 39° 50' 01'' E and far from 850 meters from shore; the last one is named Sogutlu that has coordinate 41° 01' 20'' N - 39° 36' 44'' E and far from 920 meters from shore. (Fig. 2) Deep sea discharge systems have been started up in 2001. In this study, also macro algae developments were observed. Camburnu station was selected as a reference station. Stations were preferred by the east-west shores of discharge systems. These beaches have been still used by citizen.

While Yomra discharge system region has 38 meters deep, Sogutlu has only 34 meters. Secchi disc depth ranges 8-10 meter in these regions. And while Sogutlu region has a 107° north (south-east) stream, Yomra region has 319° north (west) direction. (Fig 2) Alteration of coliform bacteria in the preferred stations is given in Figure 3. Maximum value of coliform was accepted as 1100 MPN/ 100 ml. Stations numbered 5, 6, 7 and 8 that are under the anthropogenic press have got the maximum values in every year. While worth of station 1 has always got the highest, it was observed that a significant decrease after the year 2000 (43 MPN / 100 ml). Station 2 region has been still used as a beach and domestic wastewaters reaches sea indirectly. Coliform bacteria amount was increased significantly in this region after the year 2000. Station 10 has got the same variation. It is determined that both of the stations were over limited. Station 4 records that a decrease in that region in last years.
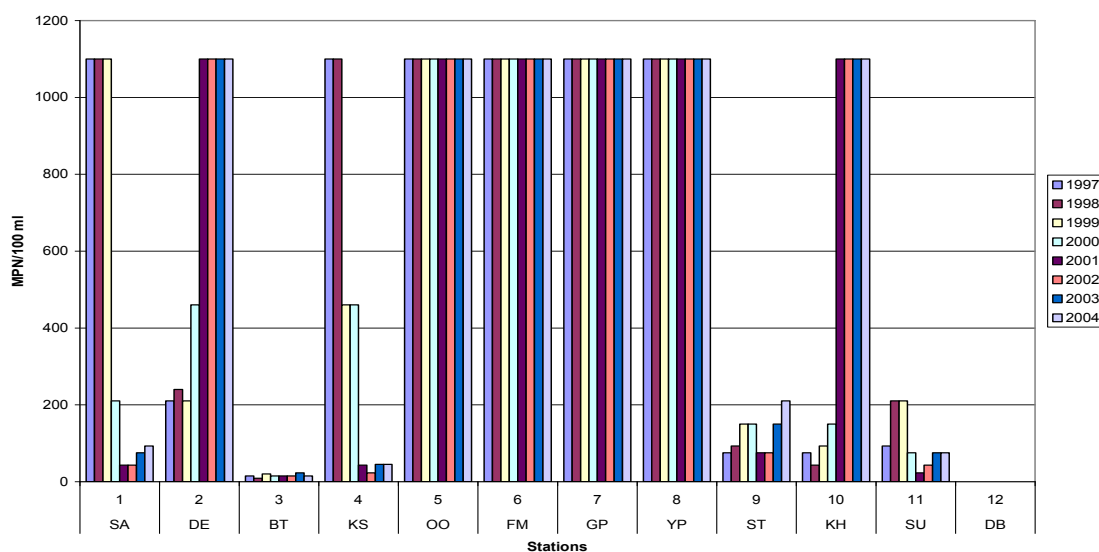
Figure 3. Coliform bacteria amount of stations.

Figure 4 shows the worth of fecal coliform concentration of research term and indicates that the variation after the year 2000.

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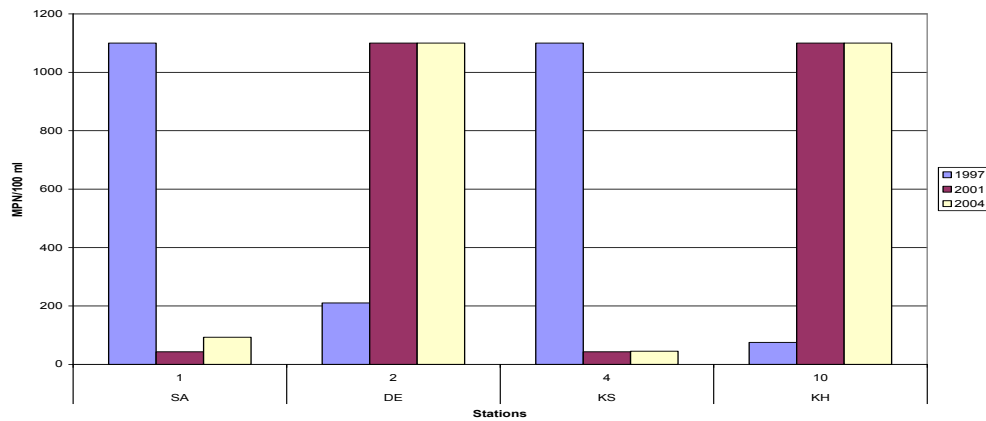
Figure 4. Fecal coliform concentration of stations

Effects of shore-ecosystem by both of the discharge system were studied with data and determined that wastewater from system affects negatively (p<0.001). Development of macro algae (*Enteromorpha* and Ulva species) have been great complaints by public (Fig 5).

Figure 5. Increase of macro algae species on shores

Discussion

This study was obtained for researching fecal contamination on Trabzon shores in the years from 1997 to 2004 summers at 12 different stations. Trabzon shores were polluted for years but in 2001 a modern deep sea discharge system was constructed. Systems were constructed at different regions according to population and two of them were made a negative affect because of the stream species. Many researchers indicate that Trabzon city beaches' have a third class water quality and call attention to have to be controlled frequently (Ozkoc et al., 1997). However negative affect of the discharge system and stream specify of region water quality has been over limited. Especially Yomra and Sogutlu regions' water quality was showed a noticeable difference by bacteriological tests (Figure 4)

After the year 2000, amount of coliform bacteria with the stream way was affected shores negatively for the public health. No value difference was detected when research was going on. Dölgen and Alpaslan (1997) noticed that sea discharge systems have to be constructed by the standards unless sea ecosystem may be affected negatively. And also noticed that

mechanical treatment plants have to be preferred in closed sea systems. It is a worrying situation that beyond the already defined polluted areas, recreation areas have been incommodious all along the shorelines too.

Increasing of macro algae that complaints by public (Fig. 5), may be arise from anthropogenic (Tan and Sluiman, 1998; Borgeas and Smith, 1998). Researches emphasized that two species of macro algae is an indicator in the sea ecosystem pollution and has to be considering in a classification in that regionDischarge systems constructed in Trabzon city affect the sea ecosystem negatively by the effects of stream ways. Future researches will be go on the minimizing the negative effects of system, over limited stations and the other systems have to take emergency measures.

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ENVIRONMENT AND ALLERGIC SKIN DISEASES

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The skin is the most prominent interface between the human and his environment. In order to understand the effects of various environmental agents on the skin, a concept of its barrier functions is needed. The skin consists of three major units: epidermis, dermis and subcutaneous fat. The size and proportion of these units varies dramatically in different locations on the body. The capacity of the skin to act as an efficient barrier varies according to relative thickness of the epidermis, dermis, subcutaneous fat and appendageal concentration. However, each layer of the skin has definite barrier functions regardless of its actual and relative size (1). Appendageal structures include the hair follicle with its attached sebaceous gland as well as the ecrine sweat gland. The structures are important as ornamental structures, as a method of heat regulation, and in secreting lipids for lubrication of the skin. Because they penetrate from the outer surface of the skin the lower dermis or subcutaneous

tissue, the appendages constitute a pathway by which harmful substances can circumvent some of the epidermal barriers that have been discussed (1). A lot of number of clinical patterns can be seen in the skin which it can react to harmful agents.

CONTACT DERMATITIS

Contact dermatitis is one of the commonest exogenous dermatoses encountered in most dermatology clinics. All contact dermatitis caused by skin or mucosal contact with an environmental agent (2).
Irritant contact dermatitis is the commonest presentation of contact dermatitis. Its causes are often multifactorial, with complex pathomechanism. There are many substances acting as irritants that will produce a nonallergic inflammatory reaction of the skin (3). Recent studies have indicated that irritant contact dermatitis arises as a result of the interplay of cellular cytokines released from irritated or damaged keratinocytes (2). This type of dermatitis may be induced in any person if a sufficiently high concentration of irritant is used. No previous exposure is necessary, and the effect is evident within minutes, or a few hours at most (3).

There was a highly significant correlation between irritation and temperature. Warm/hot water and solvents used for cleansing the skin may enhance the effect of the contact irritants (2).

Repeated exposure to some of the milder irritants may, in time, produce a hardening effect. This process makes the skin more resistant to the irritant effects of a given substance. On the other hand excessive and prolonged exposure to irritan agents resulted cumulative irritan dermatitis especially in the hands and this named house wife eczema (3).

Irritant dermatitis is often produced by alkali agents such as soaps, detergents, bleaches, ammonia preparations, lye, drain pipe cleansers, toilet bowl cleansers, and oven cleansers.

Alkalis penetrate and destroy deeply, because these compounds dissolve keratin. Occupational exposure is frequent among workers in soap manufactoring. Alkalis in the form of soaps, bleaching agents, and most household cleansing agents figure prominently in the causes of hand eczema. The powerful acids are corrosive, whereas the weaker ones are astringent. Strong acids including hydrochloric and hydrofluoric acids, sulfuric acid, nitric acid, acetic and chromic acid are irritan agents also (3). Some metal salts that act as irritants are the cyanides of calcium, copper, mercury, nickel, silver, and zinc and the chlorides of calcium and zinc. Bromine, chlorine, fluorine, and iodine are also irritants (3).

Allergic contact dermatitis

Allergy is defined as a specifically acquired altered capacity to react to a foreign substance. Allergic contact dermatitis has been estimated to account for approximately 20% of all contact dermatitis (1). Allergic contact dermatitis results when an allergen comes into contact with previously sensitized skin and results from a specific acquired hypersensitivity of the delayed type, also known as cell-mediated immunity (3). The specifity of the reaction is emphasized because specific antibodies of specific immunoreactive cells

recognize only the chemical structure to which an allergy develops. In general, the types of chemicals that become allergens have a low molecular weight. The low molecular weight chemical (or *hapten*) combines with epidermal protein to form a complete antigen. In most cases, however the hallmark of allergic contact dermatitis is vesication, in mild cases the reaction may be no more than erythema and scaling. Why a person becomes sensitized to a chemical is not completely understood, but it is dependent on (1) the condition of the skin; (2) the nature of the chemical agent; and (3) the length of contact, intensity of contact, and other aspects of exposure (1).

The condition of the skin before the exposure is very important. A person whose skin is intact with normal barriers is less susceptible to developing a contact allergic dermatitis than one whose skin is broken or in some other way abnormal. The nature of the chemical is important. It is estimated that approximately 70 percent of the population are allergic to rhus antigen (1). This is in contrast to nickel, to which only approximately 6 percent of the population are sensitized despite widespread contact. The nature of the contact may influence sensitization. Heat, humidity, and sweat cause epidermal maceration and increased contact of the antigen with epidermal cells. Once a contact sensitivity has occurred, the person is considered to be always allergic to that particular material. While absolute lack of contact with the sensitizing substance is recommended, short periods of use may actually be tolerated if an appropriate barrier such as gloves or a cream is used (1).

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Patch tests

Allergic contact dermatitis can be confirmed objectively by patch testing (2). The ability to test for an allergic versus irritant cause of contact dermatitis is useful (1).

The technique of patch testing requires diluting the suspected chemical to a low concentration, a place on the body free of dermatitis for applying the patch test, a 48-hour incubation period, and interpretation of the results. Patch testing should be performed by a person familiar with the technique and it is best to use pure chemicals rather than a finished product, which may contain a variety of chemicals. Patch testing is typically performed

using metal chambers attached to a permeable tape strip. The diluted chemical antigen to be tested is placed on the testing strip and applied to the skin so as to produce occlusion. After 48 hours the patch tests are removed. Positive reactions are graded on the erythema, induration and vesicles. It is important to keep the concentration of the allergen low enough to avoid irritancy (1). Usually, patients with a suspected allergic contact dermatit are patch tested with a standard panel of 20 allergens to screen for the most common sensitivities. However this panel only detects 75-80 % of the most common allergics (5).

Because of the new allergens are introduced into the environment every year, it has become necessary for dermatologists who are investigating patients with contact dermatitis to become familiar with new developments (2).

Airborne dermatitis:

Acute and chronic dermatoses of the exposed parts of the body, in particular of the face may be caused by different substances released in the atmosphere that simply settle on the exposed areas of the skin. These diseases represent the so-called air-borne dermatitis. Contact dermatitis is defined '' airborne'' on the basis of
(1) the existence of a dust or of volatile causative agents,
(2)the nature of the lesions,
(3) the history of the patient, (the follow-up) and
(4) the results of epicutaneous tests.

Several agents have been reported in the medical literature, such as household sprays, insecticides, animal hair, volatile chemicals, fibrous materials, and wood and cement dust (4).

In most cases airborne dermatitis appears as an eczematous reaction to contactants, sometimes with frank vesicular eruptions, usually on the exposed areas of the body. Not only the face, but also areas of the skin where allergens can be trapped are critical. These areas are: wrinkles and folds, sometimes markedly involved, genital area, eyelids, neck (under the shirt collar), forearms (under cuffs) or lower legs, where dust can blow up and collect under the trouser legs (4). Usually prolonged repeated exposure to a relatively small quantity of airborne allergens, such as pollens, dusts, and vapors, produces diffuse, dry and lichenified eruption with vesiculation. In addition to allergic contact dermatitis, other skin reactions induced by airborne contact have been reported; these reactions may manifest in the following ways:

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Contact urticaria
Acne- like lesions
Lichenoid eruptions
Exfoliative dermatitis
Telangiectasia

When an allergen is suspected, the responsible agent may be isolated by means of chemical analysis or direct microscopic study of the air or materials in the air. When

considering the possibility of contact dermatitis, it is helpful to differentiate the patient's life into separate environmental areas. After determining   the personel environment, the next step is to consider the working environment. Airborne contact dermatitis may be caused by both irritants and allergens. A list of reported airborne allergens has been revealed by a group of investigators. Cement dust usually provokes a dry, lichenified dermatitis. Also, sawdust from teak, redwood, mahogany, and rosewood may contain sensitizers that produce a dry dermatitis, particularly on the face, penis and scrotum in carpenters and woodworkers. Cabinet-makers frequently have genital dermatitis due to indirect   hand contact and accumulation of sawdust on the clothes during sawing and planing. Swelling and redness of the eyelids may be   the   only manifest signs. Dermatitis from vapors   is usually of occupational origin, as well. In these cases, amines used as epoxy hardeners and resins are the most common and the first one should look for. Additionally, plastic, rubber, glues, metals, insecticides, pesticides, solvent, and other industrial and pharmaceutical   chemicals, have been described as inducing airborne dermatitis of professional origin (4).

Wood and plants are a rich source of airborne allergens and irritants. The causative agent is often dried botanical material, and the allergy can also derive from the smoke of burning plants.Vegetable and wood allergens reported in the literature are listed in Table 1 (4).

Table 1. Vegetable and wood allergens
Alstroemeria
Blackwood, crysanthemum
Coleus
Colophony
Cupressocyparis
Dandelion
Honduran mahogany
Horsetail
Incence
Lichens
Musk ambrette
Oak
Primula
Tobacco
Tulip
Woods
Yarrow

Occasionally, inhalation of pollens, dusts, and animal hair causes either flareup of atopic dermatitis or an apparent superimposed contact dermatitis. Allergic contact dermatitis in atopic individuals may appear as an eczematous eruption. Several authors have described alleviation of atopic dermatitis with avoidance of aeroallergens. In a study a positive correlation was found between the severity of atopic dermatitis and the concentration of house dust mites in home. Exacerbation provoked by both inhalation and direct contact with algae in atopic patients has also been reported. Finally, diagnosis of airborne dermatitis is usually difficult, and standard patch test evaluation is practically of little or no help. Etiologic

treatment always depends on the identification of the triggering agents while symptomatic treatment is obviously long-term and sometimes disappointing (4).

Occupational environment
Causative agents of contact dermatitis include those encountered in the occupational and nonoccupational environment (2). Contact dermatitis accounts for > 90% of occupational skin diseases and the most common location of job related contact dermatitis is the workers' hands. It is generally accepted that 80 % of the contact dermatitis cases are irritant, while 20 % are allergic. The 20 ''standard'' patch test allergens screen for only approximately 75 % of common allergens, so additional specialized testing with industrial chemicals to which the worker is exposed is frequently warranted (5).

If the eruption consistent with a contact dermatitis,
If there are occupational exposures to possible irritants or allergens,
If the anatomic location of the eruption consistent with the exposure a worker would obtain on the job,
If the onset and time course of the eruption consistent with contact dermatitis
If nonoccupational exposures excluded as a possible cause of the dermatitis,
If the eruption improve away from work,
If patch testing reveal a likely causative agent
These mean it was an occupationally related skin disease (5).

In general workers with occupational hand dermatitis do not fare well. Approximately 25 % have complete remission, 50% have periodic recurrences, and 25 % have chronic persistent dermatitis, despite a change in jobs and therapeutic intervention. Some remediable reasons for persistant dermatitis include failure to diagnose and remove the sensitizer responsible for allergic contact dermatitis, continued exposure to nonspesific irritants at home and work, continued inadvertent allergen exposure, and secondary sensitization (5).

Remove the allergen and as many irrritants as possible from both work and home is the first thing in the treatment of an occupationally related skin diseases. But there is a widespread misconception that gloves guarantee safety, while gloves are recommended on a routine basis to protect against environmental insults, they are also the cause of a great deal of contact dermatitis themselves. Allergic contact dermatitis occurs commonly to rubber gloves containing the chemicals thiuram, mercaptobenzothiazole, and carbamates, which are ''rubber accelerator'' chemicals that speed up the vulcanization process of the final rubber latex product. The latex rubber proteins themselves also have induced type I Ig E urticarial and anaphylactic reactions in glove wearers. In this case vinyl gloves can be used in place of rubber gloves (5).

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Some protective gloves are actually worse than wearing no gloves at all, because certain allergens may penetrate various glove materials and become trapped against the skin. This occlusion against the skin increases its cutaneous absorption, inducing a more severe contact reaction. For example acrylics, formaldehyde, gluteraldehyde, and epoxies all penetrate latex gloves. While protective clothing is useful, the proper type of equipment for the specific process must be chosen carefully (5).

Prevention of occupational skin diseases

Occupatioal skin disease is usually treated by the plant's health care team. For acute contact dermatitis high- potency steroid agents may be used for short periods. The worker must also avoid contact with the offending irritant of allergens. The worker with contact dermatitis should not be exposed to irritants or allergens until the cutaneous barrier is once again intact (1).

The ideal preventive measure is substitution of a nonhazardous material for a hazardous one. In practice this is not always feasible, and prevention of occupational dermatoses is best accomplished by substituting surrogate barriers enclosed systems and mechanical devices such as splash shields, exhaust fans, and proportional dispensers built into the process prevent contamination of clothing and skin. Workers have certain responsibilities as well. Using barriers that are provided skin creams or personal protective clothing is very important. The use of personal hygiene facilities and materials is also important such as cleansers, barrier creams and lubricants (1). On the other hand, no ideal protective cream exists, it should be noted that such creams should be used only on intact skin (6).

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WASTE MINIMISATION AT THE HEALTHCARE INSTITUTIONS: PRESENT STATUS AND PROPOSALS FOR ISTANBUL

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The handling, treatment, and disposal of wastes are significant cost factors for the healthcare institutions. On the other hand, improper management of the different waste streams may not only cause additional expenditures, but also threaten the public health and the environment.

By means of a waste minimisation program in healthcare institutions, the volume of the wastes, especially the wastes to be specially handled, is reduced and the contamination of a large amount of wastes is prevented by a small amount of infected or hazardous materials. For a successful waste minimisation program, a detailed inventory is quite useful on the amount and sources of waste streams, proper waste handling processes for staff and public safety; regulatory compliance governing the handling of the waste stream; and the varying costs of handling, treating, and disposing of these wastes. Waste minimisation comprises any practice that reduces the amount of waste generated. However, the waste minimization activities mainly refer to waste avoidance, waste reduction, reuse and recycling.

A detailed research on the healthcare waste management for the institutions located in the boundaries of Metropolitan Municipality of Istanbul was conducted, however, in this paper it was focused on the waste minimization at the healthcare institutions and consequently a number of practices and recommendations are presented

Keywords: Healthcare waste, waste management, waste minimisation

INTRODUCTION

Healthcare institutions generate a wide variety of waste components. As stated by the World Health Organization (WHO), healthcare waste (HCW) is a by-product of healthcare which includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials [1]. The improper management of those waste streams may increase the quantity of infectious wastes ending up in an expensive treatment option or increase the environmental and public health risks. By means of an efficient organization and control, not only the volume of the waste is minimised, but also expenses can be reduced without causing any adverse effects to the health of patients and staff.

The quantity of waste produced by a healthcare institution depends not only on the size, type and quantity of services offered, but also on the attitude of the administration, the training of the personnel, the standard of the services, the infrastructure of the institution and the local habits.

In order to implement a sound waste minimisation program within the healthcare institution, initially the management and the staff should be committed to the waste minimization. As a commitment to the program within the institution, this should be formally approved and declared by the senior management. Then senior management should assign responsibility to an individual, department head, team, or council. The assigned individual or group should work on a "waste minimization strategy" to guide these efforts within the facility. The strategy should clearly define the goal of the waste minimization and identify new policies and directives for handling, disposal and monitoring of the various waste streams. The major components of waste minimization, namely waste avoidance, waste reduction, reuse, recover and recycling should be referred.

The next step should be to collect the data about the current waste streams being generated within the healthcare institution. The data should include the quantities of waste being generated for each of the waste streams and the costs associated with handling and treatment of these wastes.

Unfortunately in most of the healthcare institutions in Istanbul there are not reliable and regular records for the data concerning the quantities and associated costs, which is actually required at the start of the waste minimization program to determine where to initiate the waste minimization strategies. Those data will be also needed to check the efficiency of the system and to demonstrate the amount of change that has been achieved from the implementation of the waste minimization.

