



**NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF ENVIRONMENTAL ENGINEERING**

**SOLID WASTE MANAGEMENT (SWM) – A PATH TO
SUSTAINABLE DEVELOPMENT IN MONROVIA, LIBERIA**

MSc. THESIS

BUTU LEVI

Nicosia

JANUARY, 2023

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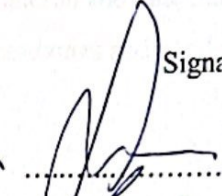
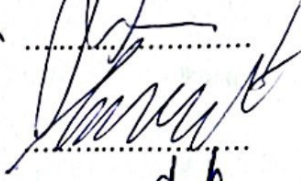

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Approval

We certify that we have read the thesis submitted by Butu Levi "Solid Waste Management (SWM) – A Path to Sustainable Development in Monrovia, Liberia" and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

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Declaration

I, the undersigned, hereby certify that all of the materials, documents, analysis, and findings included within this thesis have been gathered and presented in accordance with the academic regulations and ethical principles of the Institute of Graduate Studies at Near East University. I further declare that, in accordance with these rules and conduct, I have thoroughly cited and referenced any material and data that are not unique to this research. This statement was made so that these rules and conduct could be followed.

Butu LEVI

..... /..... /2023

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...../...../ 2023

Abstract**SOLID WASTE MANAGEMENT (SWM) – A PATH TO SUSTAINABLE
DEVELOPMENT IN MONROVIA, LIBERIA****Butu LEVI****M.Sc., Department of Civil and Environmental
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This study is intended to analyze the solid waste management (SWM) along with finding the suitable way through which the environmental sustainability of Monrovia, Liberia can be ensured. The study involved 305 survey participants from Monrovia. The data were analyzed using SPSS software. The findings suggest that waste generated in your household comprises mostly of the paper, plastic, glass and rubber. The waste generated is mostly separated before handing over to the waste collectors and the waste is mostly disposed by burning, burying or thrown in open spaces. There is a lack of civic education program on the importance of sustainable development and SWM in Liberia. However, the local government is taking serious steps to implement sustainable urban development. As Sustainable Development (SD) is directly concerned with people action to keep their environment clean. Cleaning the environment regularly is necessary for SD and having a proper system of waste disposal also affects the environment. In addition, the urbanization has become a social problem in this era, it affects SWM. SD of Monrovia Liberia, demands that citizens reduce all sorts of waste. As the community does not have a proper recycling system for waste disposal to maintain sustainability. The city council of Monrovia should make sure that people are adequately aware of keeping their environment clean for achieving SD.

Keys words: *Solid Waste, Sustainable Development, Urbanization, Monrovia, Liberia*

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Abbreviations

SWM:	Solid Waste Management
SW:	Solid Waste
SPSS:	Statistical Package for the Social Science
SD:	Sustainable Development
CLUS:	Cheesemanburg Landfill Urban Sanitation
EMUS :	Emergency Monrovia Urban Sanitation
EU:	European Union
JMP:	Joint Monitoring Program
CC:	Climate Change
GCCC:	Gulf Cooperation Council Countries
MSW:	Municipal Solid Waste
SW:	Solid Waste
SDG:	Sustainable Development Goals

CHAPTER I

Introduction

Background

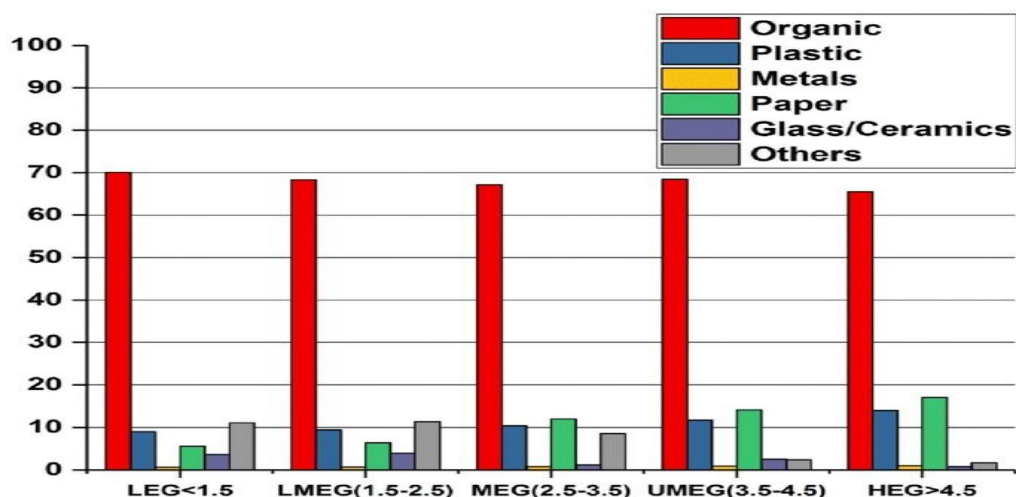
Liberia, also known as the Republic of Liberia, is a country lying on the West African coast. Liberia was recognized by the tolerant enslaved Americans in efforts to come up with the system which was looked after by the American Colonization Society in order to make a society where the enslaved people and the black West African could live. In the year 1821, around 20,000 tolerant enslaved people were deported to Liberia. Thus, the previous slaves were forced to establish in Cape Mesurado. The American Colonization society gave the names such as Monrovia and Liberia in 1824 (Büyüköztürk, et al., 2018).

Furthermore, the current economic condition of Liberia totally depends on Monrovia. Thus, there is an excellent difference between Monrovia and the other portions of Liberia in terms of wealth, infrastructure, and potential to contribute to the political procedure. Since Liberia is very rich in terms of natural resources as rubber was considered to be the backbone for the Liberian economy (David et al., 2019). Along with rubber, timber also supports the Liberia economy in terms of the country's major exports, whereas the foreign investments are growing in favor of the mining zone. Since the population of Monrovia is rising quickly along with the increase in the rapid urbanization and because of this urbanization, economic development, improvement in the living standards along with the change in the lifestyle and because of these factors, the generation rate of the waste has also increased. Because of the mismanagement of the solid waste, there has been a delay in the progress which would lead towards environmental sustainability. As there has been a rise in the commercial industries, an increment in the population size along with the urbanization and the expansion of the cities are considered to be the significant solicitude for the Solid Waste Management (SWM) efficiency. Waste is defined as anything which is un-useful, or it may be some sort of discarded material which is been used up, or sometimes it may be left over from the industrial, commercial, and sometimes from the simple household or domestic activities (David et al., 2020). Therefore, the primary purpose of SWM is ensuring a healthy environment, promoting environmental quality, and thus looking after environmental sustainability.

Moreover, a lack in the proper management of the waste thus contributes to the possible threat to mother- nature, which can come up with the risk for the human health and the environment. The main focus of SWM is to give a healthy environment that can be given only by the proper environmental disposal of the waste. Moreover, the environment can be made healthy by proper collection, storage, transfer, recovery, recycling, treatment, and proper disposal of the waste. But on the other hand, many developing countries are facing numerous issues connected to the good management of the waste. The main reason for the increase in the waste and the lack of control of this issue is because of the lack of the human activities (Mensah, 2006). Liberia is facing some serious issues related to the SWM because more than 70 percent of the population belonging to households throw over their waste in unauthorized sites.

Figure 1:

Source: <https://link.springer.com/article/10.1007/s10163-020-01046-x>



The above chart shows a difference in the waste composition by households belonging to different income groups. It can be seen that the waste created by these different income groups totally differs from one household to another household (Almazán- Casali, et al., 2019).

Problem Statement

Waste management is considered to be one of the headaches for cities authorized over the world. With the passing of the time, this problem is getting worse and worse along with the increase in the cost, the increment in the growth of the population along with the increase in the public awareness as they all combine together to put pressure on

the municipalities of the area because of the scarce resources to maintain the waste management. Moreover, the rallying of the ample resources such as financial, human and the equipment along with the maintenance of the practical institutional arrangements in order to bear efficient service delivery is hard to attain by some of the low-income cities and countries. Thus, this problem becomes more and more critical in terms of natural, civil, crisis, catastrophes etc., as the organized arrangements to bear efficient service delivery is broken or it has been weakened (Clark et al., 2020). From the past study, it has been seen that Liberia has suffered some severe civil crisis for the last two decades and because of this, there has been the destruction of many infrastructures and disorder of some of the essential services in the capital city of Monrovia.

Moreover, the 20 years of civil war in the country had and will continue to come up with the negative effects like the displacement of the human population, infrastructure getting destroyed, the exploitation of the natural growth undermining and the resources of the local productions and other coping mechanisms. As Liberia is careful to be the poorest country in the African continent. More than 1.3 million people of Liberia are living without the lack of the environmental waste and sanitation management services because of which the situation poses serious health-related issues for the people. According to some research, current waste management services covers about less than 20 percent and the disposal is thus unselective by the open dumping (McClain et al., 2017). The main course of the impermanence and the sickness in Monrovia are mostly diarrhea and the malaria diseases. The children under the age of 5 years of age are highly susceptible. Many of the assessments related to these missions have exposed that the principal humanitarian requires in order to displaced people who should have the access to the potable water enhanced sanitation and the malaria control. There have been a series of cholera outbreaks in the year 2003, which turned out to be an epidemic in Monrovia during which a total of 26651 cases were reported and many people were dying. Moreover, the collection and the management system are unproductive and useless. Thus, the big problems are the absence of the appropriate and more precise data related to the physical and the chemical composition of the waste and the magnitude of the waste as they developed throughout the nation, whereas the restriction of the comparisons in the developed and underdeveloped countries (Palomar et al., 2019).

