

**EVALUATION OF PUBLIC LIBRARIES IN NORTH  
CYPRUS ACCORDING TO THE INDOOR  
ENVIRONMENT QUALITY CRITERIA**

**A THESIS SUBMITTED TO THE GRADUATE  
SCHOOL OF PURE AND APPLIED SCIENCES  
OF  
NEAR EAST UNIVERSITY**

**By  
KHALED MARTINI**

**In Partial Fulfillment of the Requirements for  
the Degree of Master of Science  
in  
Architecture**

**NICOSIA, 2020**

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**Approval of Director of Graduate School of  
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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that I have fully cited and referenced all material and results that are not original to this work, as required by these rules and conduct.

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## ABSTRACT

The aim of this thesis is to determine and examine the interior quality of public libraries in Northern Cyprus from an architectural point of view. The libraries examined are Değirmenlik, Güzelyurt, Akdoğan, Famagusta, Yeni İskele, Mehmetçik public libraries and the Nicosia Atatürk Central Library. Spatial examinations are made according to indoor environmental quality (IEQ) criteria which are; indoor air quality, lighting, sound and noise, thermal comfort and cleanliness and hygiene conditions.

As a methodical approach, the analysis of the libraries in terms of architectural spatial organization based on interior environment quality criteria was carried out and the opinions of the users were also evaluated. In the investigations, spatial arrangement elements, windows, floors, walls, furniture and user relations related to the space program are determined. In the examinations of indoor quality, outdoor elements that affect comfort are also taken into consideration.

As a result of these analyzes, public libraries in Northern Cyprus were examined according to indoor comfort factors, and the findings were summarized and supported by SWOT analyzes.

**Keywords:** Public library; spatial comfort; indoor quality; user reviews; SWOT Analysis

## ÖZET

Bu tezin amacı, Kuzey Kıbrıs'taki halk kütüphanelerinin iç mekan kalitesinin mimari açıdan tesbit edilip incelenmesidir. İncelenen kütüphaneler, Değirmenlik, Güzelyurt, Akdoğan, Mağusa, Yeni İskele, Mehmetçik kütüphaneleri ile Lefkoşa Atatürk Kütüphanesi'dir. İç mekan çevre kalitesi yönünden yapılan mekansal incelemelerde; iç mekan hava kalitesi, aydınlatma, ses ve gürültü, ısısal konfor ve temizlik ve hijyen koşulları esas alınmıştır.

Metodik yaklaşım olarak, kütüphanelerin mimari mekansal organizasyonu yönünde, iç mekan çevre kalitesi kriterlerine bağlı analizleri yapılmış ve kullanıcıların da görüşleri alınarak değerlendirmeler yapılmıştır. İncelemelerde, konfor maddelerini etkileyen mekansal düzenleme elemanları, pencereler, döşemeler, duvarlar, mobilyalar ve mekan programına bağlı kullanıcı ilişkileri saptanmaktadır. İç mekan kalitesinin incelemelerinde konforu etkileyen dış mekan elemanları da göz önüne alınmıştır.

Çalışmadaki bu analizler sonucunda Kuzey Kıbrıs'taki halk kütüphanelerinin iç mekan konfor faktörlerine göre incelemesi yapılmış olup, bulgular özetlenerek SWOT analizleri ile desteklenmiştir.

**Anahtar Kelimeler:** Halk kütüphanesi; mekansal konfor; iç mekan kalitesi; kullanıcı değerlendirmeleri; swot analizi

## **ABBREVIATIONS**

**IEQ** : Indoor Environmental Quality

**SBS** : Sick Building Syndrome

**HC** : Heat Comfort

**VC** : Visual Comfort

**AC** : Acoustic Comfort

**IAQ** : Indoor Air Quality

**POM** : Particulate Organic Matter

**MVOCs:** Microbial Volatile Organic Compounds

**IECs** : Indoor Environmental Conditions

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## CHAPTER 1

### INTRODUCTION

The quality of the indoor setting Indoor Environment Quality (IEQ) is regarded as an indicator of the level of comfort that is not limited to the heat circumstances. It involves aspects like heat comfort, acoustic comfort, quality of indoor air and visual comfort. Most individuals spend about 90% of their life indoors and about 30% of the allocated time in the classrooms (De Giuli *et al.*, 2012). The significance of IEQ is its impact on occupants, power consumption, health and productivity. The primary IEQ determination parameters are: acoustic comfort, indoor air quality, visual comfort (Clausen and Wyon, 2008). Thermal comfort is the comfort of and satisfaction of an individual in accordance to the ISO7730 associated with Sick Building Syndrome (SBS). However, lighting (luminance, distinction between clarifying surfaces and light spectrum) can also impact both the health and efficiency of occupants, since the effectiveness of a job depends on attention or motivation which is directly dependent on the lighting condition.

In accordance to the Impact Environmental Quality of the National Institute of Safety, Health, of environmental buildings with direct correlation to the wellbeing according to (NIOSH, 2013). Hill (2009) reported the conditions that plays an important role in student satisfaction of learning environment to include necessary condition such as temperature, space, management, and others. Other sectors that matters include the type of occupants, the climatic conditions, space arrangement with several analysis of the constructed building.

Environmental factors contribute to a more practical approach that allow temperature condition to exceed the required ranges for a limited period of time. In the existing post-occupancy process, there is a need to calculate long-term comfort conditions by means of acceptable indices to compare possible design solutions and long-term measurements for buildings (Raimondo *et al.*, 2019). An instance which brings perfect insights on the general overview of the context of the research is a research conducted in Portugal by Pereira *et al.*, (2017), which found that concentrations of contaminant must be maintained for human health, which thus affected the aesthetics of the indoor environment, air quality depletion by the presence of particulate dust among other impairments to the indoor environmental

quality. (Tétreault, 2003 and Leech, 2002). Contamination also contributes to the deterioration processes (Tétreault, 2003; Krupińska *et al.*, 2012; Chinese *et al.*, 2012).

Libraries alongside hospitals, schools, museums, laboratories, drug production companies or food factories are models of sensitive indoor environments, where IAQ impacts on both people health and materials, products or procedures can be seen. Studies on specific indoor environments have identified risk sources and threshold levels for different pollutants during the last decades and have been proposing targeted control measures.

### **1.1 Statement of Problem**

The importance of evaluating indoor environmental quality of a building cannot be overemphasized. Previous studies such as Jamaludin *et al.*, (2016) have described the effect of indoor environmental qualities of a building on the performance of students. The library is of greatest importance to students in any academic environment because it is the hub for access to digital or physical information. In the case of National North Cyprus Library, the indoor environmental quality has not been evaluated, hence there is need to do so. This study also evaluated the ways to improve on the environmental impact of basic architectural designs of National North Cyprus library.

### **1.2 Research Question**

This work aims to answer the following questions:

- i. What is the current state of the North Cyprus Library in terms of indoor environmental quality?
- ii. How does the IEQ of libraries in North Cyprus Library affect the general use of library?

### **1.3 Objectives of the Study**

The general objective of the study is to evaluate the indoor environmental quality of the National North Cyprus Library. The specific objectives of the study are;

- To establish user satisfaction in the libraries
- To compare results of the architectural measurements and occupants' comments with standards set for thermal, visual and acoustic environments.
- To evaluate the spaces in terms of thermal, visual and acoustic parameters in the library settings in order to gain solid feedbacks for suggestions to enhance the conditions of public library environment in North Cyprus libraries.

### **1.4 Methodology**

The study was conducted around IEQ phases; the review of the literature regarding the factors of indoor comfort conditions in the library spaces, analysis of technical data of the libraries analyzed, review of survey carried out in the seven (7) libraries in strategic locations in Cyprus. with a total number of 20 people interviewed with the information as illustrated in table 1.1. The data was analyzed based on the respondents reply during the interview conducted. These response were subjected to interpretation and discussion. Conclusions were drawn and recommendations were made on the improvement of the IEQ of the libraries in North Cyprus. Using a descriptive analytical method, the comparison of the libraries was drawn from other published citations allow a conclusive result from an architectural point of view. The physical state, plans, locations, air quality of each of the libraries were analyzed to ensure a sampling of several qualities such as thermal, lightening condition, vibration, air quality destruction, user's satisfactions amongst other which are further discussed in the chapters.

**Table 1.1:** Analysis of Public Library

SITE PLAN	PLAN	ELEVATION
INDOOR ENV. QUALITY PARAMETERS		PHOTOS
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES		SWOT ANALYSIS

### **1.5 Scope of the Study**

The research focused on the evaluation of indoor environmental qualities of National North Cyprus library. The thermal, visual and acoustic conditions were assessed using the type of materials used, paint, flooring, windows and other factors.