COMPOSITION OF THE WASTE STREAMS AND WASTE SEGREGATION

In order to accomplish a sound waste minimization strategy, initially some fundamental concepts should be realized by all personnel. Those include the source and amount of waste generation, the necessity of special waste handling processes for staff and public safety, regulatory compliance governing the handling of the waste stream, and the varying costs of handling, treating, and disposing of these wastes.

Waste segregation is an important step for minimizing the amount of waste, whilst generating a solid waste stream, which can be easily and cost effectively handled and disposed, and reducing the amount of toxic substances to be released to the environment. Segregation into different categories leads to reduction drastically in the volume and quantities of Type C, D and E of healthcare wastes. A proper segregation also allows for reuse, recycling, and proper disposal. Segregation of the healthcare wastes is directly proportional to the consciousness of the personnel; therefore, training of the personnel is a key factor in ensuring effective and reliable waste segregation.

Legislatively, mixed wastes should be disposed according to the most highly regulated component in the mix [2]. Thus, domestic wastes mixed with the medical wastes are classified as medical wastes and that healthcare institution is obliged to dispose all of its wastes as medical wastes. In many healthcare institutions that is a common case which leads to an increase both in the amount and disposal cost of healthcare wastes.

According to the WHO, the healthcare waste generation is proportional with the national income of the countries; the amount of waste generated in the high income countries is higher as given in Table 1 [3]. In general, the distribution of health-care wastes is 80 per cent general healthcare waste (which may be handled with by the domestic and urban waste management system), 15 per cent pathological and infectious waste, 1 per cent sharps waste, 3 per cent chemical or pharmaceutical waste; and less than 1 per cent special waste (i.e. radioactive waste, pressurized containers, etc) [3].

Table 1. Total healthcare waste generation by region [3].

Region		Waste generation (kg/bed/day)
North America		7-10
Latin America		3
Eastern Asia	High-income countries	2.5-4
	Low-income countries	1.8-2.2
Western Europe		3-6
Eastern Europe		1.4-2
Eastern Mediterranean		1.3-3

In the boundaries of the Metropolitan Municipality of Istanbul, there are 202 registered hospitals; however, 197 of them are in operation with a total bed capacity of 30,349. According to the findings of the field research, the average waste amount generated from the hospital registered is about 2 kg/bed/day, which is within the range of Eastern European and Eastern Mediterranean countries with respect to the Table 1. The average amount and composition of the waste at the hospitals in Istanbul are presented in Table 2 [4].

Table 2. Average waste amount and waste composition in Istanbul hospitals [4].

Type of waste	Waste generation (kg/bed/day)	Percentage (%)
Domestic	1.01	50.23
Pathological	0.13	6.70
Radioactive	0.01	0.39
Chemical	0.08	3.77
Infectious	0.36	17.70
Sharps	0.09	4.46
Pharmaceutical	0.04	1.75
Pressurised	0.03	1.40
Recyclable	0.27	13.61
Total	2.01	100

Although the regulation on healthcare wastes was act in force in 1993, medical wastes were started to collect and dispose separately in Istanbul at the end of 1995. The daily amount of medical waste collected from healthcare institutions showed an increase and from 10 tons/day it reached to 20-25 tons/day. [5,6,7,8]

WASTE MINIMISATION COMPONENTS

Significant waste minimisation strategy in the healthcare institutions may be encouraged by the implementation of certain policies and practices. In the following sections the major components (namely waste avoidance, waste reduction, reuse and recycling) for the accomplishment of a successful waste minimization are summarized [3, 4, 9].

Waste avoidance

In the waste minimization hierarchy, the first item is waste avoidance, which means prevention of waste generation. A number of examples of policies and practices for waste avoidance in healthcare institutions are briefly given as the following;

Process Modification: To the extent that does not adversely affect any vital applications in the healthcare institute, possibilities of waste avoidance with a process modification should be investigated. For instance, during research, teaching or daily applications, the experiments and analyses could be modified to decrease the quantity of hazardous chemicals used and waste generated thereafter. Microanalysis techniques can greatly reduce the amount of waste generated. Also, the use of new equipment and technology, i.e. high performance liquid chromatography, may reduce the amount waste generated.

Product Substitution: This practise is the substitution of non-hazardous or less toxic materials in the chemical processes, experiments and in the other applications. For example, the use of citric acid based reagents, instead of xylene, benzene and toluene containing reagents in histology laboratories or the use of soy based inks instead of solvent based inks in printing operations.

Mercury management is another significant issue in healthcare institutions, since there is up to 50 times more mercury in healthcare waste than in general municipal waste [3]. Items that may contain mercury include glass thermometers and sphygmomanometers, medical batteries, tubing weights, barometers in respiratory therapy and amalgams and finally, small, and potentially overlooked, sources of mercury in the healthcare institution are cleaning products. Many healthcare institutions are trying to decrease the use of mercury-containing products, while selecting new mercury-free products i.e. replacing mercury sphygmomanometers with aneroid sphygmomanometers, or replacing rubber mercury bougies with silicone tungsten gel bougies.

Management and monitoring of materials: By means of a good management of stocks and monitoring of materials, accumulation of large quantities of outdated chemicals or pharmaceuticals will be avoided. Suppliers of chemicals and pharmaceuticals should be included in waste minimization programmes. This could be encouraged by ordering goods only from suppliers that provide rapid delivery of small orders, which accept the return of unopened items, and that offer off-site waste disposal for hazardous wastes.

Purchasing Practices: The selection of supplies that are less wasteful or generate less hazardous waste is very important for waste avoidance. For instance, by means of preferring suppliers who take back packaging materials or recover, buying in bulk whenever possible; the packaging waste shall be limited

Waste reduction

Waste reduction at source involves measures that either eliminate use of a material completely or generate less waste. Significant reduction of the waste generated in healthcare institutions may be promoted by the implementation of certain policies and practices, such as a change in procurement practices, substitution of a non-hazardous or less hazardous material, process change, improving inventory control, staff training, and/or maintenance of equipment and materials.

There are a set of easily applicable practices for waste reduction such as transferring patient records to electronic media, using electronic mail, avoiding products with excess packaging, baling packaging wastes, using two-sided photocopying and printing.

Reuse

Reuse means not only that items are reused for different purposes which otherwise would require the acquisition of new products, but also reusing product over and over again for a given function as intended. Important savings can be reached by reducing the usage of single use instruments and items, and replacing them with reusable ones. Of course, this requires skills and appropriate technology for processing the items.

Many common single-use disposable products have safe, reusable alternatives including gowns, dishware, utensils, drinking glasses and mugs, batteries by recharging, notebook binders and folders, patient water containers and cups, patient slippers, kidney and wash basins, pillows, dressing trays. Some examples for reuse include long-term radionuclides conditioned as pins, needles, or seeds and used for radiotherapy may be reused after sterilization; containers of detergent or other liquids may be reused as containers for sharps; reuse of worn cloth diapers and towels as rags; reusable urine trays; reusable drapes and gowns; reusable ventilator circuits, reusable pulse oximetry probes, etc. For example, by using a reusable instrument for laparoscopic operation of gall bladders, the cost savings will be 400 Euro/operation [4].

Recycling

Healthcare institutions generate a tremendous amount of recyclable wastes. In general; paper represents the largest portion of the recyclable waste stream in healthcare institutions and is composed of cardboard, newspaper, magazines, directories and other mixed paper. Plastics and glass represent the other highest percentage of the healthcare institution solid waste stream. If a significant waste reduction is aimed, the recyclable part of the waste stream is the main candidate for initiating such strategies. The possible recycling activities in healthcare institutions include recycling of used towels and rags; use of plain paper fax machines; recycling of glass bottles (i.e. juice bottles, baby formula), cans, plastic containers, packaging materials, solvents (xylenes, toluenes, CFCs) and waste oils; anesthetic gas recycling, transferring unwanted old equipment or furniture to charity organizations, exploring recycling options for food waste as composting to use at the facility in landscaping, etc.

RESULTS AND DISCUSSION

According to our study conducted in Istanbul, it is seen that in most of the healthcare institutions a comprehensive waste management program has not been planned or initiated. Mostly the head of nurses are assigned for those responsibilities. The institutions having the waste management team comprised only the 36.3 per cent of the total.

According to the WHO average waste production, it was concluded that the healthcare wastes produced in Istanbul are within the range of the Eastern European and Eastern Mediterranean countries. However, the waste composition is significantly different in the case of Istanbul.

When Table 2 is evaluated, the composition of total healthcare wastes in Istanbul is seen that 64 per cent is domestic and recyclable waste, 24 per cent is pathological and infectious waste, 4.5 per cent sharps waste, 5.5 per cent chemical and pharmaceutical waste; and 2 per cent special waste. While the portion of domestic and recyclable wastes are less than the general, the share of pathological and infectious waste is greater in the case of Istanbul The same situation is noticed for the case of chemical, pharmaceutical waste, as well as sharps. Those figures indicate the improper and inefficient management practices (i.e. improper segregation) in the healthcare institutions and the need of development of the waste minimization strategies.

The observations at the field studies showed that a proper waste segregation was not applied in most of the healthcare institutions [4]. Infectious wastes and domestic wastes were mixed partly. The percentage of the domestic wastes and the recyclable materials could be more than 64 per cent of the total, if they were segregated carefully from the medical wastes.

According to the field research, more than half of the domestic and recyclable wastes at the healthcare facilities were paper and cardboard composed of cardboard, craft, high-grade paper, newspaper, magazines, phone books, directories, and other mixed paper [4]. Therefore implementing a hospital-wide mandatory paper recycling policy is a necessity and a few healthcare institutions have already initiated programs to bale and recycle the cardboard. The second highest percentage of the domestic and recyclable wastes was the organic wastes including yard wastes. The largest component of the organic waste stream from the healthcare institutions was food wastes generated from the kitchen. Plastics represented the third largest portion of the domestic and recyclable wastes at the healthcare institutions. If significant reductions in the waste stream were to be achieved, those portions of the waste stream were the leading candidates for intervention strategies.

In addition to the domestic and recyclable wastes, the hazardous waste portion included pathological, infectious, pharmaceutical, radioactive and chemical wastes, sharps and pressurized containers. Those wastes are normally generated from labour wards, operation theatres, laboratories, intensive care unit and other medical units. From the field research it was also observed that sharps were usually mixed with the other types of healthcare wastes, therefore the use of sharp-boxes should be encouraged.

From the statistical analysis, the most separated waste types were found as the domestic (96 per cent), sharps (83.9 per cent), infectious (71.8 per cent) and pathological (61.3 per cent) wastes. It was observed that 69.7 per cent of the hospitals recycled their wastes with the average quantity of 15 kg. By carefully segregating the waste according to the degree of infectiveness, a healthcare institution can manage to reduce its costs with a saving 50 Euro/bed-year.

In order to be successful in any effort on waste minimization, it is a fact that to invest time and money in training the personnel of the healthcare institution is unavoidable. The personnel of the institution should be trained on waste management and particularly on waste minimization concepts, when they are first employed and then periodically. The personnel should be also encouraged to develop innovative ideas to reduce healthcare wastes and hazardous materials usage. Furthermore, brochures, posters and video tapes should support the training activities.

According to our studies, some training programs were conducted in the healthcare institutions of Istanbul, but they were not performed regularly or as a part of strategic planning. Furthermore, they were not comprehensive to cover waste minimization strategies.

By means of the training of the waste handling people, the separate collection system in the healthcare institutions can be realized much more efficiently, and thus the cost arisen from the wrong healthcare waste management applications would be avoided. Application of the waste minimization practices in Istanbul will lead to decrease in the amount of the infected wastes drastically. The pathological wastes and sharps will be the next highest types of the generated wastes that are going to be reduced.

When the sources of the wastes are evaluated it is seen that the medical treatment units, operation and surgery rooms, recovery departments and emergency rooms are the main units generating most of the infectious and the pathological wastes. Therefore, focusing on those units and training the people in those units are crucial.

CONCLUSION

It would be beneficiary, if the healthcare institutions could be provided with guidelines to plan their systems for strategic management by the central or local authority. The guidelines should cover all related issues like clear definition of infectious wastes, methods for handling, treatment and disposal of infectious and non-infectious wastes. It should also refer to the waste minimization strategy.

The waste minimization strategy plays a good motivation for both of the healthcare institutions and local authority. Since with an efficient waste minimization, the fee paid by the healthcare institutions to the local authority for the transportation and disposal of these wastes will be reduced, and on the other hand the capacity of the plant needed for treatment and disposal will be decreased.

In order to improve the conditions in the healthcare institutions in Istanbul, a proper healthcare waste management system should be regularly implemented which is supported by the training programmes for the personnel involved in healthcare waste management.

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ENVIRONMENT AND HEALTH PROBLEM OF FLUORIDE IN RAJASTHAN VILLAGE

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Water is one of the major elements essential for sustenance of all forms of life and is available in abundance in nature covering approximately three fourths of the surface of earth. The chemical nature of water is one of the most important criteria that determines its usefulness for a specific need and as such not all the waters are fit for drinking; hence the problems of scarcity of drinking water. The presence of fluoride, in quantities in excess of limits is a serious matter of concern from a public health point of view. Like any other pollutant the fluoride pollution can also occur due to both natural and man made reasons.

Gunnar Jacks of Sweden's Royal Institute of Technology found that fluoride levels are highest in the valley bottoms.

In Rajasthan, where ground water is the main source of drinking water. High fluoride content is found in many places. Any fluoride concentration more than 2ppm in drinking water is considered harmful for health. Due to lack of surface water sources, there is no option for the villagers, but to use the ground water for drinking as well as agriculture purposes. Rajasthan is the only state where almost all the districts are affected by high fluoride. In 23 districts the fluorosis problem can be visualized at various intensity level. (6)

Fluoride is any combination of elements containing the fluoride ion. In its elemental form, fluoride is a pale yellow, highly toxic and corrosive gas. In nature, fluorine is found combined with minerals as fluorides. It is the most chemically active nonmetallic element of all the elements and also has the most reactive electro- negative ion. Because of this extreme reactivity, fluorine is never found in nature as an uncombined element.

This is a story of an Indian village Hingotia situated 65 Kms. from city of Jaipur in Rajasthan state. A village with a population of 3500 people, comprises a rural area with unfertile land. The production rate is very low compared to its neighbouring areas. The population of this village is totally dependent on the wells, where the level of water is very low. Due to the unavailability of water villagers are not dependent on farming. Last 4 years of survey shows that people have been forced to leave agriculture and adopt other source of earning.

In this village people have been complaining about their health problems every now and then. On looking to their deteriorating health, I decided to find out the reason behind this problem. After going through all kinds of investigations, I found that high rate of fluoride was there in the ground water of the village.

Analysis of Ground Water of the Village:

After the analysis of the water of village Hingotia, it was shocking to see that the water of the wells and tube wells contained 4 ppm to 12 ppm of fluoride, which is obviously hazardous to human health. There are near about 6 handpumps and 3 wells in the village. The analysis of water was done by the Ground Water Department of Jaipur. Samples of water were taken from collected from all the wells and hand–pumps of the village and taken to the labs.

We found that the villagers were consuming the water for the last 20 to 30 years, which contained maximum ppm of fluoride harmful to human body.

Studies by Meghna Das and Anuradha showed some interesting and alarming observation while monitoring 28 cities in India, that people depend heavily on ground water for all their needs. This could be due to the fact that they do not receive piped water (which is supplied by the municipality), or get an insufficient amount. While monitering water in these places, it was found that the ground water in many areas is exceeding permissible limits of parameters like fluoride, hardness, ammonia. In Delhi, fluoride content of ground water in nearby villages was recorded as high as 6 ppm. Ground water of Police Colony, and nearby areas depicted nitrate values above 100 mg/l. Balmiki Basti had a very high nitrate value of 680 mg/l. In Varanasi (UP) ammonia was found in the tap and ground water in almost half the monitored sites, while high degrees of hardness was discovered in 40 of the 49 sites.Phosphorous was also found much beyond permissible limit in the River Varuna and the different ponds monitored. In Muzaffarnagar(UP) Chloride was found beyond 1000mg/l. In Vijaywada (Andhra Pradesh) almost 50% of the sampled places tested positive in terms of coliform bacteria and Ammonia, and observed to have high hardness. In Nagercoil (Tamil Nadu) ground water contained high hardness and chloride content.(3)

Reasons for Fluoride in Water :

1. Lack of surface water resources.
2. Low rainfall.
3. Level of water going down in the wells.
4. Deep wells.

In Rajasthan, where ground water is the main source of drinking water, high fluoride content is found in many places. Any fluoride concentration more than 1 ppm in drinking water is considered harmful for health. Due to lack of surface water sources, there is no option for the villagers, but to use this water for drinking purposes. For the last three years due to very little rainfall in village Hingotia, many wells have dried up or there is very little water left in the wells for drinking purposes. The level of water in the wells is also decreasing day by day due to low rainfall. Deeper the wells, higher the dissolved salts. Digging of more wells also affected the water level. This was the main reason for the increase of fluoride in ground water. There has not been any effort taken by the villagers to collect or preserve the rain water.

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Total Intake of Fluoride

It was established that it is TOTAL fluoride intake from all sources which must be considered for any adverse health effect evaluation. This includes intake by ingestion, inhalation and absorption through the skin. In 1971, the World Health Organization (WHO) stated : " In the assessment of the safety of a water supply with respect to the fluoride concentration, the total daily fluoride intake by the individual must be considered. Exposure to airborne fluorides from many diverse manufacturing processes – pesticide applications, phosphate fertilizer production, aluminum smelting, uranium enrichment facilities, coal- burning and nuclear power plants, incinerators, glass etching, petroleum refining and vehicle emissions – can be considerable. In addition, many people consume fluorine- based medications, which greatly adds to fluoride's anti-thyroid effects. Household exposures to fluorides can occur with the use of Teflon pans, fluorine- based products, insecticides sprays and even residual airborne fluorides from fluoridated drinking water.(2)

In 1991 the US Public Health Service issued a report stating that the range in total daily fluoride intake from water, dental products, beverages and food items exceeded 6.5 milligrams daily. Thus the total intake from those sources alone already greatly exceeds the levels known to cause the third stage of skeletal fluorosis. (2)

Besides fluoridated water and toothpaste, many foods contain high levels of fluoride compounds due to pesticide applications. One of the worse offenders is grapes. Tea is very high in fluoride because tea leaves accumulate more fluoride (from pollution of soil and air) than any other edible plant. It is well established that fluoride in tea gets absorbed by the body in a manner similar to the fluoride in drinking water. (2)

Every hundreds and thousands of tons of fluorides are emitted by industry. Hydrogen fluoride can exist as a particle, dissolved in clouds, fog, rain, dew, or snow. In clouds and moist air it will travel along the air currents until it is deposited as wet acid deposition (acid rain, acid fog). In waterways it readily mixes with water.

In village Hingotia, people have been found drinking three cups of tea daily. Use of fluoride toothpaste is also very common among these villagers. Smoking among 75% of males and females (lower castes) have been found to be very common. So the total intake of fluoride along with fluoride water have exceeded the limit.

Effect of Fluoride on the Health:

1. Weak Bone   80% Villagers
2. Bent Back Bone   50% Villagers
3. Artharitis   85% Villagers
4. Tooth Decay   75% Villagers
5. Yellow Teeth   70% Villagers
6. Broken Teeth   60% Villagers

People of this Hingotia village have been badly affected by fluoride causing the disease fluorosis in 85% of the villagers. Their backbone have become weak and bent. They are unable to stand straight. Their teeth have changed to yellow colour and have become brittle. The age of a villager is increasing very badly, where a man of 45yrs. looks like a man of 55yrs. Artharitis disease has become very common among the villagers. Some common ailments have been found to be increasing among the villagers. Fluoride has also affected most of the children of this village.

Recent study in China showed that a huge amount of fluoride in coal has been released into indoor environment by the combustion of coal and fluoride pollution seems to be increasing in some rural areas in China. Combustion of coal and coal bricks is the primary source of fluoride and this can easily enter exposed food products and the human respiratory tract. Major human fluoride exposure was caused by fluoride contaminated food such as corn, chillies and potatoes. (1)

In 1995, neurotoxicologist and former Director of toxicologist at Forsyth Dental Center in Boston, Dr. Phyllis Mullenix published research showing that fluoride built up in the brains of animals when exposed to moderate levels. Damage to the brain occurred and the behavior patterns of the animals was adversely effected. Two new epidemiological studies which tend to confirm fluoride's neurotoxic effects on the brain have shown that children exposed to higher levels of fluoride had lower IQs. The Department of Health in New Jersy found that bone cancer in male children was between two and seven times greater in areas where water was fluoridated. US Environmental Protection Agency (EPA) researchers confirmed the bone cancer causing effects of fluoride at low levels in an animal model. A new study has shown that fluoridation of water is linked to uterine cancer deaths.

BBC News gives information about Nalgonda, one of the poorest and most drought- prone districts of Andhra Pradesh in Southern India, that this is a land where excess fluoride has turned the ground water into a slow poison, crippling at least 10,000 people and leaving hundreds of thousands of others in constant misery. People with paralyzing bone diseases, stooped backs, crooked hands and legs, deformed teeth, blindness and other handicaps are a common sight. The most shocking and sad image of this suffering is 18 year old Ramaswamy, who looks to be hardly five-years-old, with a physique completely devastated by the effects of fluoride. He is so weak that he cannot walk and weighs barely 34 lbs. He is blind and mentally challenged. (4)

Treatment of fluoride:

Many independent researchers, organization, holistic health centers and a growing number of dentists who avoid the use of toxic substances are warning their patients to avoid fluoridated water and fluoridated toothpaste and to definitely not to give children any fluoride since they appear to be more susceptible to the neurological toxicity from fluoride.

It has been found that there is no treatment of the disease fluorosis. We can only lessen the intake of fluoride by the consumption of nutritive food. Fluorosis can be controlled by drinking plenty of buttermilk and curd. Eating lots of green vegetables can control the disease. Indian Doctors advised the villagers to increase the consumption of citrus fruits.