Along with this, the lack of the sustainable approaches for many sources separating has also become a problem due to of the absence of proper infrastructure etc. as they have led to unsanctionable activities of waste handling such as the lack of biodegradable utilization of the waste as they tend to raise the volume of the waste content. This study also includes the choice experiment (CE) which is used to assess the household's valuation of some of the specific attributes which are related to the waste collection services. As there has been an estimation which is related to the mixed logistical model as they suggest that the household have high value to the waste been collected from the home and thus negatively value separating the waste. Furthermore, these results also highlight that there is a capacity for enhancing the Liberia's SWM by designing a suitable and reliable services that revolves around the household collection (Nyumah et al., 2021).

Research Aim

The main goal of this research is to study about the SWM along with finding the suitable way through which the environmental sustainability of Monrovia, Liberia can be studied and with this the proper solution can be found to control this SWM.

Research Objectives

- 1) To identify the steps taken by the government in order to bring developmental sustainability.
- 2) To identify the measures which can be taken to control SWM.
- 3) To examine the impact of SWM on the residents of Monrovia, Liberia.

Research Questions

- 4) What are the steps taken by the government to control the diseases caused by SWM?
- 5) How can the environment be made better in order to keep the sustainable growth?
- 6) What are the causes of the outbreak of the solid waste (SW) in Monrovia, Liberia?

Significance of the Study

This study focuses on the impact of SWM on the Sustainable Development (SD) of Monrovia, Liberia as this is the most focused issue in Monrovia because the environment is getting harmful because of this. This study addresses the Monrovia

government and the administrative department in order to analyze how these barriers and issues can be overcome in order to create a SD (David, et al., 2020).

Limitations of the Study

In terms of this research, the limitations in terms of Solid Waste Management (SWM) can be the costly transportation of the waste which is considered as the major limitation. Thus, the transportation of the waste products from the households to the processing plant is considered to be a costly process. Moreover, the careless dumping of waste is considered to be another limitation (David et al., 2016).

Definition Key Terms

SWM: It is defined as the collecting, treating and the disposal of the solid material which are disposed of as they have served their objective or they are no longer useful.

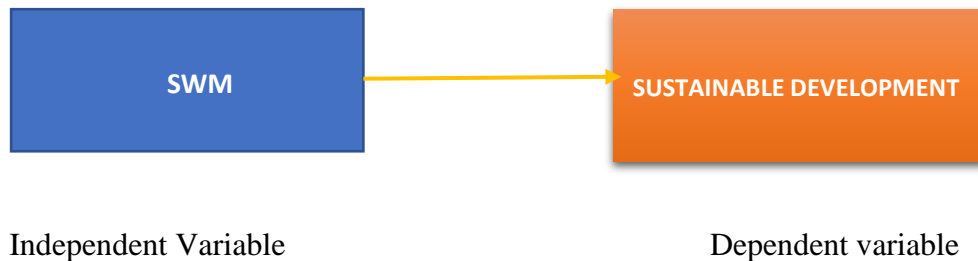
Sustainable Development (SD): SD can be explained as the development that helps in meeting the needs in the present time without bargaining about the ability of the coming generation in order to meet their needs (Butu, and ASLANOV

CHAPTER II

Literature Review

In terms of the public/private partnership in terms of the Solid Waste Management (SWM), it can be viewed as the sociological theories related to the functionalism and the general system. In terms of the functionalism theory, it is important for the institutions to survive despite having the change circumstances by the means of interdependence in terms of their various branches and partners. PPP in the SWM is adapting this theory well in terms of the partners as the parts of the whole organization as they deliver the services. Since both the partners (public and private) are considered as an interdependence body belonging to the larger organizations as each of them are having their specialized functions as they are working as the whole in pursuit of achieving the common goal that is to deliver effective services. Since both the functionalism and the common theory assists in the visualization of the partnership as adapting, living beings struggling for their survival in this changing world. Thus, this viewpoint is very important in analyzing the needs, related to the evolution and the future directions of the partnership (Ahmed et al., 2004).

There are many relative economic studies that have been conducted in order to differentiate between the similar public and private corporations. From many past researchers, it has been seen that private sectors dependably generate more profit, and they are also efficient in terms of the operations. Some of the economists have pointed towards the theory of property rights and thus shows a belief that in order to create incentives to excel, the duty lies on the shoulders of the ownership. In some of the private industry, the persons and the commercial business usually succeeds by paying no more than needed. On the other hand, the businesses pay the market rate, as they pay no more than the requirement of the labors, suppliers and the capital. But in accordance to the difference, government also produces services and goods from the market as they provide them for the public service, but in this scenario the market competitiveness is not functional. Which in turn results in the higher cost (Hettiarachchi et al., 2018).

Figure 2:*Conceptual framework***Hypothesis**

Solid Waste Management (SWM) have a negative effect on the Sustainable Development (SD).

Solid Waste Management (SWM)

Almazán-Casali, et al., (2019) stated that in terms of the solid SWM, there have been a rise in the commercial industries, the size of the population has also increased, there have been a rapid urbanization and the expansion of the cities are considered to be the major concerns regarding the SWM efficiency. Therefore, the main focus of the SWM is to guarantee a healthy environment as they address the issues which are related to the ecologically friendly waste disposal. Thus, the healthy environment can be achieved by the appropriate collection, storage, transfer, recovery, recycling, proper treatment and the waste disposal. But there are many under developed countries that are facing numerous problems in order to manage the waste competently. Since the main factors that contribute to these issues are the population growth, economic development, rapid urbanization and thus the change in the consumption patterns and people having improved living standards. Whereas, (Clark et al., 2020) argued that the mishandling of the SW occurs because of the lack of the financial resources, poor treatment systems, and not having proper disposal facilities, along with the lack of the skilled professionals and unsatisfactory technologies for the ample management. As the waste management has become a large problem for Monrovia for many years. Thus, the waste management in Monrovia is rare, and there is a substantial amount of domestic SW which is generated but remains uncollected. Therefore, the industries and the individuals will dispose and dump the waste in the open spaces, at the corner

of the streets and in the swamps, thus creating a threat for the health of the public (Bundhoo, 2018).

In addition, (Nyumah et al., 2021) noticed that in accordance with the Environmental protection Agency (2013), SWM faces the problems which comprises of the low public awareness related to the waste and thus the risk associated with the health of the public if this waste issue is not handled properly, along with the poor environmental education, having a lack in the communication and the participatory approach between the stakeholders and the strategies makers. Subsequently, the insufficient resources are also directed towards the waste management services, having insufficient governmental provision, and thus lacking in the implementation of those policies. Monrovia, a city in Liberia, has suffered a huge increase in the generation of the waste and the reason behind this is due to the rapid urbanization, population increment and the change in the consumption pattern. About 33.35% of the overall Liberian are living in Monrovia. (Bundhoo, 2018) observed that with the period of time, the situation of Monrovia is getting worsened because of the inadequate technological factors along with the technical, financial and human resource capacities. Thus, the main focus of this research is to analyze the domestic factors of the SWM in Monrovia and comes up with the relevant sanctions in order to provide a SWM in Monrovia. The main problem of this research revolves around the lack of the services which are provided to SWM, proper administration on the implementation of the policies, and those who got failed in achieving the goals related to the viable domestic SWM (Milbrandt, 2009).

On the other hand, (Apeh, 2018) argued that like many other countries, Liberia is also facing the problem of the increased waste generation. There are numerous ways because of which the waste is generated daily, which includes the elements ranging from prosperity, rapid development in the economy, rapid urbanization, the change in the consumption level of the people, the rapid growth of the population etc. In some of the most developing countries, there is no proper management of settling the generated waste. Therefore, the Liberian Government comes up with the steps in order to manage this SW issue to an extent. Between the year 2015 to 2018, the European Union and the World Bank step forward and given a financial support to the Liberia three big projects regarding the SW which were the Cheesemanburg Landfill Urban

Sanitation (CLUS), the other one was the Emergency Monrovia Urban Sanitation Project (EMUS) and the last project was the EU Water Facility project. According to (Ikhlayel, and Nguyen, 2017), the main purpose of these projects was to provide support along with the minor waste grouping which will result in the enhancement of the disposal and the sanitation in Monrovia. Because of the efforts of the World Bank and the EU, the infrastructure for the SW were set up at two transfer stations which were in Stockton and Fiamah, three different weighbridges (landfills and transfer stations) were installed along with the 120 communal disposal locations were created throughout the greater Monrovia different areas and in the last, a sanitary When Town landfill. There out of two projects which were the EMUS project and the other one was the EU Water Facility Projects ended because of the outbreak of the Ebola virus (Taiwo, 2009).