### **1.6 Limitation of Research**

The research is limited with seven selected public libraries in North Cyprus Architectural evaluation is done on each library using parameters of IEQ and at the same time empirical deduction as opposed to the use of standardized test equipment's. Also, not all the staffs and students were willing to provide answers to the questionnaire during the field work.

## **1.7 Thesis Structure**

The research hopes to validate the research study by evaluating the indoor environmental quality of National North Cyprus Library.

**Chapter 1:** It is the introduction to the general overview of the study, statement of problem, scope of the study, the research aim and objectives, and research question. The chapter explains the term "indoor environmental quality", its importance, effects and environmental factors that define it. It also states the gap it hopes to fill in the gaps for evaluating the indoor environmental quality of the National North Cyprus library through a quantitative research work.

**Chapter 2:** This chapter presented an in-depth analysis of previous literatures relevant to the study. Besides, it provides an overview of the several previously work on the architectural framework of academic buildings. Broad overviews of each factors of indoor environmental quality are provided.

**Chapter 3:** This chapter identified the standards parameters for the measurement of an adequate environmental air quality in terms of space and building analysis with a major focus on the geographical area of North Cyprus. Several advantageous of Libraries around the world were further discussed in the chapter.

**Chapter 4:** Analysis of case study- This chapter identified and thoroughly discussed the primary focus of the study. It will discuss other areas such as demographics, climate condition of North Cyprus. This chapter presents the research context, research methodology that justifies the several questions asked by adding to the strength of the research work using a systematic, philosophical, data collection method as well as other findings gathered through interview. SWOT analysis of each case study was also discussed in this chapter where the author comprehensively expressed his opinions about the conditions of each library analyzed.

**Chapter 5:** Discussions- The concluding part of the thesis summarized all the discussed work and presents future recommendations for the adoption of a more adequate air quality library.

## **CHAPTER 2**

### **BACKGROUND OF THE STUDY**

This chapter is discussing the different terminologies related to “Indoor Environmental Quality (IEQ)”. Explicating the factors which interact with the different components of IEQ and its effects on well-being and the comfort of occupants.

#### **2.1. Indoor Environmental Quality (IEQ)**

One of the main requirements that buildings must meet is a healthy indoor climate; indeed, the quality of the enclosed environment, described by its key dimensions, i.e. kinetic, sonic and sensory comfort, as well as the quality of the indoor air, is a significant factor both for health reasons as well as for the well-being and functionality of building occupants. Invariably, in the sense of all commonly used approaches and techniques for measuring environmental efficiency in buildings, the reliability of the indoor environment is taken into account (Giarma *et al.*, 2017). Of IEQ’s many direct or indirect effects, especially early studies, indicated that control of the temperature all on its own oversee a substantial level of IEQ functions (including air conditioning) and air quality contributed most to learning success among students (Cash, 1993; Earthman, 2004). Mendell and Heath (2005) discovered evidence that indoor (physical, chemical or pollutants contaminants) or environmental (ambient temperature) factors were explicitly or implicitly related to academic performance.

#### **2.2 Interacting Factors and Components of IEQ**

According to USEPA United States Environmental Protection Agency (2010) IEQ is affected by a number of interactive factors, including building occupants, environment, construction (original model and further renovation) with control system and techniques of construction, drainage, decorating materials and recreational activities. The processes and daily activities of humans influencing IEQ in public buildings like schools, libraries and lounges include body odor, cosmetic odor, housekeeping (air dust and dirt, household cleaning products, waste emissions and storage Supplies), including products from contaminated asbestos, chemicals from building and furnishing component for examples volatile carbons and synthetic carbons, and other components such as coolant leakage or

inadequate ventilation, and outdoor toxins (IEQ fumes communicate via physical and biochemical factors) as stated in Table 2.1.

Biological contaminants comprise toxins from unpleasant odors, mites, molds and germs, while pesticide pollutants are originating from particulates, for example environmentally cigarette smoke, burning of biomass contaminants (PM Particulate matter), and other gasses CO<sub>2</sub>, CO, SO<sub>2</sub>, NO<sub>x</sub>, O<sub>2</sub>, NH<sub>3</sub>) and gas emissions, e.g. indoor physical factors directly affects building residents, change the reaction (Levin, 1995). These include movement of air, heat, temperature. Table 2.1 shows different external factors of IEQ

**Table 2.1:** Factors of IEQ, (Tham, 2016)

Indoor Environmental Quality			
Physical factors	Chemical factors	Biological factors	Particulate matter
Temperature	(Organic) VOCs, PAH e.g. Benzo (a)pyrene, Formaldehyde	Moulds (fungi)	Dust
Humidity	Inorganic CO <sub>2</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , O <sub>3</sub> , NH <sub>3</sub> , Radon	Bacteria	Tobacco smoke
Air pressure, Air movement (draught)	Odours	Plant pollen	Fibres (e.g. asbestos)
Lightning		Dust mites	Combustion by-products
Noise		Animal dander	
Cleanliness			

### 2.3 Impact of IEQ in Occupant Well-Being and Conveniences

Sundell *et al.*, (2011) explains levels are associated with inflammation, respiratory function, asthma and other health challenges that affect work efficiency, whereas allergic conditions among children in northern countries decrease when the velocity of air exceed 0.5m/s air changes per hour. Since 1987, a standard value of 6l m/s per student in Finland has been assigned to circulation per user (Palonen *et al.*, 2009). Ultimately, bad design of

houses and insufficient maintenance of heating, ventilation and climate control systems provides poor air circulation in the classrooms (Shendell *et al.*, 2004a).

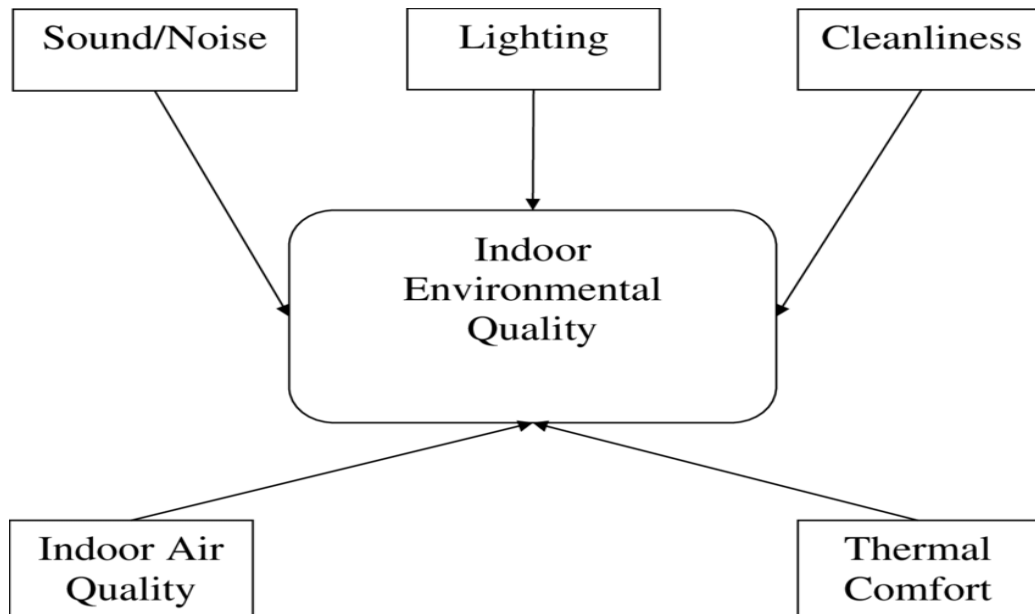
Ventilation means changing polluted air in space with fresh air. Pasanen (1998) describes ventilation as the process through which natural or mechanical air sources or reduces conditioned or unconditioned air. Air circulation can be done manually by using an air handling system (AHU) that tries to manipulate outdoor air indoors by eliminating pollution. Natural air movement can be enhanced by opening windows to release indoor air. Mechanical ventilation systems of different kinds include;

1. Mechanical exhaust air conditioning system, whereby fans are positioned centrally, continually collect the correct volume of air from the indoor environment.
2. Air intake ventilation where central fans insert and obtain the right amount continuously.

An increased amount may exacerbate pre-existing conditions of health like asthma or cause health conditions e.g. cough (Fisk, 2000). Biological to synthetic impurities vary from pollutant to pollutant. To attempt to cause serious health problems to school children, environmental, mold, VOCs, particulate organic matter (POM) and micro particulates are reported and tested. IEQ research and its impact on academic performance are minimal (Shendell *et al.*, 2004b).