Mark D. Gold recommends that the source of drinking & cooking water should be real spring water and not filtered tap water. The source of the water should always be checked. Nothing should be added to "improve" the water (e.g. chlorine, magnesium, etc.). Smoking contributes to fluoride intake. This should also be avoided. Avoid fluoridated toothpastes. Use baking soda and water, if appropriate toothpaste is not available. (5)

Krass India writes that Fluoride not only affects the people but it also affects the animals. Therefore it is desirable that the animals should also be provided with fluoride free water for maintaining their longevity. Defluoridation of drinking water for animals will be too costly and not feasible, and therefore the only solution of this problem is water harvesting. The water harvesting technologies should be aimed not only to provide fluoride free water to human beings but also to animals. Rainwater storage can be a major source of fluoride free drinking water for the animals. (6)

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ENVIRONMENTAL EPIDEMIOLOGY

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In year 1999, the World Health Organization European Center for Environment and Health prepared a report, entitled the "Overview of Environment and Health in Europe in the 1990s" [1]. The report summarizes the main developments in health status of European population and analyses the changes in the environmental factors as of primary concern for the European population. Accordingly, "contaminated food and water; ambient and indoor air pollution; death and injuries from all forms of accident; ecology and health; urban health; occupational health and consequences of armed hostilities" are listed as priority areas for the European population. Actually, a similar list of priorities can be listed for almost all industrialized countries throughout the world, even if the order in the list may change [1].

It is often true that the disease patterns change in countries in parallel to the developmental index: the disease burden of infectious and communicable diseases decreases significantly whereas morbidity and mortality associated with non-communicable diseases increase. Accordingly, policy makers, public health specialists, and clinicians all need to revise their priorities and to focus on potential interventions.

Non-infectious diseases are those, which are not caused by pathogenic organisms and are not transmitted from one person to another (except in the case of hereditary conditions). Non-infectious diseases frequently have multiple causes, often related to adverse environmental conditions and may develop slowly over a number of years. Unlike many infectious diseases which, of survived, are of short duration, most non-infectious diseases are irreversible. Many of such diseases (cardiovascular diseases, diabetes, emphysema, asthma, cancer, etc.) may be kept under control with proper medical treatment but few can be permanently cured. The vast majority of risks related to non-communicable diseases are environmental risks. Polluted water, air, soils as well as social, economical, psychological or lifestyle risks clearly influence the health status of population. This fact pre-define the present, but mainly the future position of "environmental epidemiology"[1-2].

Baker`s report on the "endemial colic of Devonshire' (1767) is one of the earliest published environmental studies and indicated that the long run colic cases occurring in Devonshire were not related to cider drinking, but instead, were associated with poisoning due to lead precipitation in cider presses. Environmental epidemiology studies have progressively been harder since then given the multitudes of agents currently surrounding us, and partly because their health effects are often subtle and may have long induction periods [3].

In today sense, "environment" is considered as all physical, chemical, biological, social, political, cultural and/or architectural agents and factors, which are "exogeneous" to and nonessential for normal functioning of the human body, yet, are present around him/her and might affect the individual's health and disease status. Saracci defined the three basic strategy of environmental epidemiology in 1978 as: 1) to improve in exposure assessment, 2) to study combined effect(s) of multiple exposures, and their interaction, and 3) to integrate experimental and epidemiologic evidence [3].

Environmental epidemiology has shown a significant progress with regards to exposure assessment and measurement. Yet, it still needs to be clarified how the exposure time from the first exposure through the time of symptoms (induction time) affects the measurements of exposure. This is even more important in cases where exposure histories are based on written records or self-reports; or the validity of measurements decrease as the time from exposure increases. Also important, exposure measured in the external environment is often different than the "dose" measured in human tissue of at the point of contact between the subject and the environment. Variations in the external exposures themselves over time and space, human activity patterns, and physiological characteristics may all cause such a difference. Biological markers (cellular, biochemical or molecular) may provide clues about past exposures, when retention time is of concern. It is important to note that errors in measurement of exposure introduce both bias and imprecision into the estimates of their health effects [3-4] .

Given that "health" has physical, social and psychological dimensions, exposures to physical, chemical and biological environmental factors should be evaluated concomitantly with exposures to potential factors/agents that may affect health in other environments as well, such as social, economical, residential settings. Individuals accessibility to health care facilities, economic well-being and ability to take (buy) health care, the quality of care obtained, work loss, and/or effects of health problems on relatives could all affect the likelihood or exposure and would also increase the severity of unwanted effects of a given exposure. It is a complex and intricate task to evaluate such environmental factors' combined effects on health and/or to distinguish their individual effects [4].

Also, individuals vulnerability to a given exposure and their bodily responses vary greatly and bring up the issue of gene-environment interaction, which has recently become a major concern of both clinicians and public health specialists likewise. Thus, environmental effects on human body are better be investigated by multidisciplinary teams of biologists, toxicologists, and environmental-engineers, and -epidemiologists.

Environmental epidemiology is a specialized area of epidemiology where the scientists make use of the basic principles and methods of epidemiology, but also have developed further analytical techniques. Environmental epidemiologists collect data on a regular, systematic, standardized basis for several environmental factors and prepare related reports but also conduct research on specific topics. For many years now, they have been collecting data on time-related analyses (time-clustering, cyclic changes, and longitudinal trends). Recently, mapping and spatial-data analyses have been popular and, similarly, Poisson regression modeling has been in use to control for several potential confounders in studying the environmental exposures as risk factors for rare diseases. Special methodologic issues should be handled carefully in environmental epidemiology studies for robust conclusions on environmental exposures and its association with disease. Among these, autoregression, and intermediate variables (in time series analyses), analysis of clusters (in spatial analysis) and confounding (in both type of analyses) are of special concern [3-4].

Introduction of enormous number and variety of chemicals into the environment in the last few decades have lead "environmental surveillance" to be a major job for environmental epidemiologists. An ideal surveillance system for environmentally induced disease would gather high quality morbidity and mortality data with residence information; should provide updated population data for calculating rates; have a wide range of information on exposures base on emission data, dispersion modeling, air/water/soil/food monitoring based on temporally appropriate sampling schedules; could geographically link the exposure and population data and, lastly, distinguish effects of localized exposures on small populations. Such a surveillance system is of high cost, yet, would include information on long-term trends and is of early warning capability.

Lastly, but not the least, "risk assessment" is also a major area of interest for environmental epidemiologists and is the interface between environmental epidemiology and environmental health policy and between scientists and regulators. It involves the estimation of risks for situations in which they cannot be measured or observed directly, either because the risks are too low, the population is too small, the exposures do not occur in isolation from other hazardous exposures, the exposure scenario is projected but has not yet occurred, or a sufficient latency period since exposure has not yet passed. It aims to define health hazards of exposure to environmental agents and/or conditions, based on evidence, and to determine their effects on health of individuals and public in general. In assessing the "risk", environmental epidemiologists first identify and define the agent, which threatens the health of individuals; measure the size of exposure (exposure assessment); explore whether there is any dose-response effect and so; assess its potential size of health hazard (risk characterization). In other words, risk assessment helps to define "given the exposed population and their estimated or actual exposure and given the extrapolated dose-response relation (if any), what is the predicted population health impact?" [3-4].

Finally, it is the responsibility of environmental epidemiologists to communicate not only with other specialists, but also, with the public and with policy decision makers, regarding the state of scientific evidence so that "they may take the proper steps to preserve their health" (George Baker, "lead in the cider of Devonshire", 1767) [3]

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BRONCHIAL ASTHMA AND THE ENVIRONMENT

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Bronchial asthma is one of the most common chronic diseases in the world. It is estimated that around 300 million people in the world currently have asthma. The increases in the incidence, prevalence, morbidity and mortality from asthma during the past few decades have led to many basic and clinical researches.

Risk factors for asthma are classified as host factors that predispose individuals to or protect them from developing asthma, and environmemtal factors that influence the susceptibility to the development of asthma in predisposed iindividuals, precipitate asthma exacerbations and/or cause symptoms to persist in Global Strategy for Asthma Management and Prevention (GINA). Main host factor is the genetic predisposition (Table I). Exposure to allergens and occupational sensitizers, viral and bacterial infections, diet, tobacco smoke socioeconomic status, and family size are the major environmental factors that influence the susceptibity to develop asthma in predisposed individuals. Exposure to allergens and respiratory viral infections are the main factors responsible for causing exacerbations of asthma and/or the persistence of symptoms (Table I).

It has been suggested that modifiying the environment can reduce the incidence of asthma. Experience with occupational asthma (OA), occuring due to sensitization to causative agents in the workplace, provides good evidence that it is possible to prevent induction of asthma in some circumstances by modifiying the work environment. There is sufficient epidemiologic and animal data to suggest that some synergism exists between exposure to air pollutants (primarily outdoor) and biologics (primarily indoor) in the induction of asthma. The important indoor pollutants are biologics (mold, dust mite, cockroach and rodent infestations), dampness and environmental tobacco smoke (ETS).. Young children are more susceptible than adults to induction of asthma by environmemtal factors.

Table I. Potential risk factors for asthma

Host Factors
Genetic predisposition
Atopy
Airway hyperresponsiveness
Gender
Race
Ethnicity

Environmental factors
Factors that influence the susceptibity to the development of asthma in predisposed individuals
Indoor allergens
- Domestic mites
- Animal allergens

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- Cockroach allergen
- Fungi, mold, yeasts

Outdoor allergens

- Pollens
- Fungi, mold, yeasts

Occupational sensitizers

Tobacco smoke

- Passive smoking
- Active smoking

Air pollution

- Outdoor pollutants
- Indoor pollutants

Respiratory infections

- Hygiene hypothesis

Parasitic infections
Socioeconomic status
Family size
Diet and drugs
Obesity

Factors that precipitate astma exacerbations and/or cause symptoms to persist
Indoor and outdoor allergens
Indoor and outdoor air pollutants
Respiratory infections
Exercise and hyperventilation
Wheather changes
Sulfur dioxide
Foods, additives, drugs
Extreme emotional expression
Tobacco smoke (active and passive)
Irritants such as household sprays, paint fumes

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CHLORINATION LEVEL OF WATER AND PREVALENCE OF VIRAL HEPATITIS IN FLOOD AFFECTED AREAS OF VADODARA CITY, INDIA

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➢ Aims and Objectives :

1. To know the post flood chlorination level in Municipal Water Supply System-Administrative ward wise in Vadodara city, in various areas of Vadodara city.

2. To Study post flood pattern of Viral Hepatitis cases.

➢ Methodology :

Sample selection: Purposively selected households from each of the 10 administrative wards of Vadodara city.

East zone: ward no.1, 2, 9
West zone: ward no. 6, 10
North zone: wards no. 7, 8
South zone: ward no. 3, 4, 5

Date of flood in Vadodara: June 29, 30 and July 1, 2 2005.

Study period: Chlorination of water - July 4th to July 15th 2005 and Disease prevalence – July '05 to Oct '05.
Chlorination was tested with chloroscope.

Department of Preventive and Social Medicine, Medical College Vadodara shared results regularly with the local and state health authorities.

➤ Results:

Measuring the chlorine level in each of the 10 administrative wards of Vadodara city showed low level of chlorine (0.5 ppm) in east and south zone followed by north and west zone which then significantly improved after regular feedback and follow-up action daily, but east (ward no. 1, 2, 9) and south zone (ward no. 3, 4, 5) continued to have a problem of low chlorination level throughout the study period.

Higher prevalence of viral hepatitis cases reported in the month of august-nov. 2005, which may be related to low chlorination level of water in all zones, significantly higher in east and south zone.

➤ Conclusion:

Low level of chlorine in water might have been associated with higher number of cases of viral hepatitis in Vadodara city. These finding support the hypotheses that there exists the potential for the increased transmission of water borne diseases and that there occurs increased levels of endemic illnesses during the post-flood period[1].

➤ Recommendation :

1.   Adequate chlorination of water and its regular monitoring up to end user level is desirable to prevent the outbreak of various water borne diseases during floods or heavy rains. " Disinfection is unquestionably the most important step in the treatment of water for public supply….efficient disinfection must never be compromised"[2].

2.   Distribution of chlorine tablets in areas where chlorine levels are less than desirable levels and where there is no piped water supply.

3.   Surveillance for water borne diseases both short term and long term- up to six to eight weeks after floods
Insert the text of your extended abstract here

➤ *Map of Vadodara City , Gujarat, INDIA*
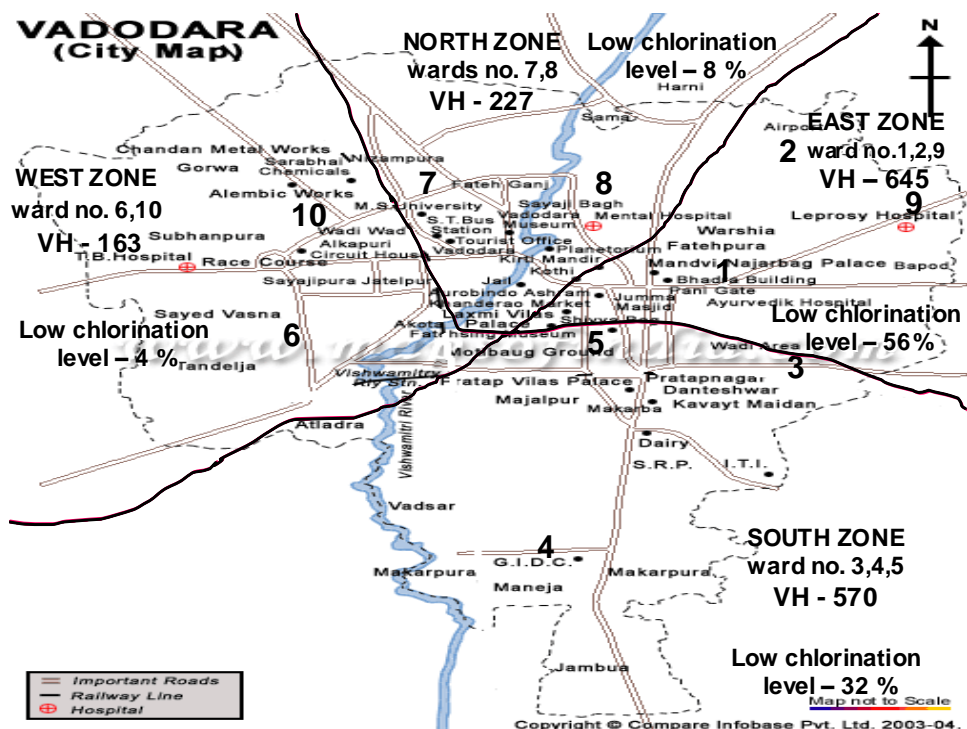
Vadodara City is divided into four Zones with different wards figured out in this map. This map also shows a correlation of number of Viral Hepatitis cases with low chlorination level of water post flood.

Table: 1 Viral Hepatitis cases in various Zones of Vadodara city, Gujarat, INDIA 2005

Year 2005	East	West	North	South
June	50	29	27	34
July	32	19	17	24
August	157	37	53	104
September	150	40	58	96
October	157	36	65	119
November	191	50	51	171

Source: Municipal Corporation, Vadodara City, Gujarat, INDIA
Table: 2 Percentage of water samples with – chlorination level < 0.5 ppm from July 4th to 15th
2005 (post flood period)

July, 2005	East	West	North	South
4th	100	00	00	90
5th	91	00	00	43
6th	80	00	00	50
7th	48	14	29	40
8th	31	19	20	30
9th	57	00	00	25
10th	80	00	00	20
11th	52	00	10	16
12th	46	06	05	15
13th	30	00	00	20
14th	30	09	00	15
15th	20	00	00	15

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THE EFFECTS OF SELENIUM ON RAINBOW TROUT SPLEEN TREATED WITH HEAVY METALS

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The sublethal toxic effects of heavy metals on fish have been described at several levels of biological organisation. These include changes in biochemistry and hematology. In polluted areas, exposure of fish to heavy metal leads to interactions between these chemicals and biological systems which give rise to biochemical disturbances. Oxidative stress is induced by the presence of molecules having unpaired electrons, usually derived from oxygen and its various reactive intermediates, but also derived from metabolic reactions. The sub-lethal toxic effects of heavy metals on fish have been described at several levels of biological organisation. These include changes in biochemistry and hematology. Chemical toxic pollutants are important sources of reactive oxygen species (ROS) in biological systems. Oxidative stress and oxidative damage to fundamental biomolecules and to antioxidant defenses of organisms is an established field in environmental toxicology and ecotoxicology. Membrane phospholipids of aerobic organisms are continually subjected to oxidant challenges from endogenous and exogenous sources, while peroxidized membranes and lipid peroxidation products represent constant threats to aerobic cells. The aquatic environment receives daily substantial amounts of environmental pollutants that have the potential to cause oxidative stress in aquatic organisms through free radical and ROS mechanisms. The primary antioxidant protection against free radical and ROS is provided by the enzymes glutathione peroxidase (GSH-Px), superoxide dismutase (SOD) and catalase (CAT), respectively. The trace element selenium has been implicated in chemoprevention and drug-resistance through reduction of oxidative stress. Depletion of the body pools due to feeding on diets with low doses of individual micronutrients has been used to examine the role of such micronutrients in the protective antioxidant systems. Selenium could prevent damage to the unsaturated fatty acid of subcellular membranes by lipid peroxidation induced by free radicals.

In the result of this study, while the activities of CAT, GSH-Px, SOD in the spleen tissue of fish exposed to the stress of Cr and Cd were significantly lower than the control groups ($P<0.05$), the closer values to the control groups were found in selenium added groups (Cr+Se, Cd+Se). For the level of MDA, the last production of lipid peroxidation, while the statistically significant increases ($P<0.05$) were found in the groups exposed to the metal stress, the falls were obtained in selenium applied groups. The results showed that the negative effects occurred in the biochemical parameters of the applied groups exposed to the toxicity of heavy metal, for statistically, were significantly eliminated ($P<0.05$) as a result of selenium treatment.

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The results reported here show that sodium selenite has an important contribution to antioxidative defense for the spleen of rainbow trout. The ability of sodium selenite to prevent the oxidative stress induced by heavy metal (Cd, Cr) in fish was rationalized.

Keywords: Antioxidant enzyme; Heavy metal (Cd, Cr); Lipid peroxidation; *Oncorhynchus mykiss;* Oxidative stress; Selenium; Spleen

INTRODUCTION

Molecular biomarkers of oxidative stress are found widespread applications in mechanisms of environmental toxicity and ecotoxicity in aquatic organisms exposed to a variety of chemical pollutants (Livingstone, 2001). For example, heavy metals which cause pollution enter the aquatic medium as a result of long-term ecotoxicological effects such as refining of rain and contaminated water (Strmack M. and Braunbeck T., 2000). Different kinds of organisms may be used to determine the mechanisms of action of pollutants on specific physiological functions. In polluted areas, exposure of fish to heavy metals leads to interactions between these chemicals and biological systems which give rise to biochemical disturbances (Liang, et.al., 1992). The aquatic environment receives daily substantial amounts of environmental pollutants that have the potential to cause oxidative stress in aquatic organisms through free radical and reactive oxygen species (ROS) mechanisms. Cellular antioxidant defense systems in biological systems, when exposed to environmental pollutants are depleted, but levels of these antioxidants in living organisms may rise also to redress the imbalance caused by the oxidative damage (Winston and Di Giulio, 1991). Oxidative stress and oxidative damage to fundamental biomolecules and to antioxidant defenses of organisms is an established field in environmental toxicology and ecotoxicology (Kelly et al., 1998; Regoli et al., 2002a).
Biological systems have developed during their evolution adequate enzymatic and nonenzymatic antioxidant mechanisms to protect their cellular components from oxidative damage. The imbalance between the generation and the neutralization of ROS by antioxidant mechanisms within an organism is called oxidative stress (Davies, 1995), is accepted oxidative stress has become an important subject for terrestrial and aquatic toxicology (Ames et al., 1993; Stadtman and Berlett, 1997; Livingstone, 2001).

Membrane phospholipids of aerobic organisms are continually subjected to oxidant challenges from endogenous and exogenous sources, while peroxidized membranes and lipid peroxidation products represent constant threats to aerobic cells. Malondialdehyde (MDA) is the final product of lipid peroxidation. The concentration of MDA is the direct evidence of toxic processes caused by free radicals (Sieja and Talerczyk, 2004).

Depletion of the body pools due to feeding on diets with low doses of individual micronutrients has been used to examine the role of such micronutrients in the protective antioxidant systems (Hidalgo et al., 2002). Selenium is a structural component of several enzymes with physiological antioxidant properties, including glutathione peroxidase and thioredoxine (Perottoni et al., 2004). In recent years, there has been a great deal of studies carried out on selenium metabolism (Shi et al., 2004). In most of studies, the external selenium was given to experimental animals as sodium selenite form (Hintz, 1999). Selenim could prevent damage to the unsaturated fatty acid of subcellular membranes by lipid peroxidation induced by free radicals (Sieja and Talerczyk, 2004).

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The aim of present study is to determine the protective effect of selenium supplementation on the enzymatic antioxidant capacity of the spleen tissues of rainbow trout. The activities of Glutathione peroxidase (GSH-Px), Superoxide dismutase (SOD), Catalase (CAT) and changes in the levels of malondialdehyde (MDA) have also been determined, and the possible generation of heavy metal (Cd, Cr) induced oxidative stress is discussed.

MATERIALS AND METHODS
Experimental section
The experimental fish, rainbow trout (*Oncorhynchus mykiss* Walbaum, 1792) was obtained from a rainbow Trout Cage Cultivating Farm, Karakaya Dam Lake (Malatya, Turkey). Fish were fed for 15 days in a stock pond (8 x 5 x 1.5 m) to provide their acclimatisation to the new environment. After adaptation period, ten fish were taken randomly into a tank (250 L in volume). Fish used in this study had an average 214.36± 8.14 g in weight and 27.22±0.51 cm in length. Physico-chemical properties of tank water were as fallow: temperature, 10-12 °C; pH, 7.4-8.0; dissolved oxygen, 7.56 ±0.51 ppm; water hardness, 162.4±4.22 ppm ($CaCO_3$). Experimental tanks were aerated during the study.