Meanwhile, (Baud, et al., 2001) argued that the third project which was the Cheesemanburg Landfill Urban Sanitation (CLUS) was started to aimed at enhancing the contact with the SW collection and the disposal of the waste in the Monrovia and also in the different parts of the country as it was in the process and thus it is normal to put back the When Town facility within two years. Since the progress has been made in order to manage the waste, the main challenge which still exist is of the defendable Solid Waste Management (SWM). Because the effect of the undependable SWM practices widely includes the land degradation, the breeding sites for the mosquitoes and many other flying insects, different type of diseases, the impact on the land valuation and in last the illness. There are many developed countries whose first and foremost duty is the proper management of the waste activities which have been completed with the adaptation of the 4R's which are reduction, reclaiming, recycling and re-usage of the scrap. Almazán et al (2019) argued that moreover there are many other developed countries and some of the developed countries which includes China, South Africa, Australia and the Netherland who have adopted the waste-to –energy (WtE) approach. This waste to energy approach involves the step-by-step cycle of treatment through which the energy is produced in the form of power, because of which there is a clean production of the renewable energy along with the recovery of the resource from the sustainable management. Furthermore, some of the studies have also shown that the utilization of the SW is considered important environmentally, socially

and economically. Therefore, it is necessary for the developing nations like Liberia to make this way implemented in order to manage the waste which will minimize the pollution in the environment (Oyebode, 2013).

As per the study done by Bundhoo, (2018), Liberia, which is considered as the consigner to some of the major environmental contracts also lacks as there is a gap between the sanction of these contracts and the implementation of these resources. Having the lack of the knowledge related to the implementation of these integrated programs, which have defectively skilled individuals, having the financial issues, lack of technical, strategically and technological resources, along with unpredictable guidelines which relates to the waste management, lacking in the systemization of the informal reprocessing industry, therefore having less research and development based activities, thus some of these issues also includes the absence of the engineered sanitary landfills, lacking in the opportunities related to the recycling and the lack of the proper infrastructure have largely contributed to the increase in the trend of the uncritical dumping of the waste in Liberia. Therefore, because of the lack of the scarce research and development activities in Liberia, there has been a limited amount of research available related to the municipal SW disposal. But according to Townsend et al (2019), in the recent years, there have been minimal amount of research done which relates to the environmental problems in Liberia. The study on the mining sector was conducted in 2017, which focuses on the current practices along with the environmental problems which revealed that the industrial mining is linked with many environmental effects which includes the pollution, land deprivation, the loss of the biodiversity and the contamination of the water present underground. Moreover, a study was also connected on the urban planning in Liberia shows that the 14 years of the civil war resulted in the destruction of the infrastructure in the capital city of Liberia, Monrovia. From the EMUS report, it is revealed that Liberia will be needing more ample help from the developed countries ranging for longer period than expected with regards to their waste services collection, recycling activities and the final disposal of the waste (Ferronato, et al., 201

Sanitation Trend in Liberia

Apeh (2018) notifies that in the current time, the sanitation trend in Liberia is considered as the “Deadly Gap” which is given by the Joint Monitoring Program (JMP) who are responsible for the delivery of the water and sanitation. Moreover, some reports from JMP shows that about 25 percent of the population of Liberia have ample access to the clean drinking and using water and about 15 percent of them have ample sanitation services. Moreover, from the different resources, it is also observed that about 18 percent of the death cases in Liberia happens because of the association with the disease which is caused because of the poor water and sanitation system. Bikash et al (2022) argued that the lower number of the death facilities happens because of the fact that the facilities are not present or they may not be properly hygienic and useful. Moreover, it should be noticed that there should be a difference in accessing the sanitation with the developed countries and within the suburban areas and thus between the rural and the urban areas. For instance, in Mamba Point, Sinkor and in other high economy district of Monrovia, the effective sanitation system is only available for 35 percent of the population, but in the Grand Kru country, Maryland country, Soniwein and in many other slums communities, there is a less equivalent proportion which is less than 3 percent. Thus, in the review, it also states that the sanitation issues are mostly determined in the urban economic areas, whereas the poorest coverage of the sanitation system can be found in the overpopulated slums and rural communities.

Impact of Urbanization

As reported by (Ianoş, et al., 2012), according to the United States Census Bureau, it was reported in 2012 that the population doubled in less than 50 years and increased by more than 7 billion. UN studied in 2011 and concluded that 55 percent of the total population lives in the cities and more than 400 cities have a population of more than 1 million. It was estimated by them that more than 83 percent and 53 percent population of the developed developing countries respectively will shift to urban areas of their countries by 2030. Environmental quality, resources availability and natural dynamics have a significant threat as urbanization is rapidly increasing with the

increasing global population. The understanding of the hydrological processes (urban) still is the priority when it comes to hydrological science. The United Kingdom has a long history of urban expansion and related deterioration of the water environment in the cities, which improved in the late twentieth century, thanks to technological advancements and ecologically inclined laws. (Pujara, et al., 2019) argued that the water quality in the urban areas is still a concern, particularly with the existence of new and unrestrained materials and increasing population, an advanced value positioned on ecosystem services, and ambiguity about the effects of climate change on regulatory factors of the quality of water such as environmental flows and temperature. Since the second half of the twentieth century, urbanization has become a significant driver of changes in land use and, as a result, a danger to biodiversity across the world. The makeup of biotic communities has been documented to shift as a result of urbanization. It can lead to biotic merging by replacing non-urban professional species with urban adapted, mostly generalist species that can exploit the wide variety of resources and habitats that urban areas provide. Urbanization, even if it is very low, has been renowned as a significant driver from very long to river ecosystems; flow disruptions, water quality changes, and direct habitat alterations all have an impact on many streams across the globe on the health. On the other hand, according to (Lerpiniere, et al., 2014) states that since there is a great attention which has been dedicated to the impact of stormwater management methods on peak flows and urbanization, the effects on base and low flows have received far less attention, with broad studies in the literature focusing on stormwater administrative impacts only. The same literature body on the effect of stormwater (SW) administration on base flow and low flow can be in portion described by the difficulty of the subsurface flow group procedures in catchments of urban, where many alterations by the balance of water are reasoned by boomed imperviousness, exterior inputs of water, and possibly enduring climate changes (CC). With the present urbanization procedure in the Gulf Cooperation Council Countries (GCC), important alterations happen in their landscape. Such a procedure could guide to a boost in the temperatures of the urban area related to their country surroundings, starting 'islands' of greater temperatures. Sotamenou et al (2010) argued that because of this situation, some foundations have appeared that the metropolitan cities centers are in warm weathers similar to those of

the Gulf Cooperation Council Countries knowledge raised temperatures in the series of 2 °C–4 °C, while related to their country surroundings. This alteration is what creates the urban heat island impact, which is normally plain on made situation surfaces and in the environment. The boost in impacts of surface temperature upon the power of limited and temperatures of downwind ambient air, particularly those nearby to the surface, for the reason that of many convective warmth changes from the surface (Rodić, and Wilson, 2017).

Solid Waste Management (SWM) and Environmental Agenda

Samiha, 2013) observed that SWM has enthused towards the forefront in terms of environmental agenda. Therefore, the actions which are needed to reduce the environmental risk in order to control the SW treatment along with the operational activities which are related to the disposal have reached to the exceptional levels. Thus, the country is bearing in mind to put restrictions on the packaging and controlling of the products in order to lower the SW generation rates. The local and the regional governments are considering the waste to be separated for the purpose of recycling, and on the other hand, some have also established the recycling targets. Furnaces and the waste to power plants are been equipped having the state-of-the-art proper air pollution controlling system. The landfills are designed using the liners, impermeable caps and liquid compilation systems along with the gas and the water present in the ground is monitored routinely. According to (MacRae, et al., 2015), the past studies consider a local issue which was connected to the SWM which has now international and global implications. Moreover, there have been some concerns which are considered to the shipment of the hazardous waste material as this was done under the adoption of the Basel convention signed by the United Nations. Moreover, in order to recognize the interaction between the SW standards and economic development, therefore EU is planning to move forward and correspond to the waste disposal requirements in other under developed countries. SWM in terms of the countries where the economy is developing constitutes a special set of problems. Therefore, in these types of countries, there is no proper financing available which can be used to construct the waste treatment facilities, along with having a low or a smaller number of trained personnel which can be used to operate the waste management system. (Hahn, et al.,

2014) observed that there are no proper rules and regulations or no specified control system present, there is no administrative body present who is responsible for the solid waste (SW) control and therefore, there is no proper compulsion which the industry has to face in terms of the disposal of the waste properly. Therefore, the SWM plan makers who are present worldwide should have the thorough and dependable information regarding the technical performance, the environmental impact and the overall cost of the SW collection along with the recycling, treatment and the proper disposal systems. Furthermore, it binds the country in terms of the lawmaking and supervisor, as they are responsible to adopt an overall environmental policy which can be formulated into the national development plans which can prove to be environmentally workable. SWM is considered to be the greatest threat to the health of the public in Liberia. Therefore, none have been done virtually to manage the waste issue because of the financial support to the waste management sector (Tong, et al., 2021).

CHAPTER III

Methodology

Research Design

This research adopted mixed research methodology. The study conducted on the SWM and the Sustainable Development (SD) will include the mixed research methodology. It will be having the elements of qualitative and quantitative approach; as it will involve the collecting, analyzing and the interpretation of the data which is related to the quantitative and the qualitative data. Moreover, in this mix method will be studying and investigating about the primary phenomenon of the subject matter and thus how it will be useful to gather the in-depth perception about the given problem and to generate a new idea for the given research (Novikov et al., 2013).

Research design mentions the complete approach which a researcher selects to assimilate the various workings of the research in an intelligible and rational means, in that way, making it sure that a researcher will efficiently discourse the problem of research; it establishes the proposal for the gathering, depth, and examination of collected information. Most researchers use two common research approaches to perform many studies, i.e., quantitative or qualitative approach. Quantitative work essentially aims at estimating the causal relationship between variables soon know the phenomenon and precisely supported numerical and quantifiable terms.