Many studies found IEQ, school safety, attendance and engagement relationships (Shendell *et al.*, 2004b). The quality of air and the high temperature had such an adverse effect on student performance in the same report by Wargocki and Wyon (2006). Exposure to industrial contaminants and cigarette smoke in just the air can negatively affect kids lung function (Dales *et al.*, 2008). “Microbial volatile organic compounds” (MVOCs) (Kim *et al.*, 2011) and the plasticizers in classroom settings may present a potential risk for asthmatic symptoms in children. The lack of heat protection in college is linked to nausea, somnolence, skin and ears, upper airways discomfort (Andersen and Gyntelberg, 2011).

**Table 2.1.1:** Different Components affecting Indoor Environment Quality (Toyinbo, 2012)



#### **2.4 SBS (Sick Building Syndrome)**

The IEE refers to the Institute of Environmental Epidemiology (1996) is a syndrome of excessive skin and mucous membrane work-related irritation with other symptoms such as fatigue and headache such as the following;

- 5 Irritation of the eyes, noses and throats
- 6 Sensation of sore nasal membranes and skin
- 7 Erythematic
- 8 Fatigue
- 9 Headaches
- 10 Airway inflammation and cough, wheezing, coughing and unexplained hypersensitivity.

Characteristically, SBS signs are present in 20 percent or more of the occupant population of office or public buildings as compared to building-related disease which usually only affects a few occupants (Samet, 1993).

## 2.5 Thermal Comfort

Thermal comfort is a state of mind in which a person is pleased with the thermal climate; it is a product of exchange of energy between the body and the atmosphere (ASHRAE standard). This contributes to an individual person overall environmental satisfaction, well-being, and efficiency (Van hoof, 2008). It has been calculated that for 85% of building dwellers, city dwellers, to achieve heat comfort, indoor temperature is recommended for as low as 24°C (Andersen and Gyntelberg, 2011). Essentially, thermal comfort is also significantly important for humans as the heat we produce as human must equal the heat loss according to the law of thermodynamics. For the above stated reason, the human body temperature needs to be maintained at the average of 37°C

## 2.6 Acoustic Comfort

The word "acoustic comfort" is "a phenomenon basically characterized by the absence of unwanted noise and acoustic operating opportunities without disrupting others." This definition offers the consumer's opinion, rather than a relationship to mere acoustic observed data: for a certain person, auditory comfort is an individual's combination as a sound receiver (Rindel, 2002). This indicates that an individual may be disturbed by the sounds they produce because the sounds are seriously disturbing but rather because others may be disturbed and thus resulting in discomfort or disputes.

Past studies have shown that measurements and metrics used by acousticians determined to assess acoustic factors in building might be a relative reflection of how people perceive sound in their living environment. For instance, tenants may have issues with impact noise types or amplification of noises from neighboring flats in the frequency range that is slightly omitted (Ljunggren *et al.*, 2014). Vardaxis *et al.*, (2018) strongly suggest that in dwellings there are severe nuisance problems that affect auditory comfort. Ljunggren *et al.* (2018) strongly indicates that auditory satisfaction in dwellings is compromised by major noise issues. Generally, adjacent effect noise sources require an optimal level of low frequency material. Indeed, the most distracting source of noise was walking noise. Furthermore, the lack of very low frequency content in sound impact measurements results in poor empirical correlation with qualitative responses obtained by inhabitants. Most research therefore proposed that calculations should include variable frequencies out to 50

Hz (or even 20 Hz) rather than 100 Hz as the current lowest ISO norm limit. Low level structures have the biggest problems with impact interference and associated low-frequency propagation, while apartment blocks have overall better noise transmission, sound impact insulation (Vardaxis *et al.*, 2018).

## **2.7 Visual Comfort**

The visual comfort in architecture explains the reaction to the amount of light intensity at a particular architectural space in a specific period of time. There are several measure of this system of which the four commonly used methods (BREEAM, LEED, SBTool, CASBEE). According to a critical review carried out by (Giarma *et al.*, 2017) the research was focused on versions of software for tertiary sector buildings and primarily office buildings and specifically with office buildings which gives details about the significant impact of lightning condition in a space design. Furthermore, other factors impact visual comfort includes color, reflections, light distribution, city view and location of the building with respect to natural intensity of light.

## **2.8 Indoor Air Quality (IAQ)**

The USEPA also known as the United States Environmental Protection Agency (2016) defines air quality of all building to have effect on the health and comfort on the building and residents. Mores, indoor air can also contaminate more than the outer air. It refers to the total quality of breathable air in an environment with respect to the occupant's health. Pollution also contributes to the smog, dust and other smells. Natural ventilation is a form of air process supply without the aid of mechanical systems to assist it. There are other devices that aids both heating and cooling condition of space environment such as the A.C aka air conditioning system.

The most frequent pollutants in homes include lead, most toxic fragrance chemicals in other traditional cleaners. Cleaning and vacuuming also improves the indoor air of the health of the employees (ASHRAE, 2009).

### 2.8.1 Indoor contaminants

Crump *et al.*, (2009) identified and specified some indoor pollutants. These pollutants include;

- Volatile Organic Compounds- (VOCs) are produced from the manufacturing and furnishing of products over periods of weeks or years and the threat of bad air quality. The interest in removing VOCs from commercial products like electronic goods such as computers.
- Carbondioxide is a colourless, inert gas produced by most fuels being imperfectly combusted. Incomplete ignition can occur, e.g. if an appliance is not properly ventilated. Table 2.2 displays indoor air contamination origins and forms.
- SVOCs are low in pressure than volatile

NO<sub>2</sub> is released from cookers, fires, water heaters and space heaters that are fired with oil. SO<sub>2</sub> is produced through the burning of sulfur containing fuels such as coal and oil. Ozone is predominantly a photochemically generated airborne air pollutant. It combines with surfaces and airborne contaminants indoors to produce new naturally occurring compounds and particles (Ramaswamy *et al.*, 2010). During tasks such as cooking, cleaning and washing and through normal breathing, people produce water vapor. The volume of water vapor in the atmosphere has clear effects on health and comfort as well as the incidence of biological contaminants.

**Table 2.2:** Sources and types of indoor air pollution (Turiel, 2012)

Source	Main Pollutant
Outdoor air	SO <sub>2</sub> , Nox, Ozone, Particulates Matters(PM), Benzene
Combustion of Fuel	CO, NO <sub>x</sub> , VOCs, PM
Tobacco smoke	CO <sub>2</sub> , Organic Compounds
People	VOCs, Formaldehyde, pesticides
Building Materials	VOCs, Formaldehyde
Consumer Products	VOCs, Ozone, PM
Furnishings	VOC
Office Equipment	Methane, VOCs, Contaminated susts
Bacteria and Fungi	Radon, moisture
Contanimated land	Moisture

Particle pollution in air means a combination of liquid particles and tiny solid pieces contained both the indoors and the outdoors in the atmosphere that are harmful to health. Due to the fact that the particles are in different sizes, some are one-tenth the size of a thread of hair; it is difficult to assess particle pollution. Many are much smaller; some are so small that it is only possible for an electron microscope them to be seen (Dorman, 2014). Individual particles may be too microscopic because of their volume, but together they appear as a haze that forms as millions of particles distort the sunlight distribution. It means that when particles are breathed, humans do not learn, yet it is so harmful that it can shorten life. The size variations make a major difference in how they affect health. Immunity help humans to sneeze or cough out larger particles from our mouths, but these defenses do not avoid smaller particles (those with a diameter of less than about one-seventh of a single human hair or about 10 microns) (McKenna *et al.*, 2008). Such molecules are put in the lungs, while the smallest ones are so minute that they can enter through the lungs into the bloodstream (Nord, 2015).

Researchers classify particles as coarse big, small, and very small by volume. Coarse particles fall in diameter between 2.5 microns and 10 microns and are known as PM<sub>10-2.5</sub>. Very small particles have a 2.5 microns diameter or less and are numbered PM<sub>2.5</sub>. Ultra-fine particles larger than 0.1 micron in diameter and small enough to move inside the bloodstream through the lung tissue, acting like the molecules of oxygen themselves. Even though the tiny particles can reach deeper into the tissues, particles can be detrimental to health (Al-Salem and Khan, 2010).

- i. PM 0.1 - particulate diameter smaller than 0.1 microns (100 nm) (Zhang *et al.*, 2006)
- ii. PM 10 - particulate matter with a smaller diameter than 10 microns (Gupta *et al.*, 2004)
- iii. PM 2.5 - particulate matter with diameter smaller than 2.5 microns (Linares & Diaz 2009).