Heavy metal and sodium selenite administration
Experimental fish were divided into six groups as below each consists of ten samples:
Group I: control
Group II: exposed to a single dose of 2 ppm concentration of sodium selenite penthahydrate salt ($Na_2SeO_3.5H_2O$)
Group III: exposed to a single dose of 2 ppm concentration of chromium (III) nitrate ($Cr(NO_3)_3.9H_2O$)
Group IV: exposed to mixture dose of 2 ppm chromium (III) nitrate ($Cr(NO_3)_3.9H_2O$) and 2 ppm sodium selenite penthahydrate salt ($Na_2SeO_3.5H_2O$)
Group V: exposed to a single dose of 2 ppm concentration of cadmium sulphate ($3CdSO_4.8H_2O$).
Group VI: exposed to mixture dose of 2 ppm cadmium sulphate ($3CdSO_4.8H_2O$) and 2 ppm sodium selenite penthahydrate salt ($Na_2SeO_3.5H_2O$).
These doses were administered to fish for a week.

Preparation of tissues for biochemical analysis

Spleen tissues of fish were dissected by autopsy technique application 7 days later. Tissue samples were then centrifuged at 17,000 rpm for 15 min and supernatants, if not used for enzyme assays immediately, were kept in the deep freeze at -70 ^{0}C. The tissues were rinsed with 0.9 % NaCl and separated into two parts for determination of enzymatic activity and the lipid peroxidation. The samples for enzyme analysis were homogenised in PBS buffer (pH 7.4) using PCV Kinematica Status Homogenizer. Homogenised samples were then sonicated for 1.5 min (30 sec sonications interrupted with 30 sec pause on ice). Samples were then centrifuged at 17,000 rpm for 15 min and supernatants, if not used for enzyme assays immediately, were kept in the deep freeze at -70 ^{0}C. The second part of tissue homogenate was used for lipid peroxidation analysis. Tissues were washed 3 times with ice-cold 0.9 % NaCl solutions and homogenised in 1.15 % KCl. The homogenates were assayed for MDA, the last product of lipid peroxidation.

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Protein assay

Protein content of the supernatants for both enzyme analysis and the MDA assay were determined using a colorimetric method of Lowry using BSA as the standard (Lowry et al., 1951). All analyses are performed in duplicates.

Enzyme assays

The samples were determined spectrophotometrically for CAT (µmol/mg protein), SOD (ng/mg protein), Se-GSH-Px (nmol/mg protein) and MDA (nmol/mg protein) levels in the supernatant fraction.

CAT Activitiy

CAT activity was measured at 37 ^{0}C by following the rate of disappearance of H_2O_2 at 240 nm ($\varepsilon_{240} = 40$ M^{-1} cm^{-1}) (Luck, 1963). One unit of catalase activity is defined as the amount of enzyme catalyzing the degradation of 1 µmol of H_2O_2/min at 37 ^{0}C and the specific activity corresponds to µmol transformation of substrate (H_2O_2) min^{-1} per mg protein.

Cu, Zn-SOD Activity

SOD activity in the supernatant fraction was measured using the xanthine oxidase/cytochrome *c* method (McCord and Fridovich, 1969) where 1 unit of activity is the amount of enzyme needed to cause half-maximal inhibition of cytochrome *c* reduction. The amount of SOD in the extract was determined as ng of enzyme per mg protein, utilizing a commercial SOD preparative as the standard.

Se-GSH-Px Activity

Se-GSH-Px activity was determined in a coupled assay with glutathione reductase and by measuring the rate of NADPH oxidation at 340 nm using hydrogen peroxide as the substrate (Lawrance and Burk, 1976). Specific activity is given as nmol NADPH disappearing min^{-1} per mg protein.

Lipid Peroxidation Assay

The analysis of lipid peroxidation was carried out as described (Beuge JA and Aust, 1978) with a minor modification. The reaction mixture was prepared by adding 1 ml homogenate into 4 ml reaction solution (15 % trichloroacetic acid: 0.375 % thiobarbituric acid: 0.25 N NaOH, 1:1:1, w/v) and heated at 100 ^{0}C for 10 min. The mixture was cooled to room temperature, centrifuged (10,000 x *g* for 10 min) and the absorbance of the supernatant was recorded at 532 nm. MDA results were expressed as nmol/mg protein in the supernatant.

Statistical analysis

Biochemical data were analyzed with SPSS 9.0 for Windows using One-way Analyses of Variance (ANOVA). Kruskal-Wallis H test was used to compare among groups and Mann-Whitney U test was used to compare inside groups. Differences between means were determined using Duncan's multiple range test in which the significance level defined as ($P<0.05$).

RESULTS

Changes in biochemical parameters such as Se-GSH-Px, CAT, SOD activities and MDA level in spleen tissue of rainbow trouts exposed to 2 ppm doses of selenium and heavy metal (Cd, Cr) are shown in Table 1. A statistically significant decrease ($P<0.05$) in Se-GSH-Px, SOD and CAT activity was observed in the spleen tissue of fish exposed to 2 ppm heavy metal (Cd, Cr) in comparison to the control group. However, there was a statistically significant increase in the MDA level in spleen tissue of rainbow trouts exposed to 2 ppm doses of heavy metal (Cd, Cr) ($P<0.05$) (Table 1).

In the groups exposed to 2 ppm doses of selenium+heavy metal (Cd+Se, Cr+Se), it was observed that there were statistically significant ($P<0.05$) convergences in comparison to the control group values for Se-GSH-Px, SOD and CAT activity in spleen tissue of fish. In addition, there has been a statistically significant change in MDA values ($P<0.05$) of fish exposed to both heavy metals (Cd, Cr) and selenium. The MDA levels of this group caused a statistically significant convergence in comparison to the control group values (Table 1). As an important indicator for oxidative damage, the MDA level decreased in the spleen tissue of fish exposed to both heavy metals (Cd, Cr) and selenium (Table 1). Moreover, these results were in negative corelation with GSH-Px activity in which selenium acts as cofactor and with SOD and CAT activity. According to biochemical data, sodium selenite can contribute to antioxidative defense system at 2 ppm concentrations for *rainbow trouts.* This tolerance can be explained by the cofactor nature of selenium for GSH-Px.

Table 2. Changes in spleen [GSH-Px, SOD, CAT activity and MDA levels]$^\Delta$ with Selenium administration on fish exposed to heavy metals (Cd, Cr).

	GSH-Px (U/mg prot.)	SOD (ng/mg prot.)	CAT (U/mg prot.)	MDA (nmol/mg prot.)
Control	98.41±2.90[a]	3.60±0.14	72.53±1.92[a]	3.57±0.14[d]
Selenium	92.60±0.95[b]	3.56±0.37	67.70±0.89[a]	3.60±0.07[d]
Chromium	55.04±1.10[d]	1.61±0.14	44.13±0.92[c]	7.74±0.17[b]
Chromium+Selenium	66.95±1.09[c]	2.22±0.12	55.29±2.61[b]	3.85±0.08[d]
Cadmium	40.60±1.49[e]	1.56±0.15	46.22±2.23[c]	8.61±0.13[a]
Cadmium + Selenium	67.11±2.08[c]	2.36±0.16	55.21±4.98[b]	4.49±0.12[c]

[a.b.c.d.e.f]: $^\Delta$All data points are the average of n=10 with ± STDEVs. [abc] statistically significant (p<0.05).

DISCUSSION

The heavy metal damage is an important factor in many pathological and toxicological processes. Heavy metals that a toxic agents can have a significant role in the development and progression of many disease processes and damage in the fish tissue. It has been reported that cadmium ruined mitocondrial enzyme activities by causing defect in cells and tissues (Lacroix and Hontela, 2004).

The few attempts at integrated laboratory studies of heavy metal effects on aquatic animals have been at the biochemical and physiological levels in fish (Handy et al., 1999).

Biomarkers are measurements in body fluids, cells or tissues indicating biochemical or cellular modifications due to the presence and magnitude of toxicants, or of host response. Effects at higher hierarchical levels are always preceded by earlier changes in biological processes, allowing the development of early-warning biomarker signals of effects at later response levels. In an environmental context, biomarkers offer promise as sensitive indicators demonstrating that toxicants have entered organisms, have been distributed between tissues and are elicited a toxic effect at critical targets. For several reasons, fish species have been attracted considerable interest in studies assessing biological and biochemical responses to environmental contaminants. There is a growing awareness that focusing on chemical data alone is insufficient to reliably assess the potential risks of the complex mixture of contaminants in the aquatic environment. There is an increasing trend to use the behavior of pollutants (bioavailability, bioaccumulation, and biotransformation) as well as pollution-induced biological and biochemical effects on aquatic organisms to evaluate or predict the impact of chemicals on aquatic ecosystems (Oost, et.al, 2003). Metals from anthropogenic sources have long been recognized as important contaminants in aquatic ecosystems. Researchers in metal toxicology have focused on how metal toxicity is affected by heavy metal (Gauthier, et.al., Article in press). For several reasons, fish species have attracted considerable interest in studies assessing biological and biochemical responses to environmental contaminants. In order to assess the effects of environmental pollutants on aquatic ecosystems, the following suite of biomarkers (biological and biochemical parameters) may be examined in fish: hematological parameters; other hematological parameters and biochemical parameters may be valuable for effect assessment when measured in concert with more sensitive and selective biomarkers (Bharucha, et.al., 1976).

It is known that metal stress can change biochemical data including enzyme levels and amount of lipid peroxidation products (O'Nell, 1981; Cyriac et al., 1989; Munoz et al., 1991). But these changes are also depend on the type of metal used, the fish species, water quality and exposure time.

Metals from anthropogenic sources have long been recognized as important contaminants in aquatic ecosystems (Gül, et.al., 2004). The sub-lethal toxic effects of heavy metals on fish have been described at several levels of biological organisation. These include changes in biochemistry and physiology. Different kinds of organisms may be used to determine the mechanisms of action of pollutants on specific physiological functions. In polluted areas, exposure of fish to heavy metal leads to interactions between these chemicals and biological systems, which give rise to biochemical disturbances.

In fish exposed to heavy metal (Cr, Cd) display a tendency toward decreased antioxidant enzyme activity. The antioxidative effects of selenium on fish have been described at several levels of biological organisation that include changes in biochemistry of animals exposed to heavy metals (Cd, Cr). This study examined the ability of laboratory testing to measure environmental impacts of metals. These results indicate constitutes a sensitive biochemical indicator of chemical pollution (Oost et al., 2003).

Similar indicators (such as MDA levels in hepatic homogenates) can be used for metal-induced oxidative stress in fish. In recent years, a series of ecotoxicological studies investigated free radical damage and oxidative stress parameters in various species of fish exposed to toxic metals and organic pollutants (cadmium, mercury, copper, Arochlor, and contaminated sediments). Exposure resulted in increased MDA levels in hepatic and ovarian tissues, affected growth, and caused extensive tissue lipid peroxidation (Berntssen et al., 2003; Romeo et al., 2000).

High concentrations of Cu and Zn significantly reduced antioxidant enzyme activities and increased lipid peroxidation and protein content in fish tissues (Radi and Matkovics, 1988). A recent environmental toxicology study was conducted with the hypothermal vent mussel *Bathymodius azoricus* to test the antioxidant enzymatic activity and lipid peroxidation in the spleens after exposure to cadmium, copper and mercury (Company et al., 2004). The results showed the importance of specific antioxidant biomarkers to assess complex pollutant mixtures in the marine environment (Cheung et al., 2004; Valavanidis et al., 2005).

The results of this study suggest that heavy metal pollution is capable of inducing biochemical parameters in fish, which may cause physiometabolic dysfunction in rainbow trout. In conclusion, the results provide a direct evidence for the preservation role of selenium on the antioxidative defense system against heavy metal (Cd, Cr) toxicity. With administration of selenium, the toxic effects of heavy metals (Cr, Cd) on inhibition of antioxidant enzyme activity have prevented statistically significant level. This might be related to the fact that heavy metals are detoxicates by selenium.

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ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY IN *CLADOPHORA GLOMERATA* L. KUTZ. (CHLOROPHYTA) EXTRACTS

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There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action because there has been an alarming increase in the incidence of new and re-emerging infectious diseases. Another big concern is the development of resistance to the antibiotics in current clinical use.

Cladophora glomerata (L.) Kütz., a species of green algae collected from flowing water channels near Esentepe, Eskişehir, Turkey was used in this study. These extracts were first prepared with petrolium ether, methanol and ethyl acetate solvents by Soxhlet extraction. The antimicrobial activity of the extracts was then assessed using the agar-well diffusion method against gram-positive, gram-negative bacteria, and yeast and moulds.

All extracts of *C. glomerata* showed good activity against some bacteria (*Micrococcus luteus, Proteus vulgaris, Pseudomonas phaseolicola, Enterobacter fecalis, E. aerogenes, Bacillus cereus, Yersinia enterocolitica*) and 5 fungi (*Aspergillus niger, A. parasiticus, A. fumigatus, A. flavus, Fusarium graminearum,*).

Key Words: *Cladophora glomerata, antimicrobial activity, aqueous plant, fresh-water macroalga.*

Introduction

Antimicrobial agents are substances produced either synthetically or naturally by bacteria, fungi or plants, used to kill or inhibit the growth of micro-organisms including bacteria, viruses and fungi, and of parasites in particular protozoa. Such 'antimicrobial agents' have been introduced for decades to treat and prevent infectious diseases and infections. Decreased efficacy and resistance of pathogens to antibiotics has necessitated development of new alternatives (Choudhury et al, 2005).

Many bioactive and pharmacologically active substances have been isolated from algae (Orhan et al, 2002; Yoldaş et al, 2003; İbrahim et al, 2005). In recent years, an increasing number of marine natural products have been reported to display antimicrobial activities, and anti-tumor compounds have been isolated from sponges, tunicates, algae and other organisms (İbrahim et al, 2005).

Algae have been confirmed to be the rich sources of bioactive compounds with desirable activities such as antitumor, algicidal, toxins, antiviral antiparasitic and regulations of plant growth (Orhan et al, 2002; Bazes 2005). But there are a few studies on isolation of biyoactive compounds with antimicrobial activity from algae.

The chemical composition of Cyanobacteria has been investigated and isolated lipids, sterols, terpenes, and polysaccharides Their chemial composion extent the differences in the ecological conditions could change (Kamenarska et al, 2002).

In this study is aimed at evaluating the in vitro antibacterial and antifungal activity of four different extracts from *C. glomerata* (Dilw.) Kütz., collected from Turkey fresh water.

Material and Methods

Collection of algae

Cladophora glomerata (L.) Kütz., a species of green algae collected from flowing water channels in Eskişehir-Turkey at winter season was used in this study. Samples were identified by experts in the respective fields. The voucher specimens were deposited in the Herbarium of the Faculty of Science and Arts, Eskişehir Osmangazi University, Eskişehir-Turkey (ESOGU).

The algae were transported to the laboratory in polyethylene bags at ice temperature. Epiphytic and extraneous matter were removed by washing fresh water and then in fresh water. Following peeling out, the sample was dried under shade at room temperature and then ground in a mortar into fine powders which were stored into airtight containers at room temperature.

Table 1 Antibacterial and antifungal activity of three extracts from *Cladophora* as inhibition zones (mm) (well Ø 10 mm)

Tested bacterial strains	Petroleum ether	MeOH	Ethyl acetate +water	Ethyl acetate	Vancomycine (disc Ø 6 mm)	Bacitracine (disc Ø 6 mm)
Bacillus cereus NRRL 3711**	44±0.1	-	12±1.2	-	25±0.1	
Enterococcus faecalis ATCC 29212*	27±0.2	15±0.8	15±1.1	15±1.2	19±1.1	–
Streptococcus faecium NRRL B-3502**	18±0.1	12±0.1	11±1.3	12±0.1	20±0.1	–
Escherichia coli ATCC 25922*	11±1.1	12±0.9		12±1.1	7±1.1	7±0.1
Proteus vulgaris NRRL B-123***	13±0.8	15±1.1	13±0.9	13±1.1	-	–
Pseudomonas gingeri 3146***	14±0.9	13±1.2	13±0.8	12±1.3	25±1.2	–

Table 1. Cont.

Salmonella typhimurium ATCC 14028*	20±0.4	12±1.2	-	-	-	–
Staphylococcus aureus ATCC 25923*	12±0.5	-	-	-	21±1.4	–
*Yersinia enterocolitica****	25±1.1	18±0.1	11±1.4	12±1.5	21±0.1	–
Micrococcus luteus NRRL B-1018**	20±1.1	18±1.1	12±1.1	12±0.1	24±1.4	14±1.1
Enterobacter aerogenes NRRL B-3567**	23±0.1	12±1.5	12 ±1.1	15±0.1	25±0.1	–
Tested fungal strains	**Petroleum ether**	**MeOH**	**Ethyl acetate +water**	**Ethyl acetate**	**Amphotericine (well Ø10mm)**	
Aspergillus flavus NRRL 1957**	12±1.1	14±1.4	11 ±0.9	12±1.1	–	
Aspergillus parasiticus NRRL 465**	13±1.1	13±0.1	12 ±1.1	12±0.1	–	
Aspergillu fumigatus NRRL 163	14±1.4	11±1.2	12 ±1.0	12±1.1	–	
Fusarium graminearum (wild type)****	13±0.1	13±1.4	12 ±1.4	12±1.5	12±0.1	
Fusarium solani (wild type)****	-	12±1.5	13 ±1.2	13±1.2	–	
Aspergillus niger ATCC 10949	15±1.2	14±1.0	12 ±1.0	14±.1.0	12±0.1	
Candida albicans NRRL Y-12983**	30±1.3	-	18 ±1.2	20±0.1	–	
–: absence of inhibition; *from American Type Culture Collection; ** from USDA, Agriculture Research Service, Peria, USA ***from Anadolu University Faculty of Science, Eskişehir-Turkey; ****from Eskişehir Osmangazi University Faculty of Science and Arts, Eskişehir-Turkey						

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Extraction process

Extraction process was carried out at four steps. First, 70 g of algae sample in powder were extracted with 250 ml of petroleum ether by using Soxhlet equipment for 8 h. In second step, 5 g of same dried plant material whose lipids were removed were extracted again with 50 ml of 70% methanol at 40 °C in a shaker (Memmert) for 2 h and then filtered. In step followed, 200 ml of ethyl acetate+water (3:1) was added to the remaining solid material and after shaking for 1 h again filtered. Finally, same process was repeated for only ethyl acetate. After filtering using Whatman filter paper (No 1), all extracts were concentrated and evaporated to dryness in vacuo at 55 °C using a rotary evaporator (Koşar et al, 2002). The yields from the different extracts were weighed, recorded and dissolved in dimethyl sulphoxide (DMSO) to final concentration of 100 mg/ml. The extracts were then stored at 4 °C and further used for antimicrobial activity test.

Test Microorgansms

The extracts inhibitory effects on a total of 18 microbial species including 11 bacteria, 6 molds and 1 yeasts were used as test organisms in this study. Table 1 shows these microbial strains.

Determination of antimicrobial activity

The antimicrobial activities of the petroleum ether, methanol, ethyl acetate+water, and ethyl acetate extracts from the plant sample were evaluated by means of the agar-well diffusion assay (Güven et al, 2006; NCLLS, 1993) with some modifications. In short, fifteen milliliters of the specified molten agar (45 °C) were poured into sterile Petri dishes (Ø 90 mm). The cell suspensions containing 10^8 CFU/ml cells for bacteria, 10^7 CFU/ml cells for yeasts, and 10^5 spore/ml of fungi were prepared and evenly spread onto the surface of the agar plates of Mueller-Hinton agar (Oxoid, UK) for bacteria, or Sabouraud dextrose agar (Oxoid, UK) medium for yeasts and fungi using sterile swab sticks. Once the plates were dried aseptically, 10 mm wells were bored using a sterile cork borer. Extracts (100 μl) were placed into the wells and the plates were incubated for 37°C for 24 h for bacterial strains, 48 h for yeasts and 72 h for fungi at room temperature. Bacitracin and vancomycin (30 mg/ml) for bacteria and amphotericin (10 mg/ml) for yeasts and fungi were used as positive controls. The tests were carried out in triplicate. Antimicrobial activity was evaluated by measuring zone of inhibition against the test organism.

Results and Discussion

The plant material was subjected to extraction process, with petroleum ether, methanol, ethyl acetate+water and ethyl acetate. The yields were 0.4% for the petroleum ether extract, 5.0% for methanol extract, 0.3% for the ethyl acetate+water extract and 0.2% for the ethyl acetate extract. As shown in Table 1, the extracts from *Cladophora* showed antibacterial and antifungal activity against all/or some of the tested gram positive, gram negative bacterial strains and fungal strains, yeasts and molds, with the diameters of zone inhibition ranging between 11 and 44 mm.

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The most active extract on bacteria was that obtained with petroleum ether and this extract inhibited growth of all gram positive and gram negative bacterial strains tested. *B. cereus* (44mm), *E. faecalis* (27 mm), *Y. enterocolitica* (25 mm), *E. aerogenes* (23 mm), *S. typhimurium* (20 mm) and *M. luteus* (20 mm) were susceptible to this extract, respectively. Other extracts showed moderately inhibition effect against bacteria tested. Furthermore,

petroleum ether and ethyl ecetate extracts were effective against fungal strains tested. *C. albicans* (30 mm) was the most sensitive strain to petroleum ether extract. Other fungal strains inhibited by the extracts were moderately susceptible.

Many bioactive and pharmacologically active substances have been isolated from marine and fresh water algae (Orhan et al, 2002; Yoldaş et al, 2003; Choudhury et al, 2005). Some compounds, such as alcoloids, terpenoids, coumarins and fatty acids are commonly obtained only in ether (Cowan, 1999). Petroleum ether extract may contain these group compounds. Many authors had found antibacterial activities of microalgae due to fatty acids (Choudhury et al, 2005). The mechanism of action of lipophilic compounds is not fully understood but is speculated to involve membrane disruption by these compounds.

Srinivasa Rao and Parekh (1981) analysed *Enteromorpha intestinalis* and *Gracilaria corticata* collected from Gujarat coast of India for antibacterial activity and found that the algae were active throughout the year with a peak during the winter season. In another study was reported that acetone and ethanol extracts of marine algae *Cladophora fascicularis*, *Caulerpa taxifolia*, *Chaetomorpha antennina*, *Ulva lactuca* and *G. corticata* collected from south-west coast of India in three seasons showed good inhibitory activity against *Bacillus subtilis*. The results differ from the findings of Crasta et al. (1997) who had recorded significantly different inhibitory activity from season to season. *C. glomerata* investigated in this study was collected in winter. All extracts from algal sample showed inhibitory activity against most bacterial and fungal strains used.