Participants / Population & the Sample / Study Group

In terms of research about the SWM and the SD, the main focus was on targeting those who belongs to the SWM authority of Monrovia who are responsible for the collection of the waste and disposing of the waste in the proper dumping area (Cordenet al., 2006).

In the mixed research methodology, it demanded the on-field engagement by using the means of Interviews, surveys, having specified focus groups, observations, analysis and using the secondary research that focuses on the collection of the data in the form of texts, images, along with the audio and the video in terms of the broader purposes for the in-depth understanding and verification using the Monrovia as the focused city

Data Collection Tools/Materials

The method which was used to gather the data for the purpose of this research included surveys. The data that I have collected is totally primary since it was collected by the distribution of the questionnaires and the by asking the close-end questions. A survey was conducted having a total sample size of 305 survey questionnaire. These 305 survey questionnaires were distributed to all different areas heads who are responsible for the cleaning of the waste. The survey questionnaire will be consisting of a five- point Likert scale starting from strongly disagree and ending at strongly agree (Alshenqeti, 2014).

Data Collection Procedure

The surveys were from different government employees who were looking after the SWM process in Monrovia. The close-ended questions were asked in the survey. A survey questionnaire was distributed to the 305 people, and these respondents were therepresented one of the waste management authorities from different areas of Monrovia. The areas were the WestPoint, Old Road, Peace Island and the Sinkor belts. Thus, the overall sample which is of 305 people in conducting this research were distributed (Johnson et al., 2003).

Data Analysis plan

The data which is gotten from the on-field research will be tested by using a statistical software called as Statistical Package for Social Sciences (SPSS). Therefore, the data obtained from this software were presented in the graphical form in order to explain the results which is obtained from the survey questionnaire (Ngoc, and Schnitzer, 2009).

Conclusion

This research methodology basically provides us with a scientific, logical and theoretical analysis of the procedures which are utilized in any field to know the research objective. The analysis, sample size and target population in this chapter together with sampling techniques and plenty of other factors were discussed. Moreover, this chapter includes the aim of the analysis together with the instruments utilized for data collection.

CHAPTER IV

Findings and Discussion

This chapter presents the discussion of these findings in comparison to the studies in the literature.

Solid Waste Management (SWM) and Sustainable Development (SD)

Researchers (Căilean and Teodosiu, 2016) and others (Kruljac, 2012) have identified a link between the difficulty of decreasing pollution produced by solid municipal waste (MSW) and the challenge of attaining sustainable development in the past (SD). To decrease the breadth of alternatives available for NE development and boost the demand for the profitable dismantlement of existing colonies, changes to economic and contemporary relations are required. Environmental regulation of municipal solid waste (MSW) is difficult since the principal sources of MSW are homes, institutions, and settlement civil authorities. These sources are diverse and can be found in a number of locations (scattered throughout the territory). Another study by (Kruljac, 2012) also confirmed that insufficient environmental and social training and people's lack of understanding serves as a barrier to the establishment of MSW flows and the propagation of problems in everyday life. As a result, the best way to address this software issue is to employ a suitable system. In the system of natural sciences, garbageology deals with the study of waste and strategies for its disposal. The peace agreement lists 17 main SD goals and a list of important activities that may be followed to achieve these goals. It was possible to decide that the following are the most appropriate goals for municipal solid trash after doing study into how the goals of sustainable development connect to the influence that waste has on the surrounding environment: (a) Taking proactive steps to combat environmental change and its consequences, (b) Providing everyone with inexpensive, dependable, and up-to-date energy is a priority, (c) Ascertain that everyone has easy access to water management and disinfection, (d) Protect, repair, and promote the most efficient utilization of the earth's terrestrial biological systems, (e) Make efforts for the production and use of sustainable materials available, (e) Establish a solid foundation and strive for an integrated and practical industrialization and development plan. There is currently no evidence based on SW observations. After doing research on a significant number of waste resources relevant

to Solid Waste (SW) problems, it was possible to estimate the extent of climate pollution by summing together the main estimates. The analysis of a vast number of waste resources makes this feasible. According to data performed by the World Bank, the United States (18%), China (15%), Brazil (4.3%), and Japan (4%) are the leading nations producing municipal solid waste to the worldwide market, accordingly. Each of the following countries produces more municipal solid trash at a rate ranging from 2.4 percent to 3.7 percent: Russia, Germany, the United Kingdom, Italy, Mexico, India, and Turkey. The entire MSW that is represented by any other state is around 36%.

The findings of the study by (Agamuthu, and Hansen, 2007) suggest that the natural system of the World Bank corresponds to the ecological pollution of SD and the partner of social needs problems and personal satisfaction of the population. The most quantifiable data collection that is freely available to the public and includes vital estimates of the proportion of infected domains of different nations in 2019, such as Russia with 63%, China with 81 percent, the United States with 36%, and Finland with 12%. Russia annually supplies around 6.2 billion tons of various forms of garbage. By and large, 445 kg per person. Table 1 shows the ratio of municipal solid waste facility construction in Russia and the United States of America, which has the world's most developed economy. More than 80% of garbage is thrown away rather than being reused, and is instead disposed of in landfills. There are around 11,000 landfills in Russia, with a combined capacity of approximately 82 billion tons of waste. Only three to four percent of municipal solid waste is recycled, although 35% of modern garbage is recycled. In order to regulate SW in Russia, legal measures are being developed (89-FZ "On Production and Consumption Wastes"). The building of SW export in Russia and the world's major economies revealed a large difference between Russia's export ambitions and those of all other nations (Agamuthu, and Hansen, 2007).

It was found by (Mani, and Singh, 2016) that SWM rehearsals vary greatly by region, country, and even within a country. Current board waste approaches support waste agerduction, recycling, reuse, soil fertilization, and safe disposal in landfills, although these are often not drilled. In developing countries, a huge amount of waste is not reused. Waste management is also of interest and therefore makes it difficult to processor dispose of the manure. Accordingly, a huge amount of software in developing

countries are thrown into open landfills and usually copied. Types of Waste the Council in many cases rehearses the impression that there are rules and approaches that control waste management and demand, available subsidies, synthesis and the amount of waste produced. In many developing countries like Liberia, both civilians and private service providers are responsible for SWM. Sorting often takes place at the source or a non-permanent offloading site, and final removal often takes place at an open offloading site on the outskirts of the city. Unloading sites are often random open areas where cargoes store waste. Garbage buried in landfills is often used as reusable items, recyclable materials, and is commonly consumed for weight loss. Due to restrictions on the placement of MSW at any stage, the synthesis of MSW is difficult and may contain modern, medical, electronic and human waste unloaded at similar open areas where all other metropolitan waste is unloaded (Gonçalves, et al., 2019).

(Halliwell, 2010) discovered the following environmental indicators: the volume of toxins released into the atmosphere during municipal solid waste disposal; the volume of wastewater discharged into water bodies during municipal solid waste disposal; the acoustic impact (noise) on the climate during municipal solid waste disposal; the volume of ozone-depleting substances released during municipal solid waste disposal; and the promotion of innovative solutions. the amount of fruit and vegetable land that has been utilized. In the same way the findings of the study by also suggest that assessment of the picture of the implemented enterprise with the participation of SW; the degree of organization in the organization benefits from the use of modern achievements that reduce the degree of waste management; the degree to which professionals have contributed to the solution of SWM issues is considered, and how motivated are they in continuing to do so?; development of an overall assessment of the benefits of using assistive products generated from MSW; the use of municipal SW lead to the creation of new jobs and a decrease in unemployment; use of SW to improve industries as well as small and medium-sized organizations; At all levels of municipal solid waste management, efforts for the benefit of mankind and elements of municipal solid waste categorization give a solution to the problem of the necessity to restrict the placement of municipal solid waste (MSW) and natural contamination; Working with

municipal solid trash necessitates tight data and material flow control in order to reduce the environmental impact to a manageable level. Ideal methods of disposal are perceived as accompanying: the main or separate assortment of MSW; production of SW in a sterile and modern area; Municipal solid waste is buried in closed landfills as a disposal strategy; extravagance; cremation to increase the size of MSW (Goddard, 1995).

The findings from the survey conducted in Monrovia Liberia indicate that family or civil theft usually comes from a variety of sources related to various human endeavors. Similarly, several past studies (Buenrostro, and Bocco, 2003); It has been demonstrated by Kebede et al. (2019) that the majority of civilian software developed in non-industrialized nations is held by households (55–80 percent), followed by market or commercial areas (10–30 percent). The latter is made up of a variable quantity produced by enterprises, roadways, financial institutions, and a variety of other sources. SW from such sources is, for the most part, uncommon; it is diverse in nature. As a result of the diversity of their origins, their physical attributes and chemical make-up differ from one another. Yard waste, metals, paper, rubber, cowhide, batteries, hidden materials, materials, paint holders, crushing and development resources, and other complicated goods are all part of their task. The heterogeneity of such released software lies in the significant complexity of its design and use as a material. Therefore, there is a corresponding requirement to fractionate and sequence these losses prior to any significant purification process. The structuring and isolation of such tranches, according to survey participants in Monrovia, Liberia, is one of the most essential and common tactics utilized as the major stages in SWM to offer information on the nature of isolated units for any intended application. In any case, the development of any isolated SW depends primarily on public attention and dynamic investment of such waste generators in various networks (Baud, et al., 2001).