Recent studies have shown a strong relationship between particle air pollution levels, respiratory diseases and heart and cardiovascular diseases, cancers, and eventually death rates (Buzea *et al.*, 2007).

Indoor pollution sources are subject to extensive scientific studies, including a some reviews (Crump *et al.*, 2004a; Pluschke, 2004; Fernandes de Oliveira E, 2009; Crump, 2002; Mendell, 2007), below, showing the most common. People spend most part of the

time indoor; significant health effects of exposure to both outdoor and indoor contaminants may be possible. Air pollution has been projected to decrease any person's life expectancy in the United Kingdom by an average of 7-8 months, with an approximate comparable health cost around £20 billion annually. WHO (2000) indicates that poor IAQ is believed to cause the following as listed by (Ko & Hui, 2012);

- Allergic and asthma symptoms
- Lung cancer
- Chronic obstructive pulmonary disease (COPD)
- Airborne respiratory infections
- Cardiovascular disease (CVD)
- Odor and irritation (SBS symptoms)
- Odor and irritation (SBS symptoms)
- Stress and pressure.

## **2.9 Academic Library Design and Building**

Academic libraries and the various other educational environments, both physical and virtual, Alison (2016) studied how the dynamic student population satisfies learning requirements. Subsequent paragraphs, the results of Alison's work are explored. Architects (77%) and librarians (50%) made the designing of "flexible" spaces in libraries a premium. It meant creating "user-defined" space, so users could redesign a room on their needs at a short span notice. Sustainability was usually represented in compact, versatile, and often informal, whiteboard partitions and non-permanent partitions. Sustainability in other cases included the implementation of systems that could be adapted for 10 or even 20 years in the academic and technological needs of consumers in the future. (Demchak, 2000)

- What are the best practices to prepare and develop learning-centered libraries that work well today and adapt to future needs as technology opens new avenues for reading, studying, and teaching and working?
- What good practices—and worst—have they gained from the projects of our study?
- What forms of education programs are intended to provide to support new spaces and how can these projects be achieved?

- How professional principles of librarianship and the science of architecture collaborate to advise projects of scope, and what difficulties are there when designing and designs like this?
- What best and the worst methods have librarians and architects gained from our current study projects?

Although design and priorities for design varied from project to project, a common goal was to create spaces that supported a detailed log of student academic needs. Many investors said they have built spaces to promote one or more of these forms of educational learning activities: collaboration (82%), Student research (73%), point-of-need programs (63%), or "occasional" campus faculty sessions (53%). Most of the projects they researched, librarians and architects identified users as students, not professors, scholars, librarians, and library staff who also used libraries on campuses. In addition to having their own interests as educators and scholars, developing and making available learning opportunities for students. But when budgets required changes, the first to be scrapped was improvements to storage spaces and library staff to protect student spaces. These stakeholders emphasized what students needed in their libraries, but less than one-third test (31%) said that they used structured approaches as part of the process to regularly collect user data.

The most reported best practice from field study was the advantage of effective communication. Continuous reviews of staff, ranging from individual meetings with library units to organizing campus-wide forums, are vital to the creation of a space, as stated by the librarians. Furthermore, scientists mentions that, IEQ may affect people's activities and productivity and it is shown in the study of (Fisk, 2000; Mendell *et al.*, 2002) which explained that there could be a heavy deleterious effect of poor indoor environments could on the learning process of the student in academic environments. It is evident that academic buildings are very important than any other environment of schools, therefore the IEQ of the libraries need to be of utmost importance to systemically improve their academic achievement.

Numerous IEQ factors can affect the students. This is inherent of each building having different environmental value that will be interpreted by the residents as having to do with the types of activities performed in the indoor spaces of the building, i.e. classrooms, libraries, laboratories and others. The research by (Kamaruzzaman and Samsul, 2013) was

performed in the classrooms of the local school which was in Bandar Baru, Selangor to evaluate the thermal condition during the lecture. Observations were made from 2 pm to 6 pm over 5 days. Results showed students and teachers dissatisfied with the quality of the comfort in their classroom. The deductions suggested that the irritation was due to the inadequacy of natural ventilation in the classroom (Jamaludin *et al.*, 2016). Therefore, the class design layout must be changed as the location of the adjacent classroom table adds to the frustration of the participant. This is also due to the transfer of human body heat. Consequently, if they sit close to each other, they can feel uncomfortable because of their high temperatures (Jamaludin *et al.*, 2016). Furthermore, ASHRAE has identified that improved IEQ can support and enhance student learning (Jamaludin *et al.*, 2016).

Universities are also expected to face almost same problems as the IEQ in the classrooms as basic areas and operation of educational buildings, in which instructional and/or educational impartation is done are the priority. The obvious main reason for this is that the classrooms are densely populated (Jamaludin *et al.*, 2016).

Toward the demise of the last century, when it was still in use, the first research on the Baroque library's indoor environmental factors was similar to that of a conventional library, albeit with a handful of users (the General Library, built in the 1960s, had already served the school community at that time) (Pereira *et al.*, 2017). Because indoor environmental situations and conditions played a very important role in the preservation of books and wooden shelves, archived experimental surveys on the basis of permanent measurements of hydrothermal air conditions and concentrations of particulate matter have been conducted because early October 2016 with the goal of: assessing the library's current Indoor Environmental Conditions (IEC); investigating the current Indoor Environmental Conditions (IEC); Whether or not the dangerous IEC is primarily due to higher occupancy / visitation levels and suggests mitigating measures and alternative approaches. The measurement program should include measuring the following parameters: temperature of the air (Ta, Co), humidity (RH%), concentration of carbon dioxide (CO<sub>2</sub>, ppm) and the Particulate Matter (PM, µg / m<sup>3</sup>) (Pereira *et al.*, 2017).

In addition, Alison discovered that library projects ' success depends on mutual knowledge and understanding of the Academy's sweeping changes in education, pedagogy, and science. Librarians and architects need to collaborate to extend this understanding and knowledge to the unique setting of their particular institution (Goldhagen, *et al.*, 2001).

## CHAPTER 3

### IEQ STANDARDIZATION AND DEFINITION OF TERMS

#### 3.1 IEQ Standardization

The quality of indoor environment of a building defines the impact environmental quality (IEQ); it is necessary to promote the well fare of the intended residents of the building. Many factors depend personal perception of occupants with respect to their comfort in the room. According to Sarbu and Sebachievici (2013), "temperature, humidity and flow of air, scent and wind, sound and touch, acoustic influences, effect on vision and color have effects on IEQ as well as the installation of special factors, vibrations, ionization, economic factors and architecture will also be identified with human physiology..

Table 3.1 show a comprehensive description of building quality standards for health and comfort.

**Table 3.1:** Indoor Environmental Quality Factors and their Parameters (Sakhare & 2014).

	<b>Thermal Comfort</b>	<b>Visual Comfort</b>	<b>Acoustic Comfort</b>	<b>Indoor Air Quality</b>
<b>Note</b>		Requirements for lighting and daylighting		Close connection to thermal environment
<b>Parameters</b>	PMV/PPD or operative temperature; Humidity; Air velocity; Draught; Vertical air temperature differences; Radiant temperature asymmetry; Surface temperature of the floor.	Daylight provision; View out; Exposure to sunlight, Illuminance; Luminance; Light uniformity; Glare; Color (color rendering, light source color);	Sound level difference; Sound insulation; Sound absorption; Noise level(s) Frequency; Reverberation time.	Indoor sources of pollution; Outdoor sources of pollution; Ventilation parameters; Airflow patterns and pressure relationships; Air filtration system.
<b>Influence factors</b>	Clothing; Activity	Light source, Visual task; Use of room		Sources of heat gains; Outdoor conditions and outdoor air ventilation rate

**Table 3.2:** Air Quality Recommendations for Schools, Libraries and others on several Air Quality Index (AQI) Chart (SCUSD, 2018)

ACTIVITY	0 to 50 GOOD	51 to 100 MODERATE	101 to 150 UNHEALTHY FOR SENSITIVE GROUPS	151 to 200 UNHEALTHY	201 to 300 VERY UNHEALTHY
Recess (15 min)	No Restrictions	No Restrictions	Make indoor space available for children with asthma or other respiratory problems.	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.	Restrict outdoor activities to light to moderate exercise.
P.E. (1 hr)	No Restrictions	No Restrictions	Make indoor space available for children with asthma or other respiratory problems.	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.	Restrict outdoor activities to light to moderate exercise not to exceed one hour.
Scheduled Sporting Events	No Restrictions	Exceptionally sensitive individuals should limit intense activities.	Individuals with asthma or other respiratory/ cardiovascular illness should be medically managing their condition. Increase rest periods and substitutions to lower breathing rates.	Consideration should be given to rescheduling or relocating event.	Event should be rescheduled or relocated.
Athletic Practice and Training (2 to 4 hrs)	No Restrictions	Exceptionally sensitive individuals should limit intense activities.	Individuals with asthma or other respiratory/ cardiovascular illness should be medically managing their condition. Increase rest periods and substitutions to lower breathing rates.	Activities over 2 hours should decrease intensity and duration. Add rest breaks or substitutions to lower breathing rates.	Sustained rigorous exercise for more than one hour must be rescheduled, moved indoors or discontinued.