Sastry and Rao (1994) this study found the benzene extract of *G. corticata* showed antibacterial activity only against *Salmonella typhi* and *Escherichia coli* whereas the methanol and chloroform extracts had activity against *P. aeruginosa*. In our studies, fractions of methanol extract of *C. glomerata* had shown good activity against *Y. enterocolitica, M. luteus*.

In the literature, it have been mentioned that ethanolic extract of the same macroalgae had not antibacterial activity (Orhan et al, 2002). This might be due to masking of antibacterial activity by the presence of some inhibitory compounds or factors in the extract.

The results obtained in this study appear to confirm the antibacterial and antifungal potential of the *C. glomerata* and its usefulness in the treatment of diseases that may be as a result of infection. Finally, it was concluded that present results provided a basis for isolation of antimicrobial compounds of interest from *C. glomerata*.

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ROLE OF PLANT ENDEMICS IN THE ENVIRONMENT AND HEALTH- A CASE STUDY ON *TEUCRIUM MONTBRETII*

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We aimed to determine chemical composition and antioxidant activities *in vitro* of *Teucrium montbretii* subsp. *pamphylicum* essential oil (Labiatae/Lamiaceae) as environmental friendly natural antioxidant in the present study. The composition of the essential oil obtained from the dried flowering aerial parts of this plant was analyzed by GC and GC–MS. The oil yield of air-dried plant obtained by hydro-distillation was $0.20\pm3.42\%$ (v/w). Ten compounds representing an amount of 99.99% of *T. montbretii* subsp. *pamphylicum* essential oil were identified. The major constituents of the essential oil were (Z)-β-caryophyllene (31.75%), (-)-curcumene (19.89%), (Z)-α-bergamotene (9.90%), α-humulene (9.42%), β-himachalene (7.19%), germacrene (6.49%), humulene oxide (6.07%), caryopylene dioxide (5.74%) and carvacrol (3.54%). Antioxidant activities of the essential oil were evaluated using the 1, 1-diphenyl-2- picrylhydrazyl (DPPH) radical scavenging and phosphomolybdenum methods. Antiradical activity was found as $IC_{50} = 36.67$ μg/ml and *in vitro* antioxidant capacity was 98.95 ± 0.09 μg/ml by phosphomolybdenum methods. According to analyses results, essential oil of *T. montbretii* subsp. *pamphylicum* could be used as natural antioxidant instead of synthetics, if any organoleptic effects are acceptable.

Keywords: *Teucrium montbretii* subsp. *pamphylicum,* essential oil, antiradical activity, antioxidant capacity

INTRODUCTION

Teucrium (family Labiatae/Lamiaceae) is a cosmopolitan genus of about 340 species; the species of *Teucrium* are used in traditional folk medicine. [1-3] Since the revision of the 27 Turkish species of *Teucrium* (Labiatae /Lamiaceae) by Ekim [4], two new species have been described. [5] *Teucrium montbretii* subsp. *pamphylicum* (Labiatae /Lamiaceae) is an endemic species from the highlands of in Antalya province only of Turkey, with a 5-40 cm perennial procumbent plant with lilac to purplish flowers. This plant may be described as a termophilous species; it prefers limestone and tufa rocks near the coast.

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Recently antioxidant and environmental friendly agents of natural products and drugs were received much attention therefore herbal essential oils has been improved in developing countries as an alternative solution to health problems. *Teucrium* species are bitter, astringent, anti-rheumatic herb that reduces inflammation, stimulates the digestion and has been used as herbal medicine for coughs and asthma since ancient times. The essential oil compositions of some Teucrium species were studied. [1-3, 6-18]

Antioxidants thus play an important role to protect the human body against damage by reactive oxygen species. In addition to this, all aerobic organisms have antioxidant defenses including antioxidant enzymes and foods to remove or repair the damaged molecules. Hence dietary intake of antioxidant compounds is important. Although some synthetic antioxidant compounds, such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA), are commonly used in processed foods, these compounds have been reported to have some side effects. Therefore, research into the determination of the natural antioxidant source and antioxidant potentials of plants is important. Several studies about bacteriostatic, spasmolytic, antioxidant and antiinflammatory effects of *Teucrium* species are reported in the literature. [19-22] Nevertheless, regarding *Teucrium montbretii* subsp. *pamphylicum*, there are no studies on its essential oil including chemical composition and antioxidant properties.

In the present paper, we wish to report the chemical composition and antioxidant activities of the essential oil produced by the aerial parts of *Teucrium montbretii* subsp. *pamphylicum* collected in Turkey. It is noteworthy that the latter biological activity is reported here for the first time.

EXPERIMENTAL

Plant Material

The flowering aerial parts of *T. montbretii* subsp. *pamphylicum* were collected in Turkey, C3 Antalya, Konyaaltı, Varyant (36 53 078 N, 30 40 697 E), about 10 m above sea level at the end of June 2004. A voucher specimen is deposited at AKDU (Herbarium of the Biology Department of Akdeniz University) as Gokturk 5927 and COMU (Herbarium of the Biology Department of Canakkale Onsekiz Mart University) as Celik 2165.

Essential oil

Two hundred grams of air-dried plant material including flowers, leaves and stems from each population were cut in small pieces, and the essential oils were obtained by steam distillation in 3000 ml H_2O for 3 h. by Clevenger apparatus. The oils dried over anhydrous sodium sulphate, were subsequently analyzed by GC–MS and stored at $-20°C$.

Analysis of volatile compounds

The composition of the volatile constituents was established by GC–MS/Quadropole detector analyses, using a a Shimadzu QP 5050 system, fitted with an FFAP (50 m×0.32 mm (i.d.), film thickness: 0.25 μm) capillary column. Detector and injector temperature were set at 230°C. The temperature program for FFAP column was from 120°C (1 min) to 230°C at a rate of 6°C/min and than held at 200 °C for 35 min. Helium was used as a carrier gas at a flow 14 psi. (Split 1:10) and Injection volume of each sample was 1 μl. The percentage composition was computed from the GC peak areas according to 100% method without using any correction factors. The identification of the components was based on comparison of their mass spectra with those of Wiley and Nist, Tutore Libraries. The ionisation energy was set at 70 eV.

Evaluation of antioxidant activity

The antioxidant activity of the extract was evaluated by the formation of phosphomolybdenum complex method according to Prieto et al. [23] 0.4 mL of extract solution (50 and 100 ppm in methanol) was combined in a vial with 4 mL of reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate). The vials were capped and incubated in a water bath at 95 °C for 90 min. After the samples had cooled to room temperature, the absorbance of the mixture was measured at 695 nm against a blank. The antioxidant activity was expressed relative to that of ascorbic acid.

Antiradical activity determination

A 1.0 ml methanolic solution of the extracts at 100 ppm (methanol for the control) was placed in a test tube, and 2.0 ml of a α, α-diphenyl-β-picrylhydrazyl (DPPH) methanolic solution (10 ppm) was added. The absorbance was measured at 517 nm after 5 min of reaction. The percent of DPPH decoloration of the samples was calculated according to the formula [24]:

Antiradical activity = 100 x (absorbance of control - absorbance of sample/absorbance of control)

Extract concentration providing 50% inhibition (IC_{50}) was calculated from the plot of inhibition percentage against extract concentration. Tests were carried out in triplicate.

RESULTS AND DISCUSSION

The composition of the essential oil obtained from the dried flowering aerial parts of this plant was analysed by GC and GC–MS. As shown in Table 1, hydrodistillation of the dried flowering aerial parts of T. montbretii *subsp.* pamphylicum *gave a light yellowish oil in a yield of 0.20±3.42 (v/w).*

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Tablo 1. Essential oil composition of *Teucrium montbreti* subsp. *pamphylicum*.

Compounds	RT	Composition
(Z)-β-Caryopylene	25.83	31.75±4.21[1]
β-Himachalene	27.68	7.19±0.44
α-humulene	27.83	9.42±3.00
(Z)-α-Bergamotene	28.39	9.90±3.65
Germacrene	28.85	6.49±2.23
(-)-Curcumene	29.88	19.89±1.56
Caryopylene dioxide	36.85	5.74±1.10
Humulene oxide	38.45	6.07±0.42
Carvacrol	39.13	3.54±0.05

[1]The values are the average of three determinations (±S.D.).

Ten components were identified in the oil, represented 99.99% of the total composition of the oil and presented in Table 1. The major constituents of the essential oil were (Z)-β-caryophyllene (31.75%), (-)-curcumene (19.89%), (Z)-α-bergamotene (9.90%), α-humulene (9.42%), β-himachalene (7.19%), germacrene (6.49%), humulene oxide (6.07%), caryopylene dioxide (5.74%) and carvacrol (3.54%). Regarding the previously reported chemical composition of *Teucrium* species essential oil, β-caryophyllene was the main compenent, in agreement with our analysis. [8, 9, 11, 13-15] Some constituents were different our results and it is necessary to point out that environmental and genetic factors strongly influence the chemical composition of the essential oil consistent. [16]

Antioxidant and antiradical activities *in vitro* of *T. montbretii* subsp. *pamphylicum* essential oil (Labiatae /Lamiaceae) were shown in Table 2. Antiradical activity of the essential oil at 10 ppm (v/v) concentration were evaluated using the 1, 1-diphenyl-2- picrylhydrazyl (DPPH) radical scavenging activity and was found as $IC_{50} = 36.67$ μg/ml. The antiradical activity of the test sample was compared with the activity of known antioxidant such as BHT. Radical scavenging of the essential oil was better than BHT ($IC_{50} = 96.13$ μg/ml). The antioxidant activity was determined by using phosphomolybdenum method. The antioxidant activities of the essential oil (equivalent to ascorbic acid) were found as 98.95±0.09 μg/ml. The phosphomolybdenum method is based on the reduction of Mo (VI) to Mo (V) by the antioxidant compounds and the formation of a green Mo (V) complex with a maximal absorption at 695 nm. [23] The reducing properties are generally associated with the presence of reductones [25] and antioxidant action of reductones is based on the breaking of the free radical chain by donating a hydrogen atom [26]. Coban et al. [19] and Couladis et al. [20] were found that the ethanol extract from *T. polium* had high antioxidant and antiradical activity. Steam distillation oils from *T. orientale* of the budding and flowering stages were also determined the highest antioxidant activities by Yıldırım et al. [21] In addition, Ricci et al. [22] were showed that the essential oil of *T. marum* exerted a good antioxidant activity.
According to analyses results, essential oil of *T. montbretii* subsp. *pamphylicum* could be used as natural antioxidant to prevent to auto-oxidation in oils and in oil-bearing foods, if any organoleptic effects are acceptable.

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ANTIOXIDANT ACTIVITIES OF THE EXTRACTS OF SOME *STACHYS* L. (LAMIACEAE) TAXA

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Stachys (Lamiaceae) genus is presented 101 taxa in Turkey and especially is used in villages as tonic and apetite stimulant in herbal tea form. In the present study, taxa of *Stachys iberica* Bieb. subsp. *iberica* var. *densipilosa* Bhattacharjee, *S. annua* (L) subsp. *annua* var. *annua*, and *S. byzantina* C. Koch., collected in Geyve district, Sakarya, Turkey, were investigated. Among the taxa investigated, *S. iberica* subsp. *iberica* var. *densipilosa* was an endemic one. Having different polarities, methanol, ethyl acetate and water were used as solvents to extract from aerial parts of taxons. Extracts were assessed for their total phenol content (Folin-Ciocalteu method), antioxidant ($\square$-carotene–linoleic acid system) and antiradical activities (2,2-diphenyl-1-picrylhydrazl radical scavenging) activities. The results were compared to those of BHT as synthetic antioxidant. The best results were found in ethyl acetate extracts for total phenolic content, antioxidant and antiradical activities. The ethyl acetate extract of *S. annua* subsp. *annua* var. *annua* possessed the highest antiradical activities and the highest total phenol content. The lowest activity was determined in the aerial parts of *S. iberica* subsp. *iberica* var. *densipilosa.*

INTRODUCTION

Antioxidants are regarded as compounds which are able to delay, retard or prevent oxidation processes. They can interfere with oxidation by reacting with free radicals, chelating catalytic metals and also by acting as oxygen scavengers. Recently, There is a growing interest in the use of natural antioxidants found in plants combined with concerns about toxic effects of synthetic antioxidants because of the worldwide trend towards the use of natural additives in foods. Natural antioxidants can occur in all higher plants and in all of their parts. They are usually phenolic or polyphenolic compounds. It is known that Lamiaceae has been the most polyphenolic substance in the plant kingdom.

The genus *Stachys* L. is one of the largest genera of the Lamiaceae. This genus consist of more than 270 species in the world and is also presented 101 taxa in Turkey. *Stachys* species are found in mild regions of the Mediterranean and in south-west Asia. In the Flora of Turkey; 154 Stachys species are reported; 72 of them are described, of which 28 are endemic (Davis, P.H. 1982-1988). They are known in Anatolia as Adaçayi and Dağ çayi used as sage and in popular medicine to treat genital tumours, sclerosis of the spleen, inflammatory tumours, cough and ulcers.

Teas prepared from the whole plant or leaves are used in phytotherapy, possessing sedative, antispasmodic, diuretic and emmenagogue activities (Yeşilada, et.al. 1995; Duke, 1986.) in addition extracts or components of *Stachys* species exert various pharmacological effects: anti-inflammatory (Khanavi, et. al.,2005), (Maleki, et.al. 2001), antimicrobial (Petrovic, et. al. 2006) antibacterial (Grujic-Jovanovic,, et.al. 2004), anxiolitik (Rabbani, et. al. 2005), (Rabbani, et. al. 2003), antioxidant (Haznagy-Radnai, et.al., 2006) (Matkowski and Piotrowska, 2006), (Erdemoglu, et.al. 2006) (Coudalis, et.al., 2003)

In recent years, phytochemical investigations on different taxa of this genus have been intensified, have shown the occurrence of flavonoids (Marin, et al.2004), (Meremeti, et.al.2004), diterpenes (Khanavi, et.al.2005), phenylethanoid glycosides (Miyase, et.al. 1996), phenolic acids (Muntean, et.al., 2004), iridoids ((Meremeti, et.al.2004),)(Serrilli, et.al. 2006), monoterpenes (Sacaltsa, et.al 2001), sesquiterpenes ((Meremeti, et.al.2004), (Sacaltsa, et.al 2003), diterpenes (Sacaltsa, et.al 2001) and essential oils (Harmandar, et al. 1997), (Çakır, et.al. 1999), (Sacaltsa, et.al 2003), ((Khanavi, et.al. 2005), (Duman, et.al. 2005), (Norouzi-Arasi, et. al. 2006), **(**Morteza-Semnani, et al 2006), (Baher Nik and Mirza, 2006).

The purpose of this study was to evaluate the antiradical and antioxidant activities of some *Stachys* L. taxa . The results were related to the total phenolic content determined by the Folin–Ciocalteu method, and were compared with those exhibited by a reference substance, butylated hydroxytoluol (BHT).

MATERIALS AND METHODS

Plant Materials
The taxa of *Stachys (S. annua* (L) subsp. *annua* var. *annua*, *S. byzantina* C. Koch. and *S. iberica* Bieb. subsp. *iberica* var. *densipilosa* Bhattacharjee) collected in Turkey (Table 1). Voucher specimens (OUEF codes recorded below) were determined by Bio. O. Koyuncu and have been deposited in the herbarium of the Department of Biology , Faculty of Science and Arts, University of Eskişehir Osmangazi same department.

Table 1. The *Stachys* species used, their origin and their herbarium number,

Species	Herbarium number	Origin
S. annua (L). L. subsp. *annua* var. *annua*	OUFE: 12635	A3 Sakarya: Geyve, Balaban Köyü, Yamaçlar, 05.07.2005 N:40° 38 16.2-E: 030° 19' 48.6'', 256m
S. byzantina C. Koch	OUFE: 12912	A3 Sakarya: Geyve, Örencik Köyü, yol kenarları, 14.06.2005, N: 40°34'50.9"-E 030°20'08.2", 110m.
S.iberica Bieb. subsp. *iberica* var. *densipilosa* Bhattacharjee	OUFE: 12913	A3 Sakarya: Geyve, Maksudiye Köyü, yol kenarları, 21.07.2005, N:40°35'45.0"-E 030°22'54.5", 460m

Chemicals

BHT and Folin Ciocalteu's phenol reagent, □-caroten, linoleic acid and Tween 80 were purchased from Sigma Chemical Co. (St. Louis, MO), 2,2-diphenyl-1-picrylhydrazyl radical (DPPH·) and all solvents were from Aldrich Chemical Co. (Milwaukee, WI). All solvents used were of analytical grade.

Preparation of the Extracts
Dried and powdered aerial parts were extracted with petroleum ether to remove fats. Fat-free air dried material was extracted with aqueous methanol (%70) at 40^oC water bath 30 sec (x 4). MeOH was removed under reduced pressure by a rotary evaporator and the remaining aqueous solution was lyophilizied (MF). This extraction process was repeated and aqueous methanol extraction was partitioned with ethylacetate, in order to obtain compounds in different polarity. After concentration under reduced pressure a dark green ethyl acetate fraction was obtained (EF). The remaining water fraction was freeze dried (WF). All fractions (MF, EF and WF) obtained were weighed to determine the yields of soluble constituents, total phenolic content and their antioxidant activity.

Total Phenolics Determination

Antioxidant compounds generally contains phenolic group(s). Because of this, amounts of phenolic compounds in each of the fractions were compared to obtain more information about the fraction(s) which posses(s) antioxidant potential. The total phenolics were determined by the Folin-Ciocaltaeu colorimetric method (Hoff and Singleton, 1977) as follows: Samples (0.5 ml) were introduced into test tubes; 2.5 ml of Folin Ciocalteu (10% in water) reagent solution and 7.5 ml of Na_2CO_3 (20% in water) solution were added. The tubes were mixed and allowed to stand at room temperature in the dark for 2 h. Absorption at 750 nm was measured. A standard curve was prepared with gallic acid of known concentrations. Total phenolic content was expressed as gallic acid equivalents (GAE) in mg/g dry material. The results are expressed as average of three measurements.

Antioxidant Activity Evaluation

Antiradical Activity

The DPPH method is representative of the methods employing model radicals in the evaluation of radical scavengers; such methods have gained high popularity over the last decade because of their rapidity and sensitivity (Brand-Williams, et. Al. 1995). Free radical scavenging effects of the fractions on DPPH were estimated according to the method of Sanchez-Moreno (1998) with some modification. An aliquot of methanol (0.3 ml), sample solution (1.6 □ g/ml) was added to 3 ml of 0.05 mM 2,2-diphenyl-1-picrylhydrazyl radical (DPPH·) in methanol prepared daily. The mixture was shaken vigorously and left standing at room temperature for 30 min; absorbance of the resulting solution was then measured spectrophotometrically at 517 nm. Decreasing of the DPPH solution absorbance indicates an increase of the DPPH radical-scavenging activity. The radical scavenging activity of the tested samples, expressed as % Inhibition against DPPH·, was calculated as follows:

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Inhibition (%) = [(A$_{control}$-A$_{sample}$)/A$_{control}$] x 100.
Free radical scavenging activity determination was repeated four times for each sample and the means are reported. The DPPH solution without sample solution was used as control

$\square$-caroten-linoleic acid assay system:
The antioxidative activity of extracts was evaluated using the $\square$-carotene-linoleic acid model system as described by Maure (Maure et al., 2001). Briefly, 10 mg $\square$-carotene was dissolved in 3 ml of chloroform. The solution was added to 40 mg linoleic acid and 400 mg Tween 80. After removing the chloroform using a rotary evaporator at 40 ^{o}C, oxygenated distilled water (100 ml) was added to the $\square$-carotene-linoleic acid emulsion with vigorously shaking. 3 ml of this solution were mixed with 200 $\square$ l extract prepared at 0.2 mg/ml concentration. After incubation at 50°C for 180 min, absorbance of each sample at 470 nm was monitored at time intervals of 15 min during 180 min. Antioxidant activities of extracts were compared with those of BHT at the same concentration and blank consisting of 0.2 ml of methanol. The antioxidant activity (AA) was calculated from the following equation:

$$AA = \frac{A_s - A_c}{A_0 - A_c} \text{x}100$$

where, A_s and A_c are absorbances of sample and control, respectively at 180 min; A_0 is absorbance at 470 nm of sample at the start of test.

RESULTS and DISCUSSIONS

Total phenolics content

The antioxidant activity of plant materials is mostly due to the presence of phenolic compounds. Table 2 shows the amounts of total phenolics content and the fraction yields expressed as percentage of dry matter of fractions obtained from some *Stachys* taxa. There was a wide range of phenol concentrations in the fractions as shown Table 2. The highest total phenolic contents were detected for ethyl-acetate extracts, the lowest total phenolic contents were detected for water extracts. Total phenols in all fractions varied from 9.47 mg/g extract of GAE in *S. annua* subsp. *annua* var. *annua* - water (SAWF) to 181.88 mg/g extract of GAE in *S. annua* subsp. *annua* var. *annua* - ethylacetate (SAEF) as measured by the Folin-Ciocalteu method.

Table 2. Total phenolics contents and yields of fractions obtained from *Stachys* taxa

Fractions	**Extraction Yield (%)**[1]	*Total phenolics content* [2,3]
S. annua *subsp.* **annua** *var.* **annua - methanol (SAMF)**	*24.96*	45.17 ± 0.98
S. annua *subsp.* **annua** *var.* **annua - ethylacetate (SAEF)**	*7.52*	181.88 ± 2.01
S. annua *subsp.* **annua** *var.* **annua -** *water* **(SAWF)**	*16.83*	19.47 ± 1.10
S. byzantina- *methanol* **(SBMF)**	*18.30*	81.14 ± 1.87
S. byzantina- *ethylacetate* **(SBEF)**	*9.07*	108.23 ± 1.43
S. byzantina-*water* **(SBWF)**	*12.03*	56.80 ± 1.68
S. iberica *subsp.* **iberica** *var.* **densipilosa -methanol (SIMF)**	*26.71*	*39.45 ± 1.20*
S. iberica *subsp.* **iberica** *var.* **densipilosa - ethylacetate (SIEF)**	*8.56*	*60.15 ± 1.15*
S. iberica *subsp.* **iberica** *var.* **densipilosa -water (SIWF)**	*20.79*	34.95 ± 1.45

[1] %, w/w on dry weight basis, [2] mg GAE*/g extract, [3] Results are represented as means±standard deviation (n=3).