The Solid Waste Generation (SWG) is a complex issue of concern across the planet, especially in every metropolitan area. Such ARGs are seen as perhaps the most difficult problem faced by most agricultural countries suffering from the detrimental effects of environmental pollution caused by the huge amount of ARGs. The rising average age of sanitation employees in cities has had a substantial impact on sanitation

problems as well as basic administrative issues such as disinfection facilities, water supply, garbage collection, and transportation bases. According to a number of studies (Rodi and Wilson, 2017), managing the sorting, storage, transportation, and disposal of municipal solid waste (MSW) is a considerable difficulty in metropolitan urban settlements and regions (Thakur et al., 2021). This is a serious concern for these scholars. Urban inhabitants in East and North Africa, as well as those in the majority of developing countries, face the same critical challenges as are associated with SDGs. The failure of these areas' economy, namely the poor outcomes obtained in the angle grinder, is the root of these problems. This is the major cause of the issues. Most of these agricultural countries are failing in terms of SWM and productivity due to the limited assets available and the competing demand for their assets. Therefore, SRH; without a doubt; one of the real and serious problems facing numerous urban areas on the planet.

Previous research (Ferronato, et al., 2018) and (Onyelowe, 2017) show that other financial considerations influence the Sustainable Development Goals and the organization at the same time. The normal size of a family, the number of rooms in a home, the monthly wage, and the work status are some of the other financial considerations. In addition, it was found that there is a direct relationship between SW implementation and social exercises at the local level. Moreover, various elements of memory changes in source placement and product use behavior are among the various variables that affect the location and number of SWs in families. Socio-social, financial, legal, political and natural variables, as well as available assets are fundamental issues affecting the management of MSW in all countries. To do this, leaders and WGs must accept any innovations for MSW, taking into account the results and impact on the socio-social and economic environment of the region (Pujara, et al., 2019).

The participants in the research in Monrovia, Liberia, agreed that the amount and structure of municipal solid waste (MSW) has changed as a result of changes in the way human behavior is exploited, as well as rapid breakthroughs in innovation. According to the findings of a study undertaken by the European Environment Agency between 2001 and 2010, the amount of municipal solid waste (MSW) supplied yearly

per inhabitant by 32 European countries increased in 21 countries while decreasing in 11 countries. In addition, the researchers looked at the amount of abuse that happened in 26 different countries between 2001 and 2008, and they discovered that in six of them, the numbers had decreased. As a result, the amount of garbage and its features differed from one country to the next, as well as from one location to the next, even within the same city, which agreed on the elements indicated, such as individual proclivity to use. Furthermore, waste qualities differed from one location to the next, even within the same metropolis (Debrah, et al., 2021).

Solid Waste (SW) Collection and its Transportation

The study by (David, et al., 2020) confirmed that waste sorting and transportation means the control of waste from the age mark to the place of processing or removal. Examples of the assortment method include door-to-door delivery, local stores, site visits, and contract assistance. The method of administration varies depending on the geological regions. The rules in place in the area determine whether waste should be separated or combined. Non-industrialized countries, in contrast to affluent ones, create extremely little to nearly no waste. In any case, garbage collectors take out recyclables to earn money. During their activities, the collected waste often remains scattered, making waste sorting and disposal a very serious problem. In any case, when their activities are properly coordinated, garbage collectors can be successfully included in the waste management structure to help managers spend money.

Another study by (Lakioti, et al., 2017) also confirmed that the waste management in developed countries is very efficient, despite the small SWM financial plan for the pasture. Developing countries, on the other hand, allocate a portion of their SWM budget to assortment benefits, but their assortment rates are lower due to poor assortment management and transportation. "House-to-house sorting of containers," which also includes sorting containers in yards, is the most typical method of distributing collection in Bangalore City, East Africa. The inventors of the system observed that the rubbish is moved from the hand trucks used for collecting to the dump trucks that are parked at the collection location for self-collection. Households in Bangalore City, East Africa, deposit trash in local bins, which are then collected by the Metropolitan Chamber or private administrators and transported to collection sites across the city.

In most cases, private administrators gather spenders directly from the source. Private administrators negotiate with people about the cost of garbage sorting, while commercial facilities, such as shopping malls, hire private administrators to collect garbage. The communities are also dependent on fees for squandering shares of capital. The metropolitan poor receive little or no waste of inventory management due to cluttered streets, squatter settlements, and neglect by metropolitan communities. The assortment of waste in the megacities of East Africa depends on the honesty and level of payment of the region of support. According to the Ghana Housing and Population Census conducted in 2010, around 2.5 percent of Ghanaian families have homes or modifications such as curbside assortment. On a communal level, 4.8 percent of households collect trash directly from their homes, while 7.9 percent of families eat their own garbage. Moreover, 57.6 percent use various family storage facilities for the container and send it to public landfills, including public stations or cleanrooms (Lakioti, et al., 2017).

Management of Solid Waste (SW) in EU.

According to the findings of the research (Oduro-Appiah, et al., 2020), waste yards, compartments for collecting and transferring trash, as well as its transportation, storage, and categorization, are all controlled by administrative and legislative directives. It is generally widely accepted that the media, which are seen as domestic aces, effectively carry out their teaching mission with the general public. The "trash cops" are in charge of ensuring that all cleaning requirements are met. They have the power to impose severe sanctions on anyone who disposes of rubbish in inexplicable places. A number of methods have been undertaken across Europe's various nations in order to urge people to carefully segregate their garbage. Teenagers in Berlin, for example, are paid financially for picking up rubbish and turning it in so that it may be reused. In the Netherlands, professionals provide exceptional purity certificates to residents who actively participate in the trash diversity program. There are also additional examples of garbage sorting that occur on a regular basis in Barcelona, such as critical limits on utility charge payment. In Switzerland, the cremation industry has grown, allowing for the insulation of a significant number of towns to be finished at the expense of waste that is used in specific sectors. Several breakthroughs have been achieved in the management of municipal solid waste in European countries. For

example, roughly 38% of municipal solid waste is buried in landfills, 22% is burned in incinerators, 25% is recycled as supplemental material assets, and 15% is used to fertilize crops in the EU's 27 member countries. Denmark (54%) squanders the most, followed by Sweden (49%), the Netherlands (39%), and Germany (39%). (38 percent). Repurposing physical assets as non-essentials is the most prevalent technique for municipal governments in Germany (45 percent) and Belgium to squander money (40 percent). Austria has the greatest recycling rate for garbage and soil nutrients inside the European Union, at 70%. (Desa, et al., 2012).

Solid Waste Generation (SWG) and Composition

For the most part, the higher the cash flow of events and the rate of urbanization, the more remarkable how much SR has been created. On a worldwide basis, cities create roughly 1.3 billion tons of rubbish each year. It is expected that by 2025, they would have climbed to roughly 2.2 billion tons per year. Established countries produce 85,000,000 tons of waste annually, the bulk of which is paper (Das, et al., 2015). The level of waste generation in developing countries is 158 million tons per year, and a significant part is waste of natural origin. Furthermore, by 2025, it is expected that non-industrial countries' rubbish production would have climbed to 480,000,000 tons per year, while industrialized countries' waste production will have increased to 86,000,000 tons per year. Unused age factors (urbanization, monetary events, etc.) vary from one area to another and even within urban communities of the same region, which justifies the diversity in waste age and size. The city of London, in the province of Ontario, Canada, has a higher per capita waste age (1.2 kg) than the city of Kumasi, in Ghana (0.6 kg). In any case, the overall amount of rubbish produced in Kumasi exceeds that produced in London, Ontario (352,395), where families are the most frequent waste producers. This is due to the fact that Kumasi has a far greater population than London, with a population of 1,889,934. (Koushki and colleagues, 2004). Some of the garbage in London, Ontario is mostly paper waste, while in Kumasi the bulk of the waste is natural waste. Contrasts in the synthesis of waste arise from differences in the expectations of everyday amenities and lifestyles of people in the two urban areas. Muscat, in the Sultanate of Oman, has a waste aging rate of 0.70 kg per person per day in 2004.

However, as of right now, it has climbed to 0.97 kilogram per person per day by weight, with a mean thickness of 311.73 kg/m³. This new

measure, as it was dubbed by its creators, falls within the permissible range for agricultural countries' growth rates. Rapid economic development and population growth are both linked to much higher rates of waste production (0.97 kg per day per person). The rise in the average age of rubbish is due to an increase in the number of customers who purchase completed goods, as well as other human activities (Ghose, et al., 2006). Natural garbage, particularly mixed food waste, makes up the majority of Oman's municipal solid waste. Paper, plastic, and glass are among the other types of rubbish found in Oman, and are listed below in descending order of occurrence. Food waste has been highlighted as a substantial component of the SW in countries that rely largely on agriculture, according to previous research and figures from the Gulf Cooperation Council.

A related report in Malaysia talks about waste management schemes and the existing structure. The amount of rubbish created daily increased from 13,000 tons in 1996 to 19,100 tons in 2006, according to the conclusions of this study, with the increase in waste age coming at the expense of metropolitan populations. The gains are attributed to changes in propensity to use and an increase in the intelligence of the customer's products. Natural waste in Malaysia dominates waste management, after that, the trash consisting of paper and plastic. These findings were to be expected in the Indian metropolis of Bangalore. Families along with business centers are important sources of life, and the pace of aging is explained by instructive, social and functional design. Recycling of paper and plastic rubbish is higher in developed countries than in poor ones, where natural garbage predominates.