### 3.1.1 Thermal comfort

Thermal comfort simply explains the satisfaction of the climatic condition according to ASHRAE (ASHRAE, 2017), in measurement of thermal comfort with several parameters such as temperature, humidity, air quality with respect to ISO 17772-1 (ISO, 2017), EN ISO 7730 (ISO, 2005) specify the recommended criteria. Such guidelines identify methods for assessing and analyzing thermal conditions and provide information for estimating the general temperature condition of the indoor occupants (i.e., projected total vote with calculating percentage of predicted mean vote). Several systems can monitor the thermal comfort parameters such as heating and cooling of the air temperature control. It should be remembered that all thermal comfort control systems are slow-reacting technologies, meaning that it takes some time for them to adjust to requirements (e.g., new air temperature).

According to a journal on "Principles of Sustainable Design: Indoor Thermal Comfort", 2019, six factors must be taken into account in the design process before calculating human comfort. There is a combination of personal and environmental factors, including:

- Metabolic rate: energy produced from the human body
- Skin isolation: the thermal insulation that the person wears
- Air temperature: air temperature around the person
- Radiant temperature: average of all surface temperatures around the individual
- Air velocity: air movement rate over time
- Relative humidity: percentage of water vapor in the air. Metabolic rate and clothing are variables, while environmental factors include air temperature, radiant temperature, relative humidity, and air velocity.



**Figure 3.1:** Design for thermal comfort (Principles of Sustainable Design: Indoor Thermal Comfort, 2019)

### 3.1.2 Visual comfort

Visual comfort is described in accordance with EN 12665 (CEN, 2011) as "the visual environment's subjective state of well-being." A well-fabricated light condition is required for adequate illumination in order to ensure a safe environment for mobility which aims to increase the perception of color. The measurement of the said environment such as light distribution, shades and the atmosphere should maintain both visual and biophysical well-

being for human beings (Bellia *et al.*, 2011, Hraška 2014 and Van 2006). Insufficient light may cause internal biological rhythms to be distorted. Efficiency, protection, and health may be affected by this as well.

### **3.1.3 Indoor air quality**

IEQ-relating standards describes air pollutant ventilation rates, humidity and exposure limits. IAQ (indoor air quality) measurements are subjected to an indirect method of calculating ventilation speed, while the standard compared value is given a ISO 1772-1 standard (ISO, 2017). The said calculations can only be made when the calculations be made of different contaminants. Some recommended values for selected air pollutants depending on the several factors that contributes to the impacts of building (WHO, 2010). EN 16798-3 (CEN, 2017) provides for non-residential building performance requirements. ASHRAE 62.1 and 62.2 and CR 1752 (ASHRAE, 2016 and CEN 1998) describes the acceptable value of IAQ, as well as a design, construction and commissioning guide (ASHRAE, 2009). Just two methods of assessment are defined in all current ventilation requirements, a "prescriptive method" and an "analytical procedure" (Bluyssen, 2009). The value of indoor air is closely linked to thermal comfort. Therefore, in criteria specifying thermal comfort, certain guidelines such as humidity can be included. Natural regulation of the indoor air quality (windows, wall openings) and mechanical means (air conditioning). It ensures that the climate switch can either be provided naturally by doors, or an air conditioning system can add it. Ventilation belongs to the rapid reaction systems, allowing for instant adjustment to modified requirements.



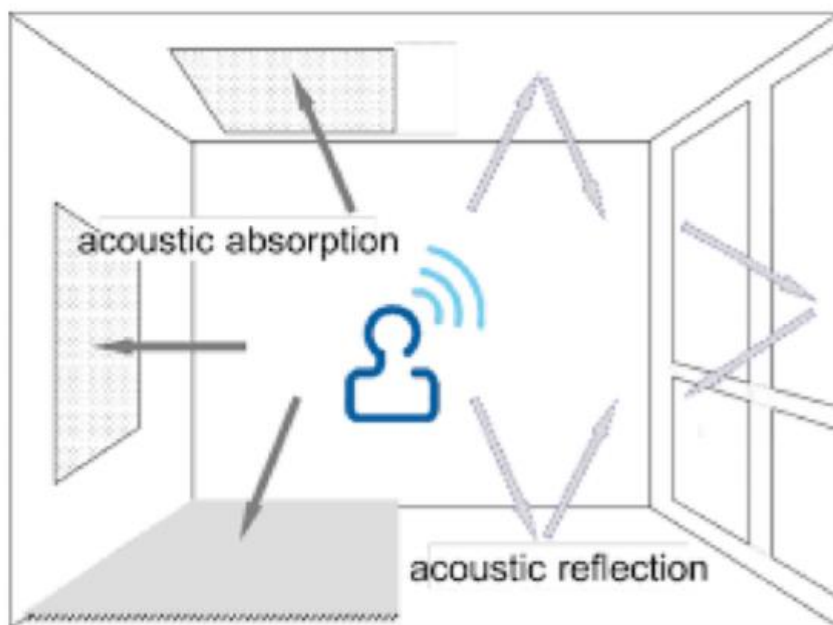
**Figure 3.2:** Indoor air quality issues ("Fresh air for offices", 2019)

### 3.1.4 Acoustic quality

Several literatures have defined acoustic comfort as a condition in which noise levels are acceptable. Nevertheless, sound perception is a much more complex issue, depending, among other things, such as characteristics, but also on a person's behavior, state of mind, and expectations. The so-called Soundscape research (Brown, 2011) pays particular attention to several noise attributes. Sound and noise can be misplaced in text, when a sound disturbs the human hearing, it is considered as noise, while the sound is a wave motion with varying frequency and pressure.

- i. The insulation of sound of façade, windows and the roof is very important in terms of protecting the interior of the architectural frame work from excessive outside noise (such as noise from traffic). This sound proofs of walls, its partitions and doors must be addressed once there are indoor sources (noise from neighbors, air conditioning units).
- ii. The insulation of the room from sound allows protection from external sounds such as sounds from restaurant, causing a deterioration of the level of noise (Reinten *et al.*, 2017). There are many criteria that define the calculation and simulation procedures for sound insulation and sound absorption. For example, in series ISO 10140 (ISO, 2015),

series ISO 717 (ISO, 2013), series ISO 3382 (ISO, 2012) and series ISO 12354 (ISO, 2017)



**Figure 3.3:** Measures for effective acoustic comfort for indoors (Acoustic comfort Google Search, 2019)

### 3.1.5 Library and its Use

A library can be defined as a curated record of sources of information and related resources, picked by professionals and made accessible to defined classes of people for reference or lending out. Besides, a library provides digital or physical access to information, and may be a brick and mortar set up or an online location, or the combination of both. Examples of resources found in a library include documents, books, manuscripts, periodicals, CDs, newspapers, films, prints, microform, audio books, and many more (Vydiswaranet *al.*, 2011).

From small libraries to regional collections, libraries differ. Libraries are becoming easier to gain easier access to information in different formats and without limitation from many sources. We are expanding their service mode beyond the physical walls of a brick and mortar house, providing open data through electronic networks, and allowing librarians to

scan and evaluate knowledge avalanche through various types of digital tools. Libraries are becoming increasingly community centers where services are being delivered and people are indulging in continuous learning (Vydiswaran *et al.*, 2011).

- i. Academic libraries are usually located on campuses of college and university and serve mainly universities and other educational institutions students and faculty. Many educational libraries, especially those at public institutions, may not be restricted to any unique class of individuals who are members of the general public in whole or in part can access the library (Vydiswaran *et al.*, 2011).
- ii. National information is stored in the library with right of proper documentation of the country. The first national libraries originated from the sovereign or some other supreme body of the state collections. Unlike a public library, a national library rarely makes books available for borrowing purposes to citizens. Most of the time, there are many special, important, and relevant documents in their collections. Certain concepts of a national library, however, put less emphasis on the characteristics of space (Lor and Sonnekus 1997).