Evaluation of antioxidant activity

Antiradical activity

The DPPH. free radical method determines the antiradical power of antioxidants. (Sanchez-Moreno et al. 1998). DPPH radical-scavenging activities of each of fractions (1.6 □ g/ml) were measured. Figure 1 shows the effect of the fractions obtained from *Stachys* taxa on the reduction of DPPH. As shown in Figure 1, there were big differences in antiradical activities between the investigated *Stachys* fractions. Ethyl-acetate fractions were found to effectively scavenge free radicals generated by DPPH. The lowest activity was shown water fractions. Among the investigated fractions; the SAEF (60.36%, value of Inhibition %) showed the highest DPPH radical-scavenging activity and amount of total phenolic compounds. However, the antioxidant activities of fractions except SAEF were lower than that of synthetic antioxidant, BHT (48.95 %, value of Inhibition %).

The hierarchy of antiradical activity on DPPH of the *Stachys* taxa is as follows: *S. annua* subsp. *annua* var. *annua* (SA) > *S. byzantina* (SB) > *S. iberica* subsp. *iberica* var. *densipilosa* (SI).
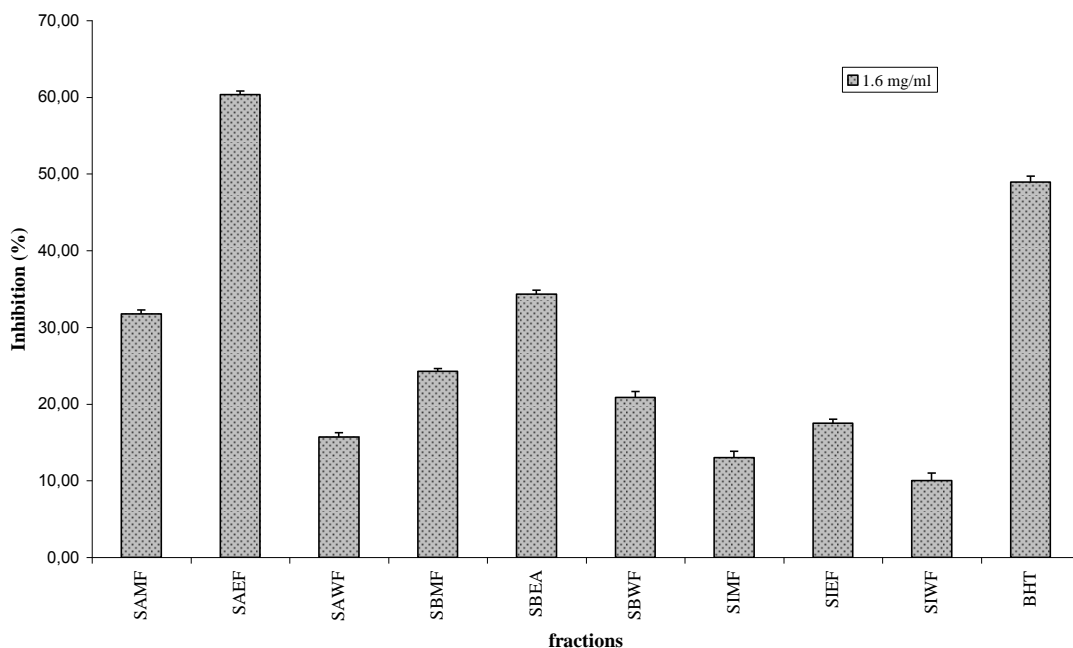
Figure 1. Antiradical activities as assessed on DPPH at concentration of 1.6 □ g/ml of fractions obtained from *Stachys* taxa

□-caroten-linoleic acid assay system

The method is based on the loss of the yellow colour of □-carotene due to its reaction with radicals which are formed by linoleic acid oxidation in an emulsion. □-Carotene bleaching, measured by the decrease in the initial absorbance at 470 nm, is slowed down in the presence of antioxidants. The method is widely used in the antioxidant activity evaluation of different types of samples and sensitive due to the strong absorption of □-carotene, but it is slower (at ca. 3 h per sample) than the DPPH method (Koleva, et.al. 2002)

Figure 2 shows the degre of antioxidant activity of the *Stachys* fractions in □-carotene-linoleic acid system. The absorbance of emulsions has been decreased with time. The values of antioxidant index of the extracts ranged from 34.33% to 66.61%. The ethyl acetate extracts of *Stachys* taxa   produced a strong antioxidative effect by exhibiting the best preventive activity against bleaching of □-carotene. On the otherhand, the water extacts of *Stachys* taxa showed less antioxidant activity. SIEF showed comparatively good antioxidant effect. However, activity of fractions was not comparable with that of BHT. In this work, the highest antioxidant activity was found from the synthetic antioxidant (BHT).

The hierarchy in □-carotene-linoleic acid system of the *Stachys* taxa is as follows: BHT > *S. iberica* subsp. *iberica* var. *densipilosa* (SI) > *S. annua* subsp. *annua* var. *annua* (SA) > *S. byzantina* (SB).

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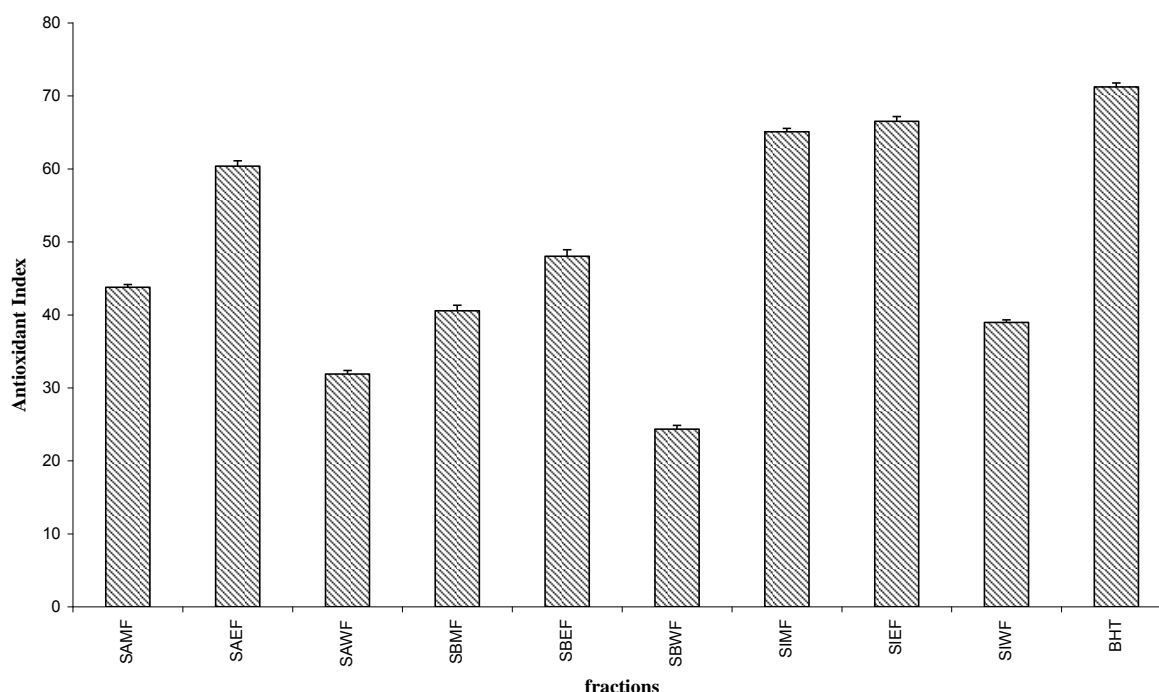
Figure 2. The value of Antioxidant Index estimated by means of □-carotene/linoleic aci
system of *Stachys* fractions

DISCUSSION

In the present study, antiradical activities of extracts obtained from aerial parts of *S. annua* subsp*. annua* var. *annua* (SA), *S. byzantina* (SB), *Stachys iberica* subsp. *iberica* var. *densipilosa* (SI) grown in Turkey were determined by using DPPH. The ethyl acetate fractions of plants showed the highest activity (Figure 1). These fractions also contained the highest amount of total phenolic compounds (Table 2). Both of them can be accepted an indication of antioxidant potential (Antolovich, M., 2002). Especially, the *S. annua* subsp*. annua* var. *annua* ethylacetate fraction (SAEF) (60.36%, value of Inhibition %) showed the highest DPPH radical-scavenging activity and amount of total phenolic compounds. Antioxidant activities of the *Stachys* fractions were evaluated in □-carotene-linoleic acid system. In the case of antiradical activity, the ethyl acetate fractions of species showed a significant antioxidative effect against bleaching of □-carotene. In this test system, *Stachys iberica* subsp. *iberica* var. *densipilosa* ethylacetate fraction (SIEF) showed comparatively good antioxidant effect; but, none of fractions was reach the activity of BHT. Although SAEF was able to show high DPPH radical-scavenging activity, it did not show antioxidant activity in □-caroten linoleic acid system. On the otherhand, Although, SIEF was able to show good antioxidant activity in □-caroten linoleic acid system, it did not show antiradical capacity. These results may suggest that although DPPH radical-scavenging activity might be an indication of potential antioxidant activity, there may not be always a linear correlation between these two activities. There many methods to determine antioxidant capacity. These methods differ in terms of their assay principles and experimental conditions; consequently, in different methods particular antioxidants have varying contributions of total antioxidant potencial. The usage of various methods for the evaluation of antioxidant capacity makes comparison even more difficult (Antolovich, M., 2002), (Shahidi and Wanasundara, 1992).

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To the best of our knowledge, no reports have appeared on the constituents and antioxidant activit of *Stachys iberica* subsp. *iberica* var. *densipilosa,* as an endemic species. Our results is the first data for this taxon.

From the other side, investigated other taxa*, S. byzantina* showed also a significant activity in tested systems. It was previously reported that aqueous extract of *S. byzantina* shown significant antiradical activtiy on DPPH and inhibitory effect on the peak chemiluminescence signal produced by luminol–H2O2 and luminol–HOCl systems (Erdemoğlu, et.al.2006).

In addition, there are few publications on antioxidant properties of some *Stachys* species in different test systems. *S. spruneri* has been reported to shown *in vitro* antioxidant activity (Couladis et al, 2003). In the other study, *Stachys officinalis* has been shown maximum activity in lipid peroxidation assay and in phosphomolybdenum method and significant antiradical activtiy on DPPH (Matkowski and Piotrowska, 2006). Háznagy-Radnai, et al. (2006).have been reported to shown significant antioxidant activity of six *Stachys* species (*S. officinalis*, *S. annua*, *S. recta*, *S. macrantha*, *S. alpina*, *S. sylvatica*) in an enzyme-independent lipid-peroxidation system. Methanol extracts of aerial flowering parts of four *Stachys* taxa (*S. anisochila* Vis. et Pancic, *S. beckeana* Dorfler & Hayek, *S. plumosa* Griserb. and *S. alpina* L. ssp. *dinarica* Murb.) have been shown high correlations between total phenolics content, total antioxidant activity and antiradical activity on DPPH (Kukic, et.al., 2006)

In conclusion, the present study demonstrates that the investigated *Stachys* extracts have a potential source of antioxidants of natural origin.

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NOISE AND CHILDREN: OUTDOOR SOUND LEVELS IN PRIMARY SCHOOLS

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Background. Every child has the right to grow up in a healthy environment - to live, learn and play in healthy places. Noise, an ubiquitous environmental pollutant, around educational centres can negatively affect the health and performance of the children. Primary schools are important because primary school children often spend long periods of time in school, and a noisy environment can adversely affect.

This study aims to determine the noise levels of outdoor environment of primary schools; to investigate relation of transport noise of vehicles with the noise levels of outdoor environment.

Methods. The sound levels have been measured with a precision sound level meter in the outdoor areas of all primary schools (n=43) in February, 2006 in Isparta, located in the Mediterranean region, a relatively developed region of Turkey. The characteristics of the running road such as distance from garden wall and distance from building wall and number of vehicle crossing the running road have been determined. The sound levels were measured with a precision sound level meter in the outdoor areas of schools. In each area, meter microphone was placed at ear level and at a distance of 1m from both the school building wall and garden wall nearby the running road. The measurements were taken during one minute. The sound level meters employed were equivalent to continuous sound level in a specific time (in 8 hours) interval (L_{Aeq}), lowest value (L_{Amin}) and highest value (L_{Amax}) and mean of sound levels measured for one minute. According to Regulation of Noise Control in Turkey and guideline values recommended by World Health Organization for the outdoor playgrounds of schools, the sound pressure level of the noise from external sources should not exceed 55 dBA L_{Aeq}. Accordingly, the schools are accepted as inappropriate environment on account of noise, if the sound value of outdoor areas is over 55 dBA.

Descriptive statistics, Pearson's correlation and Mann Whitney U test were carried out using the Statistical Package for the Social Sciences (SPSS), with two tailed *P*-value of 0.05 used as a threshold for significance.

Results. Forty nine percent of primary schools having inadequate outdoor sound level were determined. In these schools, the numbers of vehicle crossing near the running road were higher (p<0.001) than the others. The numbers of vehicle crossing the running road in one minute were positive correlated with all sound levels. Either the building or the garden wall distance was not associated with any sound levels.

Conclusion. As a result of this study, it has been determined that about half of the schools evaluated had inappropriate level of outdoor noise and their noise levels were related to the number of vehicles passing by the road near the school. During construction of the schools, selection of an appropriate location is crucial. In addition, around the present schools, noise levels should occasionally be measured and precautions aimed at reducing noise level should be taken concerning intense traffic which is determined as a major source of noise especially in this study.

Key words: *noise level; children; primary school*

Introduction

Every child has the right to grow up in a healthy environment - to live, learn and play in healthy places. Children are the most vulnerable population group to unhealthy environments that cause an estimated 5 million deaths in children per year worldwide, and contribute to about one third of the total burden of disease among children.[1] Exposure to tobacco smoke, lead poisoning, toxic waste dump, polluted waters, vector-borne diseases, pesticides, persistent organic pollutants and other chemicals are considered as the major environmental health problems affecting children.[2] Noise, an ubiquitous environmental pollutant, is a public-health issue because it leads to annoyance, reduces environmental quality, and might affect health and cognition.[3, 4]

Noise is unwanted sound from road traffic, jet planes, jet skis, garbage trucks, construction equipment, manufacturing processes, lawn mowers, leaf blowers, and boom boxes.[5] About 20% of the population in the developed (OECD) countries are exposed to environmental noise levels above 65 dBA from road traffic. Exposure to noise in developing countries is traffic noise about 100 dBA at kerbside in big cities of India, Pakistan, Argentina, Brazil and others.[6]

The problem with noise is not only that it is unwanted, but also that it negatively affects human health and well-being.[5] Harmful effects of noise on human consist of auditory and non-auditory effects.[7] Auditory effects are physical effects of noise that are hearing loss related noise, hearing impairment, threshold shift or tinnitus. Nonauditory effects of noise are physiological effects (startle and defense reaction leading to potential increase of blood pressure), interference with speech communication, sleep disturbance (difficulty in falling asleep, alterations in sleep rhythm and being woken up), psychological effects (headaches, fatigue and irritability), performance effects (task performance, distraction and productivity), annoyance (feeling of displeasure, tolerances vary enormously and noise impulses more annoying than a steady noise).[6] In children, the adverse effects of noise are similar with adults but noise can negatively affect children's learning and language development, can disturb children's motivation and concentration and can result in reduced memory and in reduced ability to carry out more or less complex tasks.[7]

Noise may provoke a stress response in children that includes increased heart rate and increased hormone response, and noise may disrupt sleep and hinder needed restoration of the body and brain.[7]

There have been many studies,[3, 4, 7-13] which provide evidence about noise affecting children. In these studies examining the effects of chronic high levels of environmental noise on schoolchildren's cognitive performance and health it has been found that noise exposure leads to decrease in school performance, memory deficit, noise annoyance and impaired well-being.

Primary schools are important because primary school children often spend long periods of time in school, and a noisy environment can adversely affect.

The aim of this study is as the following:
- To determine the noise levels of environment of primary schools
- To investigate relation of transport noise of vehicles (vehicle count, distance of road) with the noise levels of outdoor environment

Material and methods

All primary schools (n=43) in area, located in the Mediterranean region, a relatively developed region of Turkey, were included to the study. The sound levels were measured with a precision sound level meter (Software for the CASELLA CEL -440, United Kingdom) in the outdoor areas of schools in February, 2006. In each area, meter microphone was placed at ear level and at a distance of 1 m from both the school building wall and garden wall nearby the running road. The measurements were taken during one minute. The sound level meters employed were equivalent to continuous sound level in a specific time (in 8 hours) interval (L_{Aeq}), lowest value (L_{Amin}) and highest value (L_{Amax}) and mean of sound levels measured for one minute. The characteristics of the running road such as distance from garden wall and distance from building wall and number of vehicles crossing the running road were determined.

According to Regulation of Noise Control in Turkey[14] and guideline values recommended by World Health Organization (WHO)[15] for the outdoor playgrounds of schools, the sound pressure level of the noise from external sources should not exceed 55 dBA L_{Aeq}. Accordingly, the schools are accepted as inappropriate environment on account of noise, if the sound value of outdoor areas is over 55 dBA.
Definitions

The definitions related to the issue and mentioned in the article are given below and they are taken from Regulation of Noise Control which is in effect in Turkey.

Sound: A physical phenomenon that is formed by the undulations of a vibrating source made in air pressure and that stimulates auditory sense in human.

Noise: A sound spectrum with a random structure, subjectively described as undesirable sound.

Sound Pressure Level or Noise Level: The difference of atmospheric pressure varying during sound emission and balance pressure. The unit of sound pressure level proportioned to 0, 0002 newton/m2 standard reference sound pressure is decibel (dB).

Decibel: Logarithm, equal sound intensity, of the ratio of a given sound intensity to 10 times less other sound intensity to the base 10 is called Bel; 1/10 Bel it is called decibel.

dBA: A unit of sound valuation in which middle and high frequencies most sensitive to the human ear are particularly stressed. dBA unit usually used to reduce or control noise is also correlated to the subjective evaluation of sound pitch.

Equivalent Noise Level(Leq): A noise scale in dBA unit which averages sound pressures or sound energy showing stability over a specific period. Its symbol is Leq.

Highest Sound Level= Peak level=Maximum level (Lmax): The highest value which a time-varying sound retains in any instant.

Outdoor Noise Level: Noise levels calculated or measured at a distance of 1.00 meter from exterior walls, outside the buildings.

Statistic analyses

Descriptive statistics, Pearson's correlation and Mann Whitney U test were carried out using the Statistical Package for the Social Sciences (SPSS), with two tailed *P*-value of 0.05 used as a threshold for significance.

Results

Mean (SD) of the built wall distance from running road was 18.7±12.5 m. Mean (SD) of the garden wall distance from running road was 3.4±6.4 m. Mean (SD) of vehicle number cross from the running road for one minute was 2.7±3.8. Table 1 shows the characteristic levels measured both at building and garden walls of the schools. Figure 1 and 2 show sound levels measured from walls (building and garden) as boxer plots. All sound levels (L_{Amax}, L_{Amin}, $L_{A(1second)}$, $L_{Aeq-8hour}$) measured distance of one m from the built wall were high and different from measured from the garden wall (Table 1).

Vehicle numbers were determined that were positive correlated with all sound levels both measured from building and garden wall (Table 2).

At the end of the measurements, 21 primary schools (48.8%) had inadequate outdoor sound level (>55dB) was determined. In this schools, the numbers of vehicle crossed near the running road were high ($p<0.001$) than the others. The numbers of vehicle crossed the running road in one minute were positive correlated with all sound levels. Either the building or the garden wall distance were not associated any sound levels (Table 2).