Since around 2014, Accra, Ghana's capital, has had a waste aging rate of 0.80 kg per resident per day. (1500 metric tons per day) Natural waste makes up a considerable portion of the wastestream, and both public and private venues contribute heavily to it (Alam, et al., 2008). Generally speaking, most studies show that the growth rate of waste is increasing, especially in emerging economies. Human homes are the largest source of natural waste, which is an important component of rubbish. The natural waste created by families is usually food squandering, in large part from shopping on the go or impromptu dining and shopping.

Management of Solid Waste (SW) in USA

According to the findings of Taşkın and Demir's (2020) research, MSW industry operators are tied to both public and commercial entities in the United States. The

findings of the investigation backed up this hypothesis. A Solid Waste (SW) program can be supported in a number of ways depending on the state. Every household in New York is required to sort their trash in line with the current standards. The natural SW is thrown down the garbage chute, and the rest of the waste is either distributed in basement compartments or distinct bins for different sorts of garbage are built into the garbage chute.

Management of Solid Waste (SW) in Japan.

According to Turan et al. (2009)'s research, Japan recycles 100 percent of its waste. The most important regulatory law in the field of waste management is the Waste Law, which was established in 1970 and adopted by the country's authorities. To correspond to the promotion of the notion of "reuse" in the public realm, this provision has undergone a number of alterations and been reinforced by the insertion of new official articles. The Mandatory Recycling Act, for example, was enacted in 1992, indicating the need of adhering to the 3R idea. The disposal of which amounts to about half of all household and modern rubbish creation. As a result of Japan's greater rate of MSW incineration, the country's accumulated rubbish is largely made up of trash that has been burnt and garbage that has been consumed.

Management of Solid Waste (SW) in China.

China's Ordinance on Trash, which went into force on January 1, 2009, classifies garbage as "wasteful property" rather than merely trash, according to Bikash et al (2022). This law went into force on January 1st. Currently, around 60% of the fiber used in the manufacturing of paper and board in China originates from recycled sources. What's more, the Chinese citizens can pay for their Beijing subway fare with empty plastic containers. It is planned to replace 73 landfills located in the most remote areas of Beijing, and the garbage will be used to generate electricity (Saeed, et al., 2009).

SWM in Brazil.

Residents of Brazil are obligated to separate their rubbish into organic and inorganic categories, in addition to what was described in the Pham Phu et al. (2018) research. The first should be thrown down the garbage chute, while the second should be placed in a separate compartment where personnel from the economic organization will

retrieve it. Regardless, there are certain people who do not adhere to this rule. Regardless of this reality, the natural plan is carried out in a deliberate manner. People in Rio de Janeiro, for example, have a tremendous opportunity to cut costs and save money by switching to a more ecologically friendly manner of consumption. Since about the year 2009, customers have been required to bring their own bags to carry their purchases, which has resulted in discounts at various establishments.

SWM in Mexico and South Africa.

The Ministry of Environmental Protection and Natural Resources claimed that the volume of garbage created in the nation reached 117 thousand tons per day by the end of 2017, based on the findings of a research done by Mgimba and Sanga (2016). The Ministry provided the information that led to these conclusions. As a result, Mexico may have attained the world's earliest position in terms of waste contribution. The United Nations has determined that, despite the fact that there is always something else and more garbage in Mexico, the problem with its tiresome assortment remains a severe worry throughout Latin America. Despite the fact that there is always something else to do in Latin America, this is the case.

Rafael Pacciano, the former head of the Ministry of Natural Resources, indicated that up to 70% of trash is not recovered from landfills or landfills, but instead is dumped directly into streams, woodlands, and gorges. Rafael Pacciano supplied this information. Semarnat's proposal to charge every family in Mexico 90 pesos (about \$4.6) per month for SW by the end of 2016 has struggled to gain traction. There is no doubting that a huge number of Mexicans have a low expectation of everyday comforts, which has been and continues to be one of the major obstacles to its implementation. In 2018, the Western Cape province of South Africa announced that beginning in 2027, all food waste pickup will be forbidden.

This decision was taken due to the fact that wasted food accounts for almost 40% of the total waste produced in the country each year. It is preferable to use tillage in a more reasonable method to obtain the same objectives. It'scritical for landfills to gradually reduce the amount of food waste they accept.

Table 1:

Age of Participants

Valid	Frequency	Percent	Valid Percent	CumulativePercent
20-30	23	7.5	7.5	7.5
31-40	105	34.4	34.4	34.4
41-50	100	32.8	32.8	32.8
51-60	56	18.4	18.4	18.4
Above 60	21	6.9	6.9	6.9
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the age of majority of respondents was between 31 and 40 years.

Table 2:

Gender of Participants

	Frequency	Percent	Valid Percent	CumulativePercent
Male	173	56.72	56.72	56.72
Female	132	43.28	43.28	43.28
Total	305	100	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the gender of majority of respondents was male.

Table 3:*Education Level of Participants*

Valid	Frequency	Percent	Valid Percent	CumulativePercent
A. Doctorate	98	32.1	32.1	32.1
B. Masters	103	33.8	33.8	33.8
C. High School	53	17.4	17.4	17.4
D. N/A	51	16.7	16.7	16.7
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the education of majority of respondents was masters' degrees.

Table 4:*Household size of Participants*

		Percent	Valid Percent	Cumulative Percent
Frequency				
A. 0-3	153	50.2	50.2	50.2
B. 4-5	105	34.4	34.4	34.4
C. Above 5	47	15.4	15.4	15.4
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the household size of majority of respondents was above 5 family members.

Table 5:*Where is your residence?*

	Frequency	Percent	Valid Percent	CumulativePercent
A. Upper Monrovia	153	50.2	50.2	50.2
B. Upper Monrovia	47	15.4	15.4	15.4
C. Central Monrovia	105	34.4	34.4	34.4
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that most of the respondents live upper Monrovia.

Table 6:*Monthly Income in the Liberian Dollars?*

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
A. Lessthan 5000	21	6.9	6.9	6.9
B. 5000 - 25000	111	36.4	36.4	36.4
B.26000 -50000	130	42.6	42.6	42.6
E.51000-100000	43	14.1	14.1	14.1
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the income of majority of respondents was between 26000 and 50000 Liberian dollars.

Table 7:*The waste generated in your household comprises mostly of the following materials*

Valid	Frequency	Percent	Valid Percent	CumulativePercent
A. Paper	127	41.6	41.6	41.6
B. Plastic	147	48.2	48.2	48.2
C. Metal	6	2	2	2
D. Glass and Rubber	25	8.2	8.2	8.2
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that thewaste generates in the household comprised mostly of plastic and paper.

Table 8:*The waste generated is mostly sorted out in advance before handing over to the concerned authority*

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	53	17.4	17.4	17.4
No	201	65.9	65.9	65.9
Can't say anything	51	16.7	16.7	16.7
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that thewaste generated is mostly not separated before handing over to the waste collectors.

Table 9:

The concerned authorities mostly come in a week for the following times

Valid	Frequency	Percent	Valid Percent	CumulativePercent
1 time	40	13.1	13.1	13.1
2 time	123	40.3	40.3	40.3
3 time	106	34.8	34.8	34.8
4 time	30	9.8	9.8	9.8
Not Available	6	2.0	2.0	2.0
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the two times waste collectors come in the week.

Table 10:

The waste is mostly disposed by the following methods

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Burning	27	8.9	8.9	8.9
Burying	123	40.3	40.3	40.3
Thrown in open spaces	23	7.5	7.5	7.5
Garbage Bag Use	106	34.64	34.64	34.64
Not Available	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the waste is mostly disposed by burying

Table 11:

There is an availability of programs for educating the masses on the importance of sustainability and the waste management process.

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Yes	70	22.9	22.9	22.9
No	201	66.0	66.0	66.0
Can't say anything	34	11.1	11.1	11.1
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the no education program on the importance of sustainability and waste management process.

Table :12

Are you familiar with the concept of reduce, reuse and recycling?

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Yes	201	66.0	66.0	66.0
No	72	23.6	23.6	23.6
Can't say anything	32	10.4	10.4	10.4
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the respondents were familiar with the concept of reduce, reuse and recycling.

Table 13:

How important are the impacts of urbanization on the global scale?

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Not very important	24	7.9	7.9	7.9
Not Important	23	7.5	7.5	7.5
Important	106	34.8	34.8	34.8
Very Important	126	41.3	41.3	41.3
I don't know	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the impacts of urbanization on the global scale are very important.

Table 14:

Your local government is taking serious steps to implementing sustainable urban development

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Yes	72	23.6	23.6	23.6
No	203	66.6	66.6	66.6
Can't say anything	30	9.8	9.8	9.8
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the local government is not taking serious steps to implement sustainable urban development.

Table 15:

I wish to live closer to a major town or city.

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Yes	203	66.6	66.6	66.6
No	67	21.9	21.9	21.9
Can't say anything	35	11.5	11.5	11.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that most of the respondents wish to live closer to major town or city.

Table 16:

Would you implement environmental sustainability policy at any given chance in your community?

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	201	66.0	66.0	66.0
No	64	20.9	20.9	20.9
Can't say anything	40	13.1	13.1	13.1
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the respondents will at a chance implement sustainable development policy in their community.

Table 17:

There are availability programs educating the masses on the importance of sustainability.