The common types of library that are of functional usage around the world are;

- Academic library
- Special library
- Public library
- National library

### **3.2 Duties of the Turkish Cypriot National Library**

One of the most important institutions, the National Library, which collectively and periodically passes a society's written culture to the next generations, fulfills the basic duty of compiling with its laws and various regulations and also assumes other responsibilities. Concepts like collecting nation papers, compiling bibliographies, and compiling the activities of the National Library are one of the basic duties of the institution.

The National Library is not mandatory, but it is the most important institution in a country effectively undertaking all these activities, it strives to be an effective information center in

research on" our national culture." The National Library of North Cyprus is a national library example. While most of the National Library represents a particular group of users or visitors, primarily university students, researchers, the situation for the National North Cyprus Library is slightly different. The library is usually available on weekdays from 08:00 to 17:00 and on Saturdays from 08:00 to 13:00. The National North Cyprus library offers lending and exploitation services to its users. For users to have access to the lending service, they must fulfill the conditions of membership. Anyone who aspires to become a member must submit a formal application and membership must be renewed in order to avoid automatic dismissal by the library.

Regarding the exploitation service, the national North Cyprus library serves a public library and a school library while performing the functions of a national library for the aforementioned reasons as well. Besides the traditional lessons, it also provides the advantage of audio visual resources and offer users the chance to navigate through the library collection through electronic means.

### **3.3 Other Libraries in The World**

Today's libraries, the Dewey / Carnegie institution's Apple-era iterations, tend to materialize their underlying administrative and epistemic frameworks on various scales, from designing their internet interfaces to constructing architecture to networking their technical infrastructure. This has been true of institutions of knowledge throughout history, and it will be true for future institutions too. Stepanov (2019) suggested that the library should be assessed as a network of integrated, mutually reinforcing and evolving infrastructure especially architectural technological, social, epistemological and ethical infrastructure.

One of such libraries in the world is the model Ying Yang public library, South Korea and the Tianjin Binhai Public Library, China. These libraries will be discussed succinctly below.

### **3.3.1 Ying Yang public library, South Korea**

The model Ying yang public library, located in South Korea is designed by Evgeny Markachev and Julia Kozlova. The design of this monumental library won first place in the sustainable design category of the Archi World Academy Awards (in the archi-world academy awards for 2011-2013). The public library symbolically represents the architectural implementation of yin and yang' philosophy signs to serve as the basis of the design of the structure, proposing the symbolic use of cultural principle and different origins through architectural interaction and complementarities.

The dynamic form of this monumental edifice is visually improved and in constant movement, with a rather harmonious distribution in the internal areas of the building and the synchronized designation of the other zones which pronounces the templates and features of the modern intensity and interchange of information in a semblance of the dynamics of modern life.

- The design has a model that preserves the available green zones in a bid to provide another way to ameliorate the global warming and also create a panacea for thermal condition.
- Constructed at a 4 storey height to fit the restrictions for sustainable architecture
- Spatially, the library was designed in 2 halves of nearly opposite functional nodes (education and communication) that complement each other
- A half of the building is lowered (by one storey) to the level of adjoining residential houses. This design is done to allow transmission of sufficient light to the adjoining building. This also allows for a harmonious use of the old and new buildings together.



**Figure 3.5:** General view of the Ying yang public library (Seddigh *et al.*, 2014)



**Figure 3.6:** Entrance view of the Ying yang public library (Seddigh *et al.*, 2014)



**Figure 3.7:** Model of the Ying yang public library (Seddigh *et al.*, 2014)



**Figure 3.8:** Aerial view of the model of the Ying yang public library (Bluyssen, 2010)

### **3.3.2 Tianjin Binhai Public Library, China**

The Tianjin Binhai Public Library, China, was designed by the MVRDV, Tianjin Urban Planning and Design Institute alongside local architects. The library is a cultural center of 33,700m<sup>2</sup>. It features a spherical auditorium (luminous in nature) and a cascading array of floor to the ceiling bookshelves and bookcases. Bookshelf was incorporated as the building's main device and its undulating shape is used as the space frames simultaneously, create the layered ceiling stairs, seating, and even louvres on the façade. It offers over 1.2 million books.

The library offers some intricate architectural design that allows for not only spatial comfort, but lighting, sound and thermal comforts all put into the design of the structure. The mass of the building exempt from site strategically split by a sphere-shape in the auditorium centre. Books are arranged on the bookshelves arrayed on either sides of the sphere whose multi-functionality includes serving as stairs, seats and even designed to continue along the ceiling, thereby creating a topography that is illuminated. The building has 5 levels and an extensive educational facility set in arrays along the edges of the interior of the library and also easily accessible to the main atrium space.

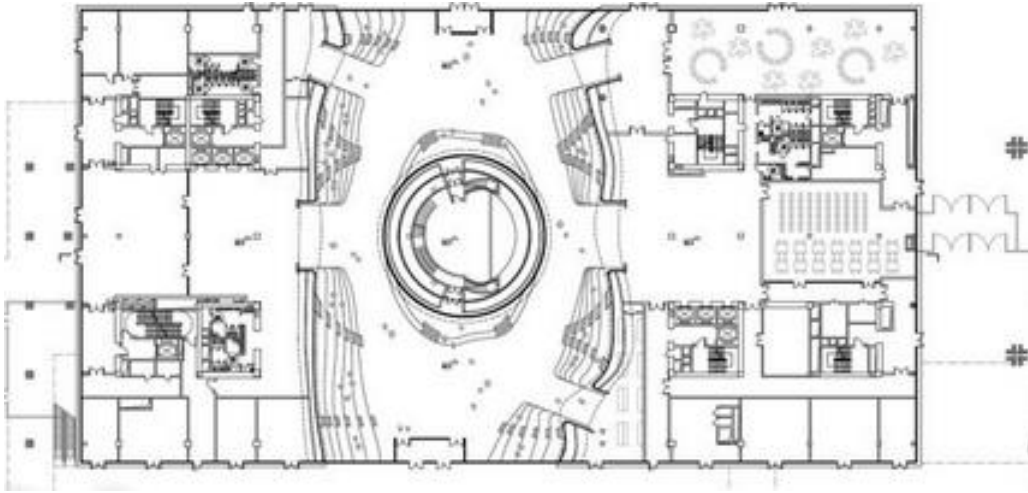
- Public access programs are supported by the structured subterranean service spaces, book storage, and a very large archive. Easy access from the ground floor, where users can easily enter the reading spaces of the library both for elderly and the children, the auditorium, entrance hall, terraced directly related to the level of upper floors and interconnected with the functions of cultural complex.
- The first two floors are majorly lounge area reading rooms, and books, while the upper floors are offices meeting rooms, audio and computer rooms and two roof top patios.
- The library was built in accordance with the standards of Chinese Green Star energy efficiency classification which goes in tandem with the blueprints for sustainable architecture and has since achieved a two-star status in the Chinese Green Star energy efficiency label.



**Figure 3.9:** Centre spiraling floor to ceiling stack at Tianjin Binhai Public library (Veitch *et al.*, 2002)



**Figure 3.10:** Eye shaped luminous spherical centre of the Tianjin Binhai Public Library (Veitch *et al.*, 2002)



**Figure 3.11:** The structural plan of the Tianjin Binhai Public Library (Google, 2019)

### 3.3.3 Lochal Library, NETHERLANDS

Lochal library Netherlands was prior to its conversion and retasking, a locomotive hall, dated to 1932 housing the bibliotheek midden public library. The design was achieved with the collaboration of both the civic architects and the interior roos architecture bureau.