Table 1 Characteristics sound levels measured both at building and garden walls of the schools

Measurements (n=47)	Distance of 1m from the building wall					Distance of 1m from the garden wall					t	P^*
	min	max	median	mean	SD	min	max	median	mean	SD		
L_{Amax} (dBA)	49.7	80.9	67.7	66.1	6.7	49.8	79.7	69.8	67.2	8.0	-1.044	0.303
L_{Amin} (dBA)	34.9	57.6	43.5	44.5	5.4	34.0	59.6	45.4	45.9	6.8	-3.082	0.004
$L_{A(1second)}$ (dBA)	47.0	74.5	64.0	62.3	6.7	45.5	79.5	66.5	64.5	8.9	-2.376	0.022
L_{Aeq} (dBA)	38.7	66.0	53.9	53.7	6.3	39.3	69.9	57.7	56.5	8.1	-4.223	0.000
Distance from road (m)	3.0	49.2	16.8	18.7	12.5	0.10	35.4	1.8	3.4	6.4	9.145	0.000

* Paired t test, df: 42

Table 2 Correlations number of vehicle crossed the running road in one minute and the sound levels

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Number of vehicle	0.325*	0.762***	0.485**	0.632***	0.243	0.574***	0.751***	0.592***	0.675***	0.093
Measurement from the built wall										
2. L_{Amax} (dBA)	1	0.680***	0.918***	0.839***	0.036	0.630**	0.580**	0.623**	0.651**	0.061
3. L_{Amin} (dBA)		1	0.788***	0.897***	0.138	0.733**	0.906**	0.750**	0.826**	0.088
4. $L_{A(1second)}$ (dBA)			1	0.952***	0.110	0.732**	0.722**	0.725**	0.767**	0.132
5. L_{Aeq} (dBA)				1	0.132	0.785**	0.839**	0.794**	0.853**	0.098
6. Distance from road (m)					1	0.067	0.097	0.045	0.109	0.472**
Measurement from the garden wall										
7. L_{Amax} (dBA)						1	0.804***	0.973***	0.931***	-0.015
8. L_{Amin} (dBA)							1	0.840**	0.895**	0.112
9. $L_{A(1second)}$ (dBA)								1	0.962**	-0.049
10. L_{Aeq} (dBA)									1	-0.016
11. Distance from road (m)										1

$*P < 0.05$, $** P < 0.01$, $*** P < 0.001$
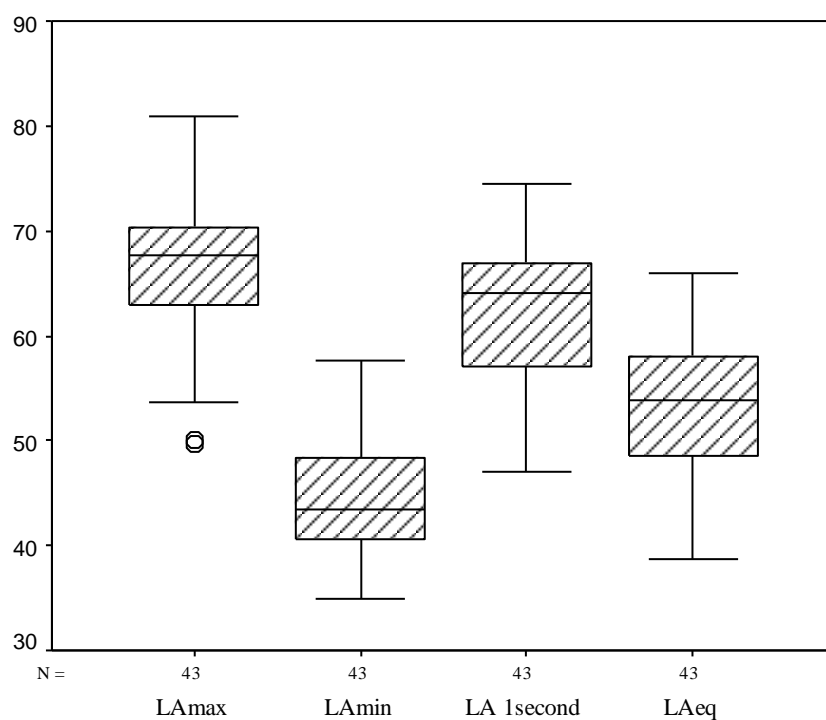
Figure 1 Sound levels measured distance of 1m from the building wall
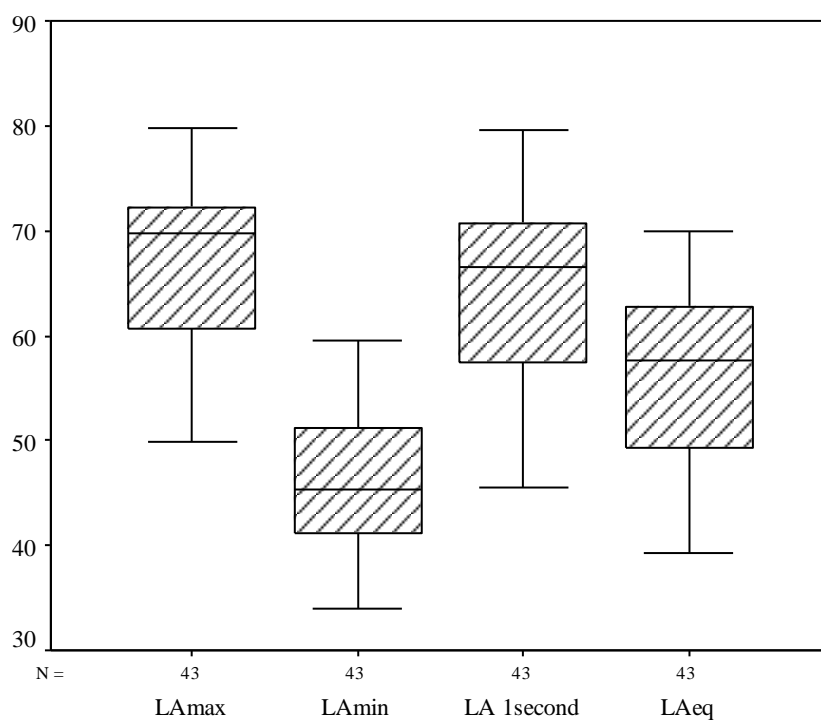
Figure 2 Sound levels measured distance of 1m from the garden wall

Discussion

Adults are responsible for providing good living, playing and learning environments for children. The necessity of providing students with appropriate learning atmosphere is incontrovertible. Certainly, atmospheric noise levels are important criteria for assessment of appropriate learning environments. Noise levels for various areas are identified according to the use of the area. U.S Environmental Protection Agency suggests the levels of 45 decibels are associated with indoor residential areas, hospitals and schools, whereas 55 decibels is identified for certain outdoor areas where human activity takes place.[16] Selected guideline values recommended by WHO for the environments to day-care settings and other situations in which children are frequently exposed to noise were 35 dB for school classrooms and preschool indoors and 55 dB for school playground outdoors (during play).[15] In our country, according to Regulation of Noise Control[14] guideline values recommended were 45 dB for classroom and laboratories and, 55 dB for school outdoors. It was obtained that approximately half of the schools in current study had outdoor sound level over 55 dB. Evans et al.[8, 9] and Lercher et al.[17] found a decreased social behavior and quality of life in children exposed to noise (aircraft or road traffic noise) in schoolchildren. These children training in the schools which have undesirable outdoor sound levels, determined in our study, face the risk of decrease in quality of life due to the noise they are exposed to.

Even though researches about sound level sensed indoors and present outdoor noise level were made during the construction of the schools, their outdoor noise levels may alter and reach undesirable results due to the number of vehicles increasing each day and sometimes the nearby street's getting busier owing to the changes made in traffic flow. That's why noise level in the environment of the school should be measured at certain intervals to exercise necessary precautions.

The first principle for preventing noise in children's settings is reducing or eliminating noise at the source.[7] The typical sources of noise reported in primary school outdoor environment are people noise (talking, chatting, shouting, running etc. especially while playing or during sport or exercise) and transport noise of vehicles, wind noise.[7] It has been found out that sound levels measured in the study are related to the number of vehicle crossing the nearby running road. The distance of the road from the school doesn't effect the sound level. In this respect, first of all, regulations such as diverting traffic to other roads during the opening hours of the school and during these hours not letting motorcycles, trucks that can produce excessive noise pass through the roads nearby the school, should be made. Also measurements aimed at reducing the numbers of vehicle passing by the school road, therefore reducing the source of sound should be taken.

Limitations

It should be noted that schools in which we carried out our study and evaluated our results was in a medium and developing city in rural area of Turkey, which has differences in terms of related environment, such as vehicle numbers and traffic crowded, when compared to urban and large cities. Therefore, it can be suggested that our results may show a more weightless tendency than others.

Level of perception of the sound emitted from outdoor noise sources is effected by construction materials used in the building, exterior and interior upholstery, presence of insulation on the ceiling and roof. The necessity of insulation and application of eligible materials is indubitable so as to lower the noise levels estimated or present at a distance of 100m. of exterior walls to the levels allowed indoors. Another limitation of this study is that measurements and analysis of merely outdoor noise levels and traffic intensity regarded as the source of this noise have been made. The correlation of the sound perceived indoors to the outdoor noise or to the construction materials has not been investigated. In the forthcoming studies, factors concerning outdoor and indoor noise levels should be investigated.

Conclusion

As a result of this study, it has been determined that about half of the schools evaluated had inappropriate level of outdoor noise and their noise levels were related to the number of vehicles passing by the road near the school. Due to the effect of noise especially on learning and memory as well as its possible well known effects on human, selection of an appropriate location is important during construction of a school. Also around the present schools, to reduce the noise level to the least, precautions concerning busy car traffic particularly at school hours should be taken.

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GLOBAL HEALTH PROBLEM : AVIAN INFLUENZA A (H5N1)

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Avian influenza A (H5N1) is a contagious disease of animals caused by influenza A viruses. The epidemic in birds began in South-east Asia in 2003 and has since spread to other parts of the world. It had infected human at 1997 and afterwards at 2004. Outbreaks are continuing with varying degrees of severity in several affected areas. It is critical to use appropriate infection control precautions to minimize the possibility of transmission of infection. Infected birds excrete large amounts of virus in feces and other secretions, which contaminate the direct environment, such as dust, soil, water, cages and tools. The virus may remain infectious in soil, water, or contaminated equipment for weeks to months, depending on the temperature and humidity. H5N1 virus can survive for 30 days at 0°C and for 4 days at 22°C and also in faeces for at least six days at 37°C. The virus dies in 3 hours at 56°C and in 30 minutes at 60°C. It is inactivated at temperatures reached during conventional cooking (at least 70°C at the centre of the product or when the meat is not pink in any part). There is no epidemiological evidence to suggest that people have been infected with the virus through the consumption of eggs or egg products. Only proper cooking will inactivate virus present inside the egg. Most human infections with H5N1 viruses involved handling of affected poultry or direct exposure to live poultry. A limited number of possible human-to-human transmissions have been reported, which involved prolonged, close and unprotected contact with infected patients but continued monitoring is required to identify any increase in viral adaptation to human hosts.Infection control measures during contact with potentially infected birds or environment, or patients with suspected or confirmed infection should prevent contact, droplet, and airborne transmission. These measures include mask, gown, goggles and gloves. Eliminating the source of infection, i.e. infected birds, remains the most effective infection control measure. No H5N1 vaccines are currently available for humans. The strategy for pandemic influenza is stopping, slowing or otherwise limiting the spread of a pandemic to the country; limiting the domestic spread of a pandemic, and mitigating disease, suffering and death; and sustaining infrastructure and mitigating impact to the economy and the functioning of society. Pandemic planning requires that every sector of society, from federal, state and local government to individuals and families, business and health care providers participate in the planning and response activities.

Introduction

Avian influenza A (H5N1) is a contagious disease of animals caused by influenza A viruses. The epidemic in birds began in South-east Asia in 2003 and has since spread to other parts of the world. It had infected human at 1997 and afterwards at 2004. Outbreaks are continuing with varying degrees of severity in several affected areas. It is critical to use appropriate infection control precautions to minimize the possibility of transmission of infection (1).

H5N1 virus can survive for 30 days at 0°C and for 4 days at 22°C and also in faeces for at least six days at 37°C. The virus dies in 3 hours at 56°C and in 30 minutes at 60°C. It is inactivated at temperatures reached during conventional cooking (at least 70°C at the centre of the product or when the meat is not pink in any part). There is no epidemiological evidence to suggest that people have been infected with the virus through the consumption of eggs or egg products. Only proper cooking will inactivate virus present inside the egg (2).

There are opportunities for a pandemic virus to emerge, either after a reassortment event, when genetic material is exchanged between human and avian viruses during coinfection of a human being or pig, or through a more gradual process of adaptive mutation. Rapid international spread is certain once a virus with the appropriate characteristics appears. The three complementary objectives for the international public health response were considered to be: to avert a pandemic, to control the human outbreaks and prevent further spread, and to conduct the research needed for better preparedness and response, including the immediate development of a vaccine against the pandemic virus (3).

Most human infections with H5N1 viruses involved handling of affected poultry or direct exposure to live poultry. A limited number of possible human-to-human transmissions have been reported, which involved prolonged, close and unprotected contact with infected patients but continued monitoring is required to identify any increase in viral adaptation to human hosts (4, 5).

In order to be able to detect an unusual cluster or number of cases of illness that may be due to a new influenza virus, it is essential for every country to have a (basic) early warning system for human disease. Early warning of human respiratory infection associated with unexplained or unusual mortality in commercial bird flocks; and unusual respiratory disease clusters or unusual or unexplained mortality associated primarily with respiratory disease in humans at risk, with special emphasis on health-care workers is very important.

Enhanced surveillance may also include the monitoring of incoming travellers from infected regions, countries or localities to the country, state, province or locality, arriving by all means of transport; people involved in culling birds or animals infected with influenza; other people exposed to birds or animals infected with influenza, for example farmers and veterinarians; health-care workers caring for patients with suspected or confirmed pandemic strain influenza infection; laboratory workers handling clinical specimens from patients with suspected or confirmed pandemic strain influenza infection (3).
This document mentions about activities that can be undertaken to prepare for the next influenza pandemic and mitigate its impact once international spread has begun.

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Diagnosis

In order to be able to quickly confirm suspected human cases of a new influenza strain, it is essential to ensure access to basic diagnostic capacity. In countries with limited resources, it may be efficient to establish a network of laboratories that have their own expertise. In the interpandemic phase, all countries should have access to at least one laboratory able to offer routine influenza diagnosis, typing and subtyping. A policy on sharing clinical material (respiratory secretions, serum and animal faeces) from confirmed pandemic cases, nationally and internationally, should be developed. In particular the policy should address the need for material transfer agreements, distribution of viral isolates and RNA, and sharing the results of sequencing analysis of pandemic strain viruses. Even when local laboratory facilities exist, countries should ensure that in case of an emergency, samples can be shipped to a WHO reference laboratory in or outside the country for rapid confirmation or determination (3).

Treatment and Prevention

Vaccination

Infection control measures during contact with potentially infected birds or environment, or patients with suspected or confirmed infection should prevent contact, droplet, and airborne transmission. These measures include mask, gown, goggles and gloves. Eliminating the source of infection, i.e. infected birds, remains the most effective infection control measure. Vaccines are the most important intervention for preventing influenza and reducing its health consequences during a pandemic. No H5N1 vaccines are currently available for humans. Specific problems involve virus's threat to personnel at manufacturing sites and its lethal effect on embryonated chicken eggs which is the current standard medium in vaccine production, more complex production technologies, heightened biosafety requirements, intellectual property rights for patented technologies, liability for adverse reactions, and some regulatory complexities. Manufacturing capacity for influenza vaccines is concentrated in Australia, Europe, Japan and North America. Vaccine development is undertaken by companies and governments in these areas, but the need for a vaccine will be global. It is expected that, should a pandemic begin, countries with manufacturing facilities will regulate production nationally (3, 6, 7).

Antiviral Drugs

Currently, two classes of drugs are available with antiviral activity against influenza viruses: inhibitors of the ion channel activity of the M2 membrane protein, amantadine and rimantadine, and inhibitors of the neuraminidase, oseltamivir, and zanamivir. There are three opportunities for using antiviral medications. First of all, these medicines can be used to treat H5N1-infected patients and to prevent infection in close contacts, including family members and health-care workers; this is currently being put into practice. Second is administration of medications to all members of a community in which clusters of cases are occurring might either stop the virus from further improving its transmissibility or delay international spread. The third opportunity presents once a pandemic has been declared. Pending the availability of vaccines, antiviral agents will be the principal medical intervention for reducing morbidity and mortality (3, 8).

A wide range of non-medical interventions, such as improved personal hygiene, quarantine, contact tracing and travel restrictions, can potentially reduce opportunities for transmission at the start of a pandemic and slow international spread. Any slowing of international spread at the start of a pandemic gains time to increase vaccine supplies; each day gained could mean an additional five million doses of vaccine. Vaccines will not be available at the start of a pandemic. The only specific intervention possible in the absence of vaccines would be the use of antivirals but their adequate availability requires stockpiling. It is essential that action is taken to accelerate availability of vaccines and antivirals and to develop guidelines for their The *strategy* use when they are in short supply (3, 9).

Pandemic preparedness and future directives

for pandemic influenza is stopping, slowing or otherwise limiting the spread of a pandemic to the country; limiting the domestic spread of a pandemic, and mitigating disease, suffering and death; and sustaining infrastructure and mitigating impact to the economy and the functioning of society. Pandemic planning requires that every sector of society, from federal, state and local government to individuals and families, business and health care providers participate in the planning and response activities (3).

Public communication

A communication plan must be developed that addresses different target groups (e.g. press, general public, health-care workers, parliament, specific risk groups), possible materials (web sites, leaflets, information in different languages, etc.) and distribution mechanisms are needed to reach the target groups (3).

Communication among those involved in the response

A group (preferably an already existing one) should be designated within the department or ministry of health responsible for coordinating the collection and dissemination of information related to the pandemic in all its phases and levels. Members may include representatives of departments or ministries of health, agriculture and emergency services, medical colleges, general practice organizations and consumer organizations. A representative of this group should be part of the national pandemic planning committee (Figure 1)

There must be a mechanism for the timely and consistent distribution of information between national bodies and regional authorities . Such information would include, but should not be limited to, the case definition for suspected and confirmed cases, policies on vaccine and antiviral drug use, clinical management guidelines, the number of cases identified and their location, deaths due to pandemic strain influenza and the effect of a pandemic on essential services (3, 10).

MANAGEMENT OF INFLUENZA PANDEMIC

PRIME MINISTRY

Ministry Of Agriculture

Ministry Of Health

Prime Ministry Crisis Administration Center

National Pandemic Monitoring Commitee

Ministry Of Health Operation Center

Undersecretary
General directorate of primary health care
General directorate of curative services
Press and information unit
International relations unit
General administrative services unit
Institution coordination unit
Surveillance unit
Translation office

Undersecretary
General directorate of primary health care
General directorate of curative services
General directorate of borders and maritinal health
Department of microbiology and clinical microbiology
Department of pediatrics
Department of pulmonary medicine
Department of public health
Department of emergency medicine

Figure 1. Management of influenza pandemic

In conclusion; authorities must understand the potential impact and threat of pandemic influenza, so that they will see the importance of pandemic planning and provide enough resources to carry it out. With adequate preparation, the morbidity, mortality and social disruption associated with a pandemic should be reduced.

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ENVIRONMENT AND HEALTH: ENVIRONMENT HAS NO BORDERS

Fresh water is one of the main factors for human health
There are some main problems in the world which have no borders. We can see them both in social and natural life, for example in social life we know HIV/AIDS, human traffic, drug traffic etc., but in natural life first we can show environmental problems on the planet, including climate change, global warming effect, desertification, ozone layer destruction, pollution of water basins of the world oceans, etc. Desertification is associated with soil erosion, its salinization, chemical pollution and degradation of lands in general. Degradation of the environment imposes danger to the human security, since it increases risk of falling sick and possibility to face lack of the food. As a general rule, for us the bell rings when we start choking on the sand coming with the water from the faucets in our homes. It is true that everything we do affects nature and nature throws it back on us. For this purpose world's countries have to be interested in the effective utilization of natural resources, take care of flora and fauna in general, animals, birds and trees, the preservation and improvement of the world's ecosystem, pass a lot of important package of statutes on natural resources, energy and environmental protection. We have to tatify all major conventions concerning the problems of ecology and environmental protection. A good example is the Environment and Health Programme initiated at the 1989 Frankfurt Conference – the first joint meeting of the ministers of the environment and health. There was adopted European Charter on Environment and Health, which formulated basic principles, tools and priorities of European programme on health and environment. At the same time WHO European Centre on Environment and Health has been established and decision to call such conferences every five years was made. Or the importance of the World Summit on Sustainable Development (Johanneesburg, August, 2002) is recognised by all concerned. The governments have confirmed the commitments, made during the UN Conference on Environment and Development, 1992 "Rio+10" and other world forums and it prepared to discuss practical steps on implementation of Agenda 21, and prepare the ground for world partnership for a global process of sustainable development. It is equally important that the Summit considers public opinion along with the official statements and providers opportunity for non-governmental sectors to actively participate in the process. Now we have some important International Environmental Dates to celebrate, so, 1 April Earth Day, 15 May International Climate Day, 22 May International Day for Biological Diversity, 31 May World No-Tobacco Day, 5 June World Environment Day, 8 June Ocean Day, 17 June World Day to Combat Desertification and Drought, 16 September Ozone Layer Protection Day, 26 September World Sea Day, 27 September World Tourism Day, 4 October Animal Protection Day, 6 October Natural Habitat Protection Day, 11 October Natural Disaster Mitigation Day, 29 December Day of Establishment of the World Nature Conservation Society. So, if we want to live better in the future we need to take care of our Land too much and have to collaborate with the representatives of scientific and educational institutions, environmental and local authorities, NGOs, international organizations and media (developing environmental journalism).

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Now I want say about the environmental situation in our country – Republic of Azerbaijan.
The Republic of Azerbaijan lies at the crossroads of Asia and Europe. It is situated in the Southern Caucasus on the west coast of the Caspian Sea and borders the Russian Federation to the north, Iran to the south, Turkey and Armenia to the west and Georgia to the north-west. The area of Azerbaijan equals 86,6 thousand km^2. Azerbaijan contains 9 out of the 11 climatic zones. Commencing from dry and humid subtropical climate and ending with the climate of tundra with -45^0C in highlands to $+45^0$C (Julfa, Nakhchevan Autonomic Republic) in lowland. In the country the lowest altitude is -28 m (Lankaran lowland, Caspian Sea) and the highest peak is 4466 m (Bazarduzu, the Major Caucasus). The nature of Azerbaijan is generous and unique: landscape ranges between burning depressions of dry subtropical and eternal snows and glaciers of highlands, subtropical forests and lifeless salt-marsh. Lowlands occupy over half of the country's territory combined with mountains above four hundred thousand meters. And mountains occupy more than half of its territory, and it enjoys 825 km of the Caspian Sea coastline. The main mountain ranges are the Major and Minor Caucasus and Talysh. The Kur and Araz are the biggest rivers in the country.

Flora of Azerbaijan is highly diverse and consists of over 4100 species including variety of endemic and endangered ones. Forests occupy about 11% of the country and mainly comprise deciduous plants: oak, beech, hornbeam and other. Relic massifs of secular trees can also be found. Desert and semi-desert lowlands are governed by wormwoods, semi-shrubby flora.

Number of zoological provinces with characteristic fauna complexes adjoin the territory of Azerbaijan. Lowlands are rich with rodents, crawlers, reptile, but Jeiran is indeed the beauty of the area. Slopes of the Greater (Major) Caucasus are rich with wolves, bear, wild boar, deer, Dagestanian auroch, pasan. Shallow Caspian gulfs are certainly the birds' world.

Starting from the second half of the 20th century ecological problems that engulfed the world had an influence on our republic as well. Pollution of air and water basins and soils has reached for apogee, the process of degradation of winter and summer pastures has decreased, in some regions forests have been completely or partly destroyed. Consequences of fluctuation of sea level, problems related to ozone layer, global changes of climate being combined with other wide-scale processes have reached the extent at which they can not be neglected in Azerbaijan.