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	123	40.3	40.3	40.3
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	26	8.5	8.5	8.5
Strongly Disagree	27	8.9	8.9	8.9
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that solid waste management can contribute to sustainable development.

Table 18:

Have you ever thought about the concept of urbanization and environmental sustainability before taking this survey?

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Yes	68	22.3	22.3	22.3
No	201	65.9	65.9	65.9
Can't say any	36	11.8	11.8	11.8
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the respondents had no thought about the concept of urbanization and environmental sustainability before taking this survey.

Table 19:

SD is directly concerned with people action to keep their environment clean

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	130	42.6	42.6	42.6
Agree	106	34.8	34.8	34.8
I don't know	35	11.4	11.4	11.4
Disagree	24	7.9	7.9	7.9
Strongly Disagree	10	3.3	3.3	3.3
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the SD is directly concerned with people action to keep their environment clean

Table 20:

Refining people's health and opportunities for a good life contribute to sustainable development.

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	125	41.0	41.0	41.0
Agree	102	33.4	33.4	33.4
I don't know	65	21.3	21.3	21.3
Disagree	10	3.3	3.3	3.3
Strongly Disagree	3	1.0	1.0	1.0
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the enhancing the health of persons and opportunities for a good life help in the SD of Liberia.

Table 21:

Cleaning your environment regularly is necessary for Sustainable development

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	125	41.0	41.0	41.0
Agree	102	33.4	33.4	33.4
I don't know	65	21.3	21.3	21.3
Disagree	10	3.3	3.3	3.3
Strongly Disagree	3	1.0	1.0	1.0
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the cleaning the environment regularly is necessary for SD.

Table 22:

Having a proper system of waste disposal also affects the environment

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	125	41.0	41.0	41.0
Agree	102	33.4	33.4	33.4
I don't know	65	21.3	21.3	21.3
Disagree	10	3.3	3.3	3.3
Strongly Disagree	3	1.0	1.0	1.0
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the having a proper system of waste disposal also affects the environment.

Table 23:

Urbanization has become a social problem in this era, it affects Solid waste management

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	86	28.2	28.2	28.2
Agree	111	36.4	36.4	36.4
I don't know	84	27.5	27.5	27.5
Disagree	13	4.3	4.3	4.3
Strongly Disagree	11	3.6	3.6	3.6
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that urbanization has become a social problem in this era, it affects solid waste management. 36.4% of the respondents agreed.

Table 24:

Sustainable development demands that we humans reduce all sorts of waste

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	83	27.2	27.2	27.2
Agree	132	43.3	43.3	43.3
I don't know	75	24.6	24.6	24.6
Disagree	13	4.3	4.3	4.3
Strongly Disagree	2	0.6	0.6	0.6
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the Sustainable Development (SD) demands that we humans reduce all sorts of waste. 43.3% of the respondents agree.

Table 25:

Your place has a proper recycling system for waste disposal to maintain sustainability

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	25	8.1	8.1	8.1
Agree	42	13.8	13.8	13.8
I don't know	104	34.1	34.1	34.1
Disagree	99	32.5	32.5	32.5
Strongly disagree	35	11.5	11.5	11.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the respondents do not know if their community has a proper recycling system for waste disposal to maintain sustainability. 34.1% do not know.

Table 26:

The city council makes sure that people are adequately aware of keeping their environment clean for achieving Sustainable Development

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	15	4.9	4.9	4.9
Agree	94	30.8	30.8	30.8
I don't know	42	13.8	13.8	13.8
Disagree	123	40.3	40.3	40.3
Strongly Disagree	31	10.2	10.2	10.2
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the city council do not makes sure that people are adequately aware of keeping their environment clean for achieving SD. 40.3% of the respondents disagree.

Table 27:

The city council is responsible for carrying out their duties keeping environment clean

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	286	93.8	93.8	93.8
Agree	2	0.7	0.7	0.7
I don't know	4	1.3	1.3	1.3
Disagree	8	2.6	2.6	2.6
Strongly Disagree	5	1.6	1.6	1.6
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the city council is responsible for keeping environment clean.

Table 28:

The city council has developed policies that impact the urbanization of the city

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	105	34.0	34.0	34.0
Agree	23	7.5	7.5	7.5
I don't know	9	2.9	2.9	2.9
Disagree	139	45.6	45.6	45.6
Strongly Disagree	29	10.0	10.0	10.0
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the city council has developed policies that impact the urbanization of the city.

Table 29:

The development in the economic sector is essential for SD

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the development in the economic sector is essential for SD. 40% of the respondents confirmed.

Table 30:

You have occasionally thought about the concept of sustainable development and waste management before taking this survey

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	95	31.1	31.1	31.1
Agree	58	19.0	19.0	19.0
I don't know	105	34.4	34.4	34.4
Disagree	20	6.6	6.6	6.6
Strongly Disagree	27	8.9	8.9	8.9
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the participants do not have prior knowledge on sustainable development and waste management.

Table 31:

Reducing water consumption is necessary for SD

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that reducing water consumption is necessary for SD. 40% of the respondents confirmed that reducing water consumption is necessary for sustainable development

Table 32:

By giving ample consideration to the environmental sustainability concept, the overall environment can be positively affected

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the bygiving ample consideration to the environmental sustainability concept, the overall environment can be positively affected.

Table 33:

Preserving nature is not necessary for SD

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the preserving nature is necessary for SD.

Table 34:

A culture where conflicts are resolved peacefully through discussion is necessary for SD

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that a culture where conflicts are resolved peacefully through discussion is necessary for SD.

Table 35:

You want to play a role in the Urbanization and Sustainable Development (SD) programs in Monrovia

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the respondents want to play a role in the SD programs in Monrovia

Table 36:

The concerned authorities consider people's opinion regarding the SD programs

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	105	34.0	34.0	34.0
Agree	23	7.5	7.5	7.5
I don't know	9	2.9	2.9	2.9
Disagree	139	45.6	45.6	45.6
Strongly Disagree	29	10.0	10.0	10.0
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the concerned authorities do not consider people's opinion regarding the SD programs. 45.6% of respondents disagree.

Table 37:*Urbanization process affects the development program*

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that theurbanization process affects the development program.

Table 38:*The impacts of urbanization on the global scale are important to you*

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	50	16.4	16.4	16.4
Agree	75	24.6	24.6	24.6
I don't know	100	32.8	32.8	32.8
Disagree	40	13.1	13.1	13.1
Strongly Disagree	40	13.1	13.1	13.1
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that the impacts of urbanization on the global scale are not important to the respondents.

Table 39:*Solid waste management can contribute to sustainable development*

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that solid waste management can contribute to sustainable development.

Table 40:*Every Liberian can contribute to Sustainable development through SWM*

Valid	Frequency	Percent	Valid Percent	CumulativePercent
Strongly Agree	122	40.0	40.0	40.0
Agree	23	7.5	7.5	7.5
I don't know	106	34.8	34.8	34.8
Disagree	28	9.2	9.2	9.2
Strongly Disagree	26	8.5	8.5	8.5
Total	305	100.0	100.0	100.0

The study involved 305 participants. As per the above graph, it is apparent that every Liberian can contribute to SD through SWM.

CHAPTER V

Conclusion and Recommendations

It has been concluded that consolidation and organization of the circulation of solid environmental waste is complicated by inadequate legitimate promotion of waste mechanisms as optional tangible assets, the lack of a viable process for revitalizing funds for the introduction of low-cost energy innovations; extreme adherence to local norms and practices, as well as the economic isolation of certain sections of the Liberian economy. The establishment of a natural basis for creative mechanical improvement, the organization and promotion of a closed economic cycle, the greening of education in various areas of training, and the organization of an expanding biological culture and population are all essential for long-term economic growth. The execution of the natural base for creative mechanical innovation is the most crucial item for the ecological spread of SW. For social, environmental and financial reasons, the placement of SRs is and should be an important undertaking in any urban environment. There are many SWM approaches and practices in different regions, countries, larger and more modest urban communities, and in formal and casual areas of the city. Although all urban communities face comparable SWM problems, the effect depends on how the measures and practices are implemented.

Solid waste (MSW) is non-liquid and non-vaporous products of human activities that are undesirable. SWM can be described as the proper management of unwanted waste in a manner that causes no real harm to human well-being and the climate. The fruitful work of urban wastewater treatment plants depends on the availability of accurate information on the age and composition of waste, which helps to organize and select the correct waste management scheme. Waste time, organization, assortment, transportation, recycling and disposal are important useful components of cardboard recycling. The SWG is associated with rapid urbanization, monetary development and improvement, and social inclinations. The increasing age of waste, which remains largely untreated, poses a threat to the climate and overall well-being. The following is a simplified list of some of Liberia's waste management system's challenges. What is missing is a vital and obvious innovative strategy to squander the board. The lack of

well-defined standards and guidelines are another key impediment in the field of waste management. Furthermore, there are no well-established structures and offices, which are required for successful waste management. Due to the lack of executive bodies for theft, there is no information or records that can be relied on for research or definitive teaching. Another reason for Liberia's struggle to keep costs under control is the gig economy's inability to recruit and retain competent and experienced managers.