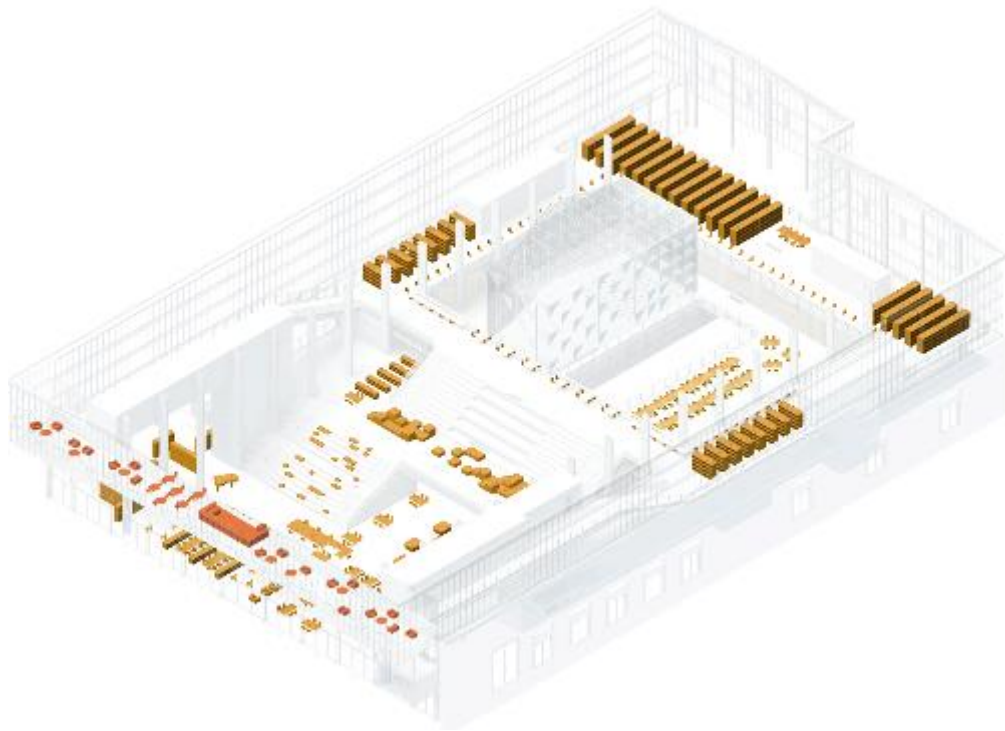
- One floor higher is a large balcony offering panoramic views of the city.
- The railway theme of the building was inspired to be transformed in to a public meeting place
- The larger percentage of the building was renovated and redesigned form a new spot for textile processing
- The entrance of the building has a square-like reading table



**Figure 3.12:** A view of the stairs and podia at LocHal Library Netherlands (Seddigh *et al.*, 2014)



**Figure 3.13:** Exterior view of the LocHal Library, Netherlands (Seddigh *et al.*, 2014)



**Figure 3.14:** Structural plan of the LocHal library, Netherlands (Veitch *et al.*, 2002

## **CHAPTER 4**

### **CASE STUDY EVALUATION OF LIBRARIES IN NORTH CYPRUS**

#### **4.1 Research Framework**

In order to evaluate Indoor Environmental Quality (IEQ) of libraries in North Cyprus, the libraries in the region were visited and a structured interview was conducted. Seven libraries were selected as sample study for the region. The interview questions are structured to be relevant to the internal or indoor environmental quality (IEQ) viz; lighting, circulation, spacing, convenience in and around the library internal environment. Special attention was paid to the walls, flooring type, color and other sensitive aesthetic indoor factors that appeal to the sense and influence consistency of mood and comfort of users in the library.

Buildings are measured and drawn proportionally. Determinations and supported with photos and assessments depending on the selected criteria. Inferences were drawn from the responses of people, interviews and analytical approaches. No testing equipment was used during the research

The library is a critical part of the learning process. It enhances learning through the provision of a log of information and access to this information, thereby making learning easier for students, lecturers, researchers and all library users alike. Also, facilitating access to information, the library provides a conducive environment for learning and processing of the information.

Consequently, the library has always been an important element in architecture and has raised interest over the years on the sustainability, improvement and designing of modern structures suited for the needs of its users and as demanded of architects and researchers worldwide. This forms the basis of this research and within the framework of sustainability indexes, the concept of indoor environmental quality is assessed in this research body.

## **4.2 Research Strategy**

A structured interview was conducted on librarians, clerks and other library users at the different libraries visited in North Cyprus. The demographic distribution of the interviewees cut across genders, ages between 27-55 years of age and an educational level between basic to tertiary levels of education. The interview highlighted questions and indexes relevant to the internal or indoor environmental quality (IEQ) are based on; lighting, circulation, spacing, convenience in and around the library internal environment.

The aim is to extrapolate aggregated deductions from the responses of the respondents, which will inform the recommendations and solutions towards a modern, sustainable library environment and cultures and make derivatives on the results of the findings to draw inferences and conclusions of the study.

## **4.3 Research Design**

The use of a structured interview method to quantitatively analyze the indoor environmental quality of libraries in North Cyprus; the general concept of the interview centered on the current state of the North Cyprus Library in terms of indoor environmental quality. The interviewees gave responses to questions which detailed individual insights on the thermal conditions, indoor air quality, acoustic conditions, lighting conditions, furnishing, technology, vibration, view conditions and aesthetics, to provide an overview of the microclimate and aesthetic parameters in these facilities and to show the feasibility and correlation between these parameters of interest and the use of library in Northern part of Cyprus.

## **4.4 Research Methodology**

This research will be based on utilizing the descriptive analytical approach to achieve the objective of this study. In which librarians and library attendants were interviewed on their perception of the subject matter. The results from the interview was then examined and juxtaposed with findings from previous literature. The sources of the information will be from articles, journals and relevant publications. The researcher aims by virtue of comparison, achieve the general objectives of the study, which is; to evaluate the indoor environmental quality of the National North Cyprus Library and the specific objectives; (i).

to establish student and teacher's satisfaction (ii) to compare the results of the measurements and occupant's comments with standards set for thermal, visual and acoustic environments (iii) to evaluations regarding the spaces in terms of these three parameters in the library settings in order to gain solid feedbacks for suggestions to enhance the conditions of library environment off and on university environments.

#### **4.5 Sampling**

Sampling was performed detailing the thermal conditions, indoor air quality, acoustic conditions, lighting conditions, furnishing, technology, vibration, view conditions and aesthetics, to provide an overview of the microclimate and aesthetic parameters in these facilities and to show the feasibility and correlation between these parameters of interest and the use of library in Northern part of Cyprus.

#### **4.6 Data Collection**

Data was collected through the use of structure interviews. The interviews were conducted on library staff and users across the libraries situated in the Northern part of Cyprus. Of the over 22 libraries situated around the area case study, 7 libraries were taken as the sample of the population. The sample libraries were visited and pictures of the physical state and architectural status of the libraries were taken to further process the results aggregated from the interview. It is noteworthy to mention that out of all the library analysed, Mehmetcik public library was an extension of a larger governmental building while some of the other library building were previously building for some other use which was later endorsed to become a library.

#### **4.7 Method of Data Analysis**

Data collected was subjected to descriptive analysis and comparisons were made with previous literature to make deductions. From results of the interviewees, deductions were drawn using the responses to each question at each library, discussed against the findings of the researcher and the architects view.

#### 4.8 Geography of North Cyprus

Cyprus is one of the beautiful island in the Mediterranean also belonging to the third largest in the Mediterranean Sea, close to the Middle East although at times it is sometimes geographically described as south of Turkey. The mountain masses and the central plain they surround, the Mesaoria, dominate the physical environment of life on the island. It is situated at a distance of 380 km north of Egypt, 105 km west of Syria, and 75 km south of Turkey at the north-eastern end of the East Mediterranean basin. The mainland of Greece is about 800 km west. Rhodes and Karpathos, 380 km west, are the closest Greek islands. Cyprus ' latitude is  $34^{\circ} 33' - 35^{\circ} 34'$  north, and its longitude is  $32^{\circ} 16' - 34^{\circ} 37'$  east.



**Figure 3.4:** Satellite view of North Cyprus (Northern Cyprus, 2019)

##### 4.8.1 History of the national library in North Cyprus

The Turkish Cypriot Institutions Federation decides to open libraries in Cyprus to increase the Turkish Cypriot Community's level of culture and education during the British Colonial Period. On November 17, 1958, the Turkish Cypriot Presidency Federation Agency will invite experts from our country's Republic of Turkey to our country for people to build the library. In those years, the Ankara Turkish Cypriot Cultural Association opened the Atatürk Library (1955) and the clubs had small libraries. Only members supported these libraries. According to modern librarianism, there were no libraries that served the public. The request of the Ministry of National Education Institutions

Federation of Libraries General Manager Aziz Ismet Berkan and specialist librarians Parmaksızoğlu arrived in Cyprus on April 13, 1959. Based on their research, the decision was made to set up public and children's libraries in the large settlements where Turks live intensively and the National Library in Nicosia, the capital. The Ministry of Education Central Library Management Service was opened on November 1, 1961, in accordance with the studies and reports prepared. The collection consisted of library works as a gift from the Turkish Republic.

The Atatürk Library and the Central Education Library were merged under the name of the Turkish Cypriot National Library, which was opened by the Cyprus Association on October 10, 1963. As the library's collection and user grew, the buildings served were insufficient, and even if they were transferred to larger buildings, problems arose in delivering healthier library services because these buildings were not constructed for library purposes. The decision to be taken in Nicosia, with the involvement of the Republic of Turkey, decided to participate in the national zone of the Cultural Center. Building the Cultural Center started in 1981 to mark the centenary anniversary of Atatürk.