Whereas global thinking and civilized relations between nations and being formed, international prestige of the state is starting to be estimated by its attitude to the nature and natural resources. Therefore at present time Azerbaijani society pays incremental attention to its attitude towards environment, natural ecosystems, surface and underground minerals.

Major environmental problems for the Azerbaijan Republic are air and water pollution. Basic sources of pollution include oil refineries and chemical and metallurgical industries. Land degradation and forest destroy are also considered as the outstanding issues.

The Absheron Peninsula in Azerbaijan, has been the scene of intensive oil extraction and vigorous industrial activities for almost a hundred years now. This caused strong air, water and ground pollution. Although, within the recent years, the situation has slightly improved, environmental pollution still remains a serious danger for human health.

Azerbaijan is one of the countries which has deficit of water, lack of fresh water and enough water pollution in its area. As we know fresh water is the most precious element for life. It is necessary for satisfaction of elementary needs, health care, food production, elaboration of electricity, and support of regional and global ecological systems. Despite it that 70% of the Earth surface being covered by water, only the small part of it about 2,5% is fresh water. 70% of water supplies is frozen and remained exists as soil dampness. As a result the human can use only 1% of water resources. Health of the population can be secured not so much by guaranteed supply of drinking water, but, rather, by a good quality of this water. 1,1 billion of people have lack of drinking water. 2,4 billion of people do not have adequate sanitary condition. Approximately 6000 children die per year from diseases caused by unsafe water and bad sanitary conditions, the number equals to crashes of 20 huge airlines. Each 8 second from diseases caused by water one child dies.

Pollution of rivers and seas by sewage was the reason for crisis aggravation in health care field. The usage of mollusks as food mainly caught in polluted waters is the main cause of 2,5 million cases of infection hepatitis per year, as a consequence 25,000 people die and more than 25,000 become disabled because of liver disorder. Besides, because of lack of sanitary norms many women and girls suffer. In the whole world approximately all beds in hospitals are occupied by patients suffering from the diseases caused by infections from water.

More than 70% of existing resources of fresh water is used for agriculture purposes. Thus because of inefficiency of irrigation systems in developing countries 60% of water evaporates and returns back into rivers and underground strata.

During recent 100 years speed of water usage increased two times faster than the speed of population growth.

The report states that 70% of total water resources of Azerbaijan is formed on the territory of neighboring countries. The Republic's water resources are exceedingly limited and their bulk arrives from trans-boundary rivers. There are two major rivers in Azerbaijan: the Kur and Araz, which the majority of population use for drinking and irrigational purposes.

The Kur river (length – 1515 km) is the chief water-course in the South Caucasus with a catchment area of 188,000 km^2. The river takes its head in Turkey and flows in five countries: Azerbaijan (52,900 km^2), Iran (40,000 km^2), Georgia (36,400 km^2), Armenia (28,900 km^2) and Turkey (28,900 km^2). The Araz river (length – 1072 km) ranks second in the region after the Kur, with a catchment area of 102,000 km^2 (54,2% of the Kur basin). A considerable length of the river forms a natural border between Iran and Turkey.

A considerable part of the South Caucasus population live in the Kur-Araz river basin, where industrial and agricultural enterprises are located. Stagnation in economy and trade promoted crisis in social-economic situation of the population in the entire region.

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The Kur-Araz river basin is heavily polluted with chemical, physical, biological and radioactive contaminants, which have completely changed the physical, chemical, hygienic-sanitary and biological conditions of the rivers' water. Currently, the rivers' water contains heavy metals, pesticides and other unwanted ingredients. The heavily contaminated water is widely used for drinking, irrigation and fishery by the local population. Besides, the highly polluted river water produces an adverse impact on human health and the environment.

Generally rivers and their basins are influenced the following anthropogenous processes:
- Cutting down of woods;
- Agro-technical arrangements;
- Ploughing up coast and valleys;
- Trampling down and destruction of a grassy cover in result of cattle pasture;
- Growth of the urbanized territories;
- Intensive use of discharge in the recreational purposes;
- Use of potable water in the in the technical purposes;
- Uneconomical use of water in a life;
- Loss of a discharge at use of water with the purpose of irrigation;
- Loss of water because of an unsatisfactory condition of water supply systems;
- Absence of knowledge about the rights and duties of citizens in relation to an environment;
- Infringement of local acts and the International conventions on use of water objects etc.

Above-stated reasons cause the following consequences:
- Deterioration of water quality from the polluting substances, taken out with agriculture, cattle-breeding complexes and other run-off water;
- Cutting of wood, ploughing up abrupt slopes, and drainage of the grounds is frequently resulted to the amplification of high waters, intensifications of erosive processes, river silting, and reduction of low water level discharge;
- Excessive water intake for economic needs, creation of deaf dams can dehydrate the river;
- Unlimited fishing and hunting aggravate adverse consequences of the person activity for ecological systems;
- The big harm brings uncontrolled ploughing up of flood-plains and valley slopes of the rivers on arable lands and kitchen gardens etc.

At rational nature use, economic activities of the person should be combined with arrangements on preservation of the environment. Only at such approach it is possible to avoid serious negative consequences for the nature. After independence in 1991, Azerbaijan makes serious steps in improvement of an environment with attraction of the public. Thus managing documents are the accepted laws and the International conventions joined by the country.The water policy in the country first of all is carried out through the water legislation, in particular the Water Code of the country, also by National Plans, the State Programs and

Plans of actions.

The purpose of the State Water Policy of the country is supply a safe and high-grade inhabitancy of the person at satisfaction of his needs. The law of the Azerbaijan Republic "About protection of nature and nature use" in 1999 was replaced by new – Law "About preservation of the environment". This law corresponds to the requirements better, reforms carried out in the country and to the International conventions to which Azerbaijan has joined.

How said in the new Law: "The present Law defines legal, economic and social bases of preservation of the environment".

Some International Conventions Ratified by the Azerbaijan Republic, concerning to an environment is mentioned below:

- The Convention on the International trade of kinds of wild fauna and flora, which are on the verge of disappearance, Washington (CITES, 1997);
- The Convention on struggle against desertification (1998);
- The Convention on prevention of pollution of the Sea (Marpol Convention, 1998);
- The Convention on an estimation of influence on an environment in trans-boundary context (1999);
- About access to the information, participation of the public in decision-making process and access to justice on the questions concerning an environment (1999);
- The Convention on protection and use of trans-boundary stream flows and the International lakes (1999);
- The Convention on biodiversity (2000);
- The Convention on protection of wild fauna and flora and natural environment of their life in Europe (2000) etc.

The organization of water resources management of Azerbaijan is carried out according to the existing legislation.

In Azerbaijan the following organizations are engaged in questions of water resources management:

- The Ministry of Ecology and Natural Resources;
- The State Agency on Melioration and Water Economy of the Ministry of Agriculture, also:
- The Ministry of Fuel and Power (on questions of water use in the power purposes);
- The Ministry of Agriculture;
- Join-stock company "Azer-Su";
- Ministry of Health;
- Ministry of Justice (participates in acceptance and realization of the statutory acts, being legal base in the sphere of water resources);
- Local Enforcement Authorities;
- Non-Governmental Organizations etc.

In general protection and useful utilization of the environment depends on both authorities and society. We can only take care of our nature together. If we want to live better in connection with nature in the future then we need to live in harmony form with the environment. Let's make such kind of harmony as far as it is not late.

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A MUSHROOM POISONING IN ISPARTA, TURKEY

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In this study, a case of mushroom poisoning by *Inocybe dunensis* P.D. Orton in Isparta is reported and decumented. Description of the taxa, case of poisoning and taxonomic discussions of the taxa are presented.

Key Words: *Poisonous Mushroom, Mushroom Poisoning, Inocybe, Turkey*

Introduction

Poisonings by different kind of toxic mushrooms are unfortunately an important medical problem in Turkey. In spring and autumn there are several serious and fatal mushroom poisonings in Turkey due to eating of toxic fungi by local people. Some studies on mushroom poisonings in the country, brought important data to our attention (Işıloğlu & Watling 1991, Işıloğlu et all 1995, Aytuğ et all 1989). In the Spring of 2006, *Inocybe dunensis* was determined after a serious mushroom poisoning as a first record and of course, was first mushroom poisoning case of this species in Turkey.

Case history

The poisoning in Isparta involved three persons; the patient a man and his wife and his brother in law, were staying in Küçükkabaca village (Uluborlu, Isparta). On April 10th 2006, wild mushrooms were collected from hills near the village. The fruitbodies had been cooked in oil. The initial symptoms had started in one hour. Within one hour all patients developed stomach cramps. After two hours, patients began to suffer from salivation, lachrymation, diarrhoea and vomiting. After the typical symptoms of muscarine poisoning by *I. dunensis* patients quickly transferred to the intensive care unit of University Hospital in Isparta. Ten days later, after the various treatments all three patients are recovered.

The mushroom specimens were collected by mycological experts with the guide of villagers from the area where the patients gathered the mushrooms for culinary purpose. The identity of the specimens was confirmed by the patients' father and uncle. After laboratory examination in the fungarium of Muğla University, it was identified as *I. dunensis*. Interestingly, it was collected and consumed with confusion of an edible *Russula* sp.

Description of taxa

Inocybe dunensis **P. D. Orton**

= *Inocybe decipiens* Bres.
= *Inocybe maritima* Fr.

Pileus 30-60 mm , conical when young, later campanulate, convex to plane with an obtuse umbo, margin inrolled at first, later incurved, surface radially fibrillose to appressed-squamulase, somewhat split toward the margin, always with attached shiny sand grains even when dry because of distinctly viscid when moist, light brown to dark brown with usually a paler marginal zone (Figure 1) **Flesh** whitish when young, light ocher when old, thin, odor and taste not distinctive. **Lamellae** light ocher at first, gray-brown to brown later, narrowly attached to stem **Stipe** 30-60 x 3-8 mm, cylindrical and fragile, hollow when old, whitish when young, soon light ocher to light pink, flesh ocherish, slightly bulbous **Spores** 8-12 x 6-7 µm, subglobose to elongate, obtusely tuberculate, light brown, spore print: umber brown.

I. dunensis grows gregariously, rarely solitary in dwarf-shrub heats of *Salix*, on sandy soils such as on stream banks, in floodplain forests, on sand banks, Summer-fall (Moser 1983, Breitenbach &Kranzlin 2000). It was collected on sandy soil, near *Salix* in aprile from the area. This species is distinguished with its viscid pileus when moist and always with attached shiny sand grains even when dry , occurrence in dunes with *Salix* and spores only obtusely tuberculate or only undulating. It is poisonous and caused muscarine syndromes (Bresinsky & Besl 1990, Breitenbach &Kranzlin 2000). Although it is very different from *Russula* sp., with its microscopic and macroscopic features, it has been confused by patients.

Figure 1. Basidiocarps of poisonous *Inocybe dunensis*

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SOME INFORMATION ABOUT NEAR EAST UNIVERSITY

Near East University was established in 1988 and since then has grown to become one of the fastest growing universities in the world setting itself the strategic goal of joining the "top 500 universities in the world".

From 1988 until now, the University has managed to expand its physical infrastructure and improve its quality of education and scientific research to meet international standards. Near East University is a member of the European University Association, the International Association of Universities and the Federation of the Universities of the Islamic World. The University has over 3,000 staff, of which 1,000 are academic personnel. 17,000 students from 53 different countries are attending 14 faculties and more than 60 departments at the university. It has luxury halls of different sizes which in total cover an area of $350,000m^2$ and have the capacity to hold a total of 5,000 people. There are also 14 dormitories with a capacity of 5,000 students, but the construction of new dormitories is also planned.

Near East University has adopted life long education as its main mission. Thus, we begin with our Kindergarten, Junior College and Secondary High School which have a total number of 2,000 students. The faculties and departments offering undergraduate and graduate degrees are as follows:

FACULTIES

1. Faculty of Architecture
   - Architecture
   - Interior Design

2. Faculty of Arts and Sciences
   - English Language & Literature
   - Mathematics
   - Turkish Language & Literature
   - Psychology

3. Faculty of Economics & Administrative Sciences
   - Banking & Finance
   - Business Administration
   - Computer Information Systems
   - Economics
   - European Union Relations
   - Human Resources Management
   - International Business
   - International Relations
   - Marketing
   - Political Sciences
   - Information & Records Management

4. Faculty of Communication
    - Radio-Television-Cinema
    - Motion Picture Production
    - Journalism
    - Public Relations & Advertising

5. Atatürk Faculty of Education
    - English Language Teaching
    - Computer & Teaching Technologies
    - Pre-school Teaching
    - Elementary Teaching
    - Turkish Language Teaching
    - Guidance & Psychological Counseling
    - Human Resources
    - History Teaching

6. Faculty of Engineering
    - Civil Engineering
    - Computer Engineering
    - Electrical & Electronic Engineering
    - Mechanical Engineering
    - Biomedical Engineering

7. Faculty of Fine Art & Design
    - Graphic Design
    - Plastic Arts

8. Faculty of Maritime Studies
    - Department of Deck
    - Maritime Management
    - Marine Engineering

9. Faculty of Law
    - Law

10. Faculty of Performing Arts
    - Dramaturgy & Dramatic Authorship
    - Acting

11. Faculty of Pharmacy
    - Pharmacy

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12. Faculty of Dentistry
- Dentistry

13. Faculty of Health Sciences
- Nutrition and Dietetics
- Nursing

14. Faculty of Medicine

SCHOOLS

1.School of Physical Education & Sports
-Coaching Education
-Physical Education and Sports Teaching
-Sports Administration

2.School of Tourism & Hotel Management
-Tourism & Hotel Management

3. School of Maritime
-Deck
-Marine Engineering
-Maritime Management

INSTITUTES

-Institute of Education Sciences
-Institute of Sciences
-Institute of Social Sciences
-Institute of Health Sciences

With the opening of the NEU Grand Library in December 2005, the University has passed a new and critical mileage stone entering truly the information age. The Grand Library is fully computerized and linked to many major world libraries and research institutions throughout the world. The library has a collection of more than 600,000 printed materials and access to more than 110 million electronic articles. The library has recently been elected as the central library for the Turkic world and now serves universities of several different countries such as Azerbaijan, Kyrgyzstan and Turkmenistan. The library is open 24 hours a day serving not only the university but the whole community.

The University has until now organized 14 International Conferences & Congresses and many local and regional conferences, seminars and panel discussions on a variety of subjects. Near East University believes that the role of the University is not merely to provide formal education but to establish close relations with the wider community. As such, it places special emphasis on strengthening and developing campus-community relations. The University set up a Lifelong Education Centre (YABEM) which provides a wide variety of adult education courses. The University also makes the use of its facilities for cultural, sports and recreation activities available to the public.

As you can see, NEU is one of the fastest growing Universities of the world. The last two years has been devoted towards Health Sciences. This year, we began education in the Faculty of Dentistry, Faculty of Pharmacy and Faculty of Health Sciences. Another important improvement that has been made in our university regarding Health is that in September 2008, education has begun in the Faculty of Medicine. The Faculty of Medicine Research Hospital will be opened in July 2009. The Hospital will have a capacity of 500 beds with a $4,5000m^2$ closed area. The faculty will be giving full service but a special emphasis will be given to researches on Oncology and Cardiology.

NEU does not have boundaries in development. Therefore, a protocol was signed with IBM International in June 2007 for the construction of the NEU Innovation Centre. The building having a closed area of $8,500m^2$ was opened last year. It consists of 3 sections: NEU-IBM Innovation Centre, NEU-IBM Advanced Research Centre and the NEU Technopark. The 'super computers' used in the building have a capacity of 12 trillion processes per second. The research areas consist of Global Warming, Earthquake Stimulation, Defense Research (military), Space Research, High Physical Energy, Nanotechnology and Biotechnology research and product design, Medical, Pharmaceutical, Microbiological, Health Science and Social Sciences. NEU Innovation Centre is unique with its facilities in Eastern Europe, Middle East, Central Asia and Northern Africa.

BRIEF INFORMATION ABOUT
TURKISH REPUBLIC OF NORTHERN CYPRUS

History: Cyprus has been occupied successively by Assyrians, Babylonians, Egyptians, Persians, Romans, Lusignans and Venetians who have sought the island's wealth of minerals and timber since the 8th century BC. The Ottoman Empire conquered the island in 1571 and ruled it until the island was leased to the British Empire in 1878. In 1963, the Republic of Cyprus was established by the Turkish Cypriot and Greek Cypriots, based on political equality. The Turkish Cypriots were forcefully ejected from the state mechanism in 1963. Intercommunal clashes which broke out in 1960 continued until 1974. A military coup by Greece in 1974 aiming to annex the island to Greece was aborted by the intervention of Turkey, which was one of the Guarantor Countries. Following the Exchange of Populations Agreement in 1975, Turkish Cypriots moved to the north and Greek Cypriots moved to the south of the island. Consequently, the Turkish Cypriots established their own administration and in 1983, the Turkish Republic of Northern Cyprus was proclaimed.

Negotiations between the two sides under the auspices of the UN started in 1968, with the aim of finding a comprehensive settlement in Cyprus. The latest negotiation process came to an end when the compromise plan, Annan Plan, prepared by the then UN Secretary General Kofi Annan, was overwhelmingly rejected by the Greek Cypriot people. During the referendum held on 24 April 2004, whilst 65% of the Turkish Cypriots voted "Yes", 75% of the Greek Cypriots voted against the plan; thus, eliminating the possibility of establishing a new partnership republic. Despite their obstructionist attitude, the Greek Cypriot administration unilaterally entered the European Union under the usurped title of the "Republic of Cyprus", on 1 May 2004. The then UN Secretary General Kofi Annan, expressed his regret and noted that *"he hoped ways would be found to ease the plight in which the (Turkish Cypriot) people find themselves through no fault of their own"* (24 April 2004). In his report to the Security Council, he called upon the international community to *"cooperate both bi-laterally and in international bodies to eliminate unnecessary restrictions and barriers that have been the effect of isolating the Turkish Cypriots and impeding their development"* (S/2004/437). The current UN Secretary General Ban Ki-moon also referred to the economic and social isolation of the Turkish Cypriot people in his report to the UN Peacekeeping Force in Cyprus (UNFICYP) in December 2007, pointing out that promoting the development of the Turkish Cypriot people would make the reunification of the island "occur in as seamless a manner as possible." Observing the injustice against the Turkish Cypriots, who have been experiencing all kinds of inhuman restrictions for years, the EU also expressed its will to enhance the economic development of Turkish Cypriots through an aid package. The EU Commission adopted a proposal, which had foreseen the transfer of 259 million Euros financial aid. However, the Turkish Cypriots have not been effectively benefiting from the EU aid due to Greek Cypriot administrations' pressures.

After the Presidential elections in February 2008 on the Greek Cypriot side, President Mehmet Ali Talat has reiterated once again his readiness for a new process of full-fledge negotiations and expressed his sincerity towards a solution.

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Places to visit: In Lefkoşa (capital): Selimiye Mosque, Mevlevi Museum, Sultan Mahmut Library, Dervish Pasha Mansion and Lapidary Museum. In Gazimağusa: Antique Ruins of Salamis, Kantara Castle, Othello Castle, Lala Mustafa Paşa Mosque, Canbolat Museum, Ruins of Ayios Philion, St. Barnabas Icon Museum and Apostolos Andreas Monastry. In Girne: Kyrenia Castle, Bellapais Abbey, St. Hilarion Castle and Buffavento Castle, and in Güzelyurt: Soli Ruins, St. Mamas Monastry and Vouni Palace.

Nature: North Cyprus hosts over 1,600 plant species (22 are endemic), 350 species of birds (7 are endemic), and there are 26 different species of reptiles and amphibians. Every year, 250 different kinds of birds, around 100 million, migrating from Europe to Egypt pass through North Cyprus. The country also became home to some 50 different varieties of butterflies. Visitors are amazed to see that there are 30 different varieties of orchids on the island, 7 of them unique to North Cyprus. Rich underwater plant life and 200 different types of fish are making the blue Mediterranean waters attractive for sea lovers. 30% of the turtles in the Mediterranean, amongst them Carretta Caretta, Chelania Mydas (Green Turtle) and Dermachelys Corniacea, come to the coasts of North Cyprus for breeding.

Life-style, Culture: Turkish Cypriots are well-educated, social and hospitable people. North Cyprus is popular with its handicrafts, cuisine, traditional music and folk dancing. The Turkish Cypriot Cuisine is famous for its kebab dishes and starters called "mezes". Daily fresh fish, meat, vegetables and fruit used in the Turkish Cypriot cuisine make the dishes both tasty and healthy. Local alcoholic drinks include rakı, brandy and red and white wine. Baklava, kadayıf and katmer are deserts favoured by most and Turkish Coffee is a must at the end of every dinner. The cultural and art facilities make the country attractive both for the tourists and foreign students. During the hot summer months, people prefer to relax by the sea whereas during the fall season, people go on picnics and long walks in the mountains and countryside. Indoor activities like exhibitions, cinemas, theatres and concerts are always available.

Electricity: 240 volts A/C. 50 Hz.

Traffic: Driving is on the left and international traffic and road signs are used. Maximum speed on highways is 100 km/hr. Vehicles entering North Cyprus must be insured upon arrival. Please refer to the Turkish Embassy or TRNC Representative Office in your country to check visa requirements.

Climate: North Cyprus enjoys a Mediterranean climate with long, dry summers and short wet winters. The average annual temperature is 19ºC. The weather in winter is very mild with temperatures ranging between 9ºC-12ºC. Average annual rainfall is 500mm.

Emergency telephone numbers: Fire 199, Police 155, First Aid 112
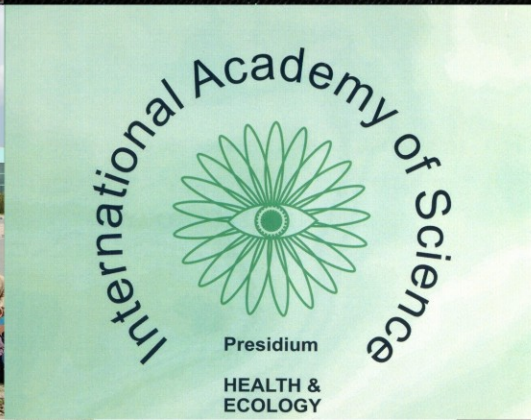
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