The following is a summary of Liberia's chances of successful trash management: As a result of logical waste management, the environment in which it is safe to live will improve. Waste energy might be used as a clean energy power source to supplement an expensive conventional energy source. This is because petroleum products and gas turbines provide the majority of the mass energy in Liberia's energy system. In a similar line, garbage-generated energy might be used to power remote grids that aren't connected to the energy matrix at a relatively low cost. Liberia will be able to earn more carbon credits and minimize the consequences of climate change by reducing natural pollution levels. In addition, successful waste management will encourage improvements in certain types of waste replacement equipment, increased capacity, and trade in innovations that can increase a country's financial advantage. Additionally, there will be educational opportunities around the country for anyone interested in waste management and garbage disposal equipment.

Recommendations / Implications

The results of this study show that all waste management measures and practices adopted in most provinces are fully focused on achieving and reducing climate and welfare impacts. These mechanisms and methodologies are consistent with the goals and objectives of practical waste management, which hope to reconcile the financial costs of waste disposal and environmental improvement. It is clear from this study that these approaches and methodologies need to be implemented once the issues and hazards associated with the natural consequences of solid waste (SW) are put at the forefront in terms of preparation and promotion. As emphasized in this study, the vast majority of approaches and systems related to waste are based on the integration of parts of the waste problem. Key issues include the importance of waste, which requires

clear and concise definitions as well as accessible and reasonable Solid Waste Management (SWM) in Liberia. Non-industrial countries, in order to create a coordinated institutional body, actually have to manage, direct and inspect the generated and rehearse public waste. Licensing of managers and the need for inspection and verification of waste as a condition for obtaining a permit are recognized as the most advanced means of monitoring and verifying all activities related to waste. This control premise requires the establishment of a free implantation room with legal authority and a carefully trained workforce.

The research also found that the current need to improve waste management arises from concerns about the impact of waste on the environment in Liberia. The likelihood associated with distributive garbage collection will be a significant factor in the wasteboard and independent direction. These spenders have great potential for risk to people and the climate. Thus, waste collection points and other waste management offices need an extremely robust intelligence structure that is equipped to detect climate leaks, conduct and authorize repairs, and, if necessary, convert random forecasts into new information., new strategies and new methods. While reuse is an optional solution to reduce climate impact, it cannot be a complete cycle unless the legal and institutional system creates markets for recycled materials. Reuse should be seen as a means by which we try to limit the natural effect of both raw material creation and garbage disposal, and should not be seen as a panacea for our garbage disposal problems. This means that specialized and project-based waste management capabilities, such as reuse, cannot operate in a vacuum.

Recommendations for Future Research

This study was simply limited to Liberia; accordingly, the findings were not summed up in different places. The information was simply collected on the SW, after which the expenditure information was excluded during the verification of the information, so there is no general expenditure data that the council in Liberia measures. The monetary imperative of a scientist, preventing wide inclusion in the information circle. Limitations are normal for most studies, and this study is no exception. During the course of this project, it becomes clear that the exam questions were too general for a full assessment of SWM in Liberia. Also, the sample survey does not refer to the

population of Liberia in light of the fact that the female to male ratio in the survey does not refer to the female to male ratio in the population. In any case, the discoveries represented general local support for SWM across networks. Future research may focus on SWM methods by increasing the size of the example

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**BİLİMSEL ARAŞTIRMALAR ETİK KURULU**

21.06.2022

Dear Butu Levi

Your application titled **“Solid waste management a path to sustainable development in Monrovia, Liberia”** with the application number NEU/AS/2022/156 has been evaluated by the Scientific Research Ethics Committee and granted approval. You can start your research on the condition that you will abide by the information provided in your application form.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

A handwritten signature in cursive script, reading 'Direnç Kanol'.

Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.

Appendix- 2

**Questionnaire on Solid Waste Management – A path to Sustainable
Development in Monrovia, Liberia**

Gender: ___M ___F

Year of Birth:

Instructions: This survey was designed to gather information about how solid waste management can be a path to sustainable development. **Read each statement and then click on the circle which best shows how you feel.**

Questionnaire**Demographic Information:****1. What is your age?**

- A. Less than 20 years
- B. 21-30 years
- C. 31-40 years
- D. 41-50 years
- E. Above 50

2. What is your Education?

- A. Doctorate
- B. Masters
- C. High School
- D. N/A

3. What is your household size?

- A. 0-3
- B. 4-5
- C. Above 5

4. Where is your residence

- A.------(fill in your answer)
- B. Don't want to answer

5. Monthly Income in the Liberian Dollars

- A. Less than 5000
- B. 5000-25000
- C. 26000-50000
- D. 51000-100000
- E. Above 100000
- F. N/A

6. The waste generated in your house comprises mostly the following stuff.

- A. Paper
- B. Plastic

- C. Glass
- D. Metal
- E. Rubber
- F. Batteries
- G. Organic Refuse

7. The waste generated is mostly sorted out in advance before handing over to the concerned authority.

- A. Yes
- B. No
- C. Can't specify

8. The concerned authorities mostly come in a week for following times?

- A. 1 time
- B. 2 times
- C. 3 times

9. The waste is mostly eradicated by the following method.

- A. Burnt
- B. Buried
- C. Thrown in open spaces
- D. Garbage Bag Usage

10. There is an availability of programs educating the masses on the importance of sustainability and the waste management process.

- A. Yes
- B. No
- C. I don't know

11. You are familiar with the concept of reducing, reuse and recycling?

- A. Yes
- B. No
- C. I don't know

12. How important are the impacts of urbanisation on a global scale?

- A. Not very Important
- B. Not Important
- C. Don't care
- D. Important
- E. Very Important

13. I wish to live closer to a major town or city

- A. Yes
- B. No
- C. Can't Decide

14. Please explain briefly about your previous answer.

15. Your Local government is taking serious steps for implementing sustainable urban development.

- A. Yes
- B. No
- C. I don't know

16. What would be the environmental sustainability policy you will implement if given a chance?

17. You have ever thought about the concept of urbanisation and environmental sustainability before taking this survey?

- A. Yes
- B. No
- C. I don't Know

Please select the appropriate response from the following scale

Question	Strongly Agree	Agree	Neutral/ Don't know	Disagree	Strongly Disagree
18. Sustainable development is directly concerned with people action to keep their environment clean					
19. Refining people's health and opportunities for a good life contribute to sustainable development					
20. cleaning your environment regularly is necessary for sustainable development					
21. Having a proper system of waste disposal also affects the environment					
22. Urbanization has become a social problem in this era, it effect solid waste management.					
23. Sustainable development demands that we humans reduce all sorts of waste					
24. Your place have a proper recycling system for waste disposal to maintain sustainability					
25. The city council makes sure that people are adequately aware of keeping their environment clean for achieveing sustainable development.					
26. The city council is responsibly carrying out their duties to keep the environment clean.					

27. The city council has developed policies that impact the urbanization of the city					
28. You have occasionally thought about the concept of Sustainable development and waste management before taking this survey					
29. The development in the economic sector is essential for sustainable development					
30. Reducing water consumption is necessary for sustainable development.					
31. By giving ample consideration to the environmental sustainability concept, the overall environment can be positively affected					
32. Preserving nature is not necessary for sustainable development.					
33. A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development.					
34. You want to play an active role in the urbanisation process development programs					
35. The concerned authorities consider people's opinions regarding the sustainability program.					
36. The urbanisation process affects the development programs					
37. There is an availability of programs educating the masses on the importance of sustainability.					
38. The impacts of urbanisation on a global scale are important to you					
39. Solid waste management can contribute to sustainable development					
40. Every Liberian can contribute to sustainable development through solid waste management.					

Reference of the Questionnaire

David, V.E., Wenchaoa, J., Johna, Y. and Mmerekib, D., 2019. Solid waste management in Monrovia, Liberia: Implications for sustainable development. *The Journal of Solid Waste Technology and Management*, 45(1), pp.102-110.

Reference of Likert Scale for the Questionnaire

Nemoto, T. and Beglar, D., 2014. Likert-scale questionnaires. In *JALT 2013 conference proceedings* (pp. 1-8).

Appendix- 3

	9%	6%	6%	1%
	SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS
PRIMARY SOURCES				
1	Victor Emery David, Yasinta John, Shahid Hussain. "Rethinking sustainability: a review of Liberia's municipal solid waste management systems, status, and challenges", Journal of Material Cycles and Waste Management			2%
	Internet Source			
2	Yu M Grishaeva, I V Spirin, S P Kiseleva, O B Napolov, O Yu Matantseva. "Solid Municipal Waste Management for Sustainable Development", IOP Conference Series: Earth and Environmental Science, 2022			2%
	Publication			
3	etd.aau.edu.et			1%
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5	Patson Chawuruka, Maxwell Agabu Phiri. "An investigation of vital issues that should be			1%

addressed to work on a country image",
Corporate Governance and Organizational
Behavior Review, 2022

Publication

6	Submitted to International University - VNUHCM Student Paper	<1 %
7	"Handbook of Waste Biorefinery", Springer Science and Business Media LLC, 2022 Publication	<1 %
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25	Egil Ona, Julius Nielsen. "Acoustic detection of the Greenland shark (<i>Somniosus microcephalus</i>) using multifrequency split beam echosounders in Svalbard waters", <i>Progress in Oceanography</i> , 2022 Publication	<1 %
26	Management of Environmental Quality: An International Journal, Volume 24, Issue 2 (2013-05-27) Publication	<1 %
27	Stefania Almazán-Casali, Jose F. Alfaro, Steve Sikra. "Exploring household willingness to participate in solid waste collection services in Liberia", <i>Habitat International</i> , 2019 Publication	<1 %
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