The Atatürk Cultural Center, opened to the public on 10 July 1984 at the 10th anniversary of the 20 July Peace Operation. The Ataturk cultural center is located at the centre of Nicosia and is surrounded by schools. It has a library, exhibition halls and conference halls on a large area. The National Library is now supporting researchers in a modern library setting.


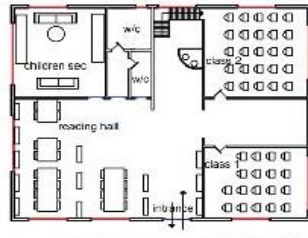
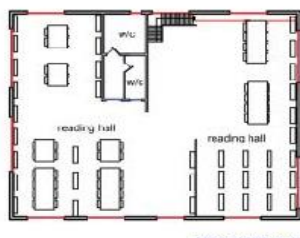



#### **4.9 Analysis of Case Study**

The analytical description of the case study; libraries in North Cyprus are thus presented below. The analysis follows a systemic evaluation and observation of the internal and external architectural elements and structures of the libraries in North Cyprus that may affect the Indoor Environmental Qualities of the libraries, which ranges from the materials used in construction, ceiling and walls, paint and colour used, interior decoration and furniture, stacking and shelf orientation, window, lighting and so on. The observations were drawn from pictures taken by the author upon visit to the libraries, while responses from interviews were aggregated. The following deductions were made from the case study as presented for each library below;

**Table 4.1:** Interview on Değirmenlik Public Library with (E. Hanim)

<b>Değirmenlik Halk Kütüphanesi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	Yes
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	Yes
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	No
Is the circulation area located near the library's entrance?	No
Is the circulation area clearly visible and identifiable from the library's entrance?	No
Is there comfortable adult seating for use in the library?	Yes
Does the space allow a variety of comfortable seating options?	No
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	Yes
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	No
In addition to general and task lighting, do certain areas of the library have special lighting?	No
Are the lights used to highlight display cases and exhibits non-glaring?	No
Is lighting adequate at the lower shelf areas in book stacks?	No
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	No
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	No
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	No
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	No
Does flooring minimize noise and enhance building acoustics?	No
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	No
Is matte, or dull, finish used where reflectivity is a concern?	No
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.2: Analysis of Degirmenlik Public Library**

SITE PLAN		PLAN		ELEVATION																													
		 GROUND FLOOR PLAN		 FIRST FLOOR PLAN																													
																																	
INDOOR ENV. QUALITY PARAMETERS		PHOTOS																															
<p><b>Spatial Comfort;</b> Entrance hall need improved corridor to reduce noise distribution</p> <p><b>Lightning;</b> Insufficient lightning condition</p> <p><b>WC;</b> Old structure that needs remodification.</p> <p><b>Windows;</b> Installation of double face glass is preferable</p> <p><b>Floors and Walls;</b> The walls and floors needs improvement</p> <p><b>Ventilation;</b> The room requires better ventilation system</p> <p><b>Hygiene:</b> The overall cleaning and hygiene of the library is not adequate. Hygiene directly impacts health</p> <p><b>Space Design;</b> Architectural design of the building requires comfortable reading chairs, sofas, internet installation, and modern technology</p>		 Entrance waiting room																															
				 Children's section																													
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES		SWOT ANALYSIS																															
<table><tr><td>Entrance Hall</td><td>2 X 4</td><td>Stairs</td><td>0.15m rise, 0.30 run</td></tr><tr><td>Corridor</td><td>-</td><td>Elevation</td><td>-</td></tr><tr><td>Children Section</td><td>4 X 4</td><td>Library Stand</td><td>0.6 x 1m</td></tr><tr><td>Toilet</td><td>2.5 X 4</td><td>Computer Room</td><td>-</td></tr><tr><td>Ramp</td><td>-</td><td>Classroom</td><td>5.5 x 4m</td></tr></table>		Entrance Hall	2 X 4	Stairs	0.15m rise, 0.30 run	Corridor	-	Elevation	-	Children Section	4 X 4	Library Stand	0.6 x 1m	Toilet	2.5 X 4	Computer Room	-	Ramp	-	Classroom	5.5 x 4m	<table><tr><th>STRENGTH</th><th>WEAKNESS</th><th>OPPORTUNITY</th><th>THREAT</th></tr><tr><td>walls boasted of some exquisite design with colors presence of a sunscreen</td><td><ul style="list-style-type: none"><li>small doorways</li><li>cramped spacing</li><li>low seating window</li><li>presence of stairs and flights in the adjoining reading halls</li><li>The shelves and stacks poorly arranged</li></ul></td><td><ul style="list-style-type: none"><li>The fortified windows could serve as a safety measure from thieves</li><li>The shelves and stack orientation could be improved upon</li></ul></td><td><ul style="list-style-type: none"><li>limited resources</li></ul></td></tr></table>				STRENGTH	WEAKNESS	OPPORTUNITY	THREAT	walls boasted of some exquisite design with colors presence of a sunscreen	<ul style="list-style-type: none"><li>small doorways</li><li>cramped spacing</li><li>low seating window</li><li>presence of stairs and flights in the adjoining reading halls</li><li>The shelves and stacks poorly arranged</li></ul>	<ul style="list-style-type: none"><li>The fortified windows could serve as a safety measure from thieves</li><li>The shelves and stack orientation could be improved upon</li></ul>	<ul style="list-style-type: none"><li>limited resources</li></ul>
Entrance Hall	2 X 4	Stairs	0.15m rise, 0.30 run																														
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Toilet	2.5 X 4	Computer Room	-																														
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### ***Summary of Findings At Degirmenlik Public Library***

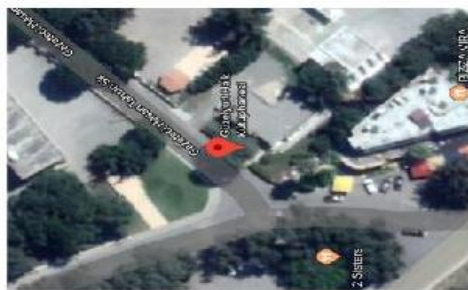




The library was previously a police station, now re-tasked to a library. Efforts were made with the very limited resources from the government to renovate and repurpose the building to serve as a library. The previous purpose of this space is reflected on the architecture of the building, small doorways, cramped spacing and low seating windows were the most prominent features of the library. The windows were decorated with drapes and the fortification with strong metals could be a psychological stressor on the users of the library. The walls boasted of some exquisite design with colors ranging from cool, to warm, which could have different reaction to the psych of the heterogeneous number of people who use the library. There is limited space and the cramp could induce a very intense reading environment and in a way have a domineering effect on the reader. A special feature was the presence of a sunscreen which could have a 3-way effect on the users of the library which includes; lighting effects, thermal comfort in extreme or moderate cold conditions and creating a natural environment. The shelves and stacks could affect the thermal comfort of the users, due to the lack of proper orientation and arrangement of the shelves and the presence of stairs and flights in the adjoining reading halls also could play a limiting role in blocking out natural lighting and casting a looming shadow over the library environment.

The children's reading section is well designed, colorful and warm with fine interior furniture and décor. The walls are painted with warm, bright colors. The room is like the other rooms in the library, small and cramped, with the limited space managed to hold the furniture and bookshelves, the remaining is very small and could limit a child's ability to express and generally affect the air quality within the space as the children share the limited breathable air within the space. The entrance adjoining waiting room is small and cramped, the furniture was made to fit into the small space. The waiting room being the receiving lounge of the library with the small space could have a limiting effect on the eventual satisfaction of the library users. The walls are tattered with dull paints and design.

**Table 4.3:** Interview on Güzelyurt Public Library with (Mehmet Bey)

<b>Güzelyurt Kutuphanesi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	Yes
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	Yes
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	No
Is the circulation area located near the library's entrance?	No
Is the circulation area clearly visible and identifiable from the library's entrance?	No
Is there comfortable adult seating for use in the library?	Yes
Does the space allow a variety of comfortable seating options?	Yes
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	Yes
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	No
In addition to general and task lighting, do certain areas of the library have special lighting?	No
Are the lights used to highlight display cases and exhibits non-glaring?	No
Is lighting adequate at the lower shelf areas in book stacks?	No
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	Yes
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	No
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	Yes
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	Yes
Does flooring minimize noise and enhance building acoustics?	Maybe
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	No
Is matte, or dull, finish used where reflectivity is a concern?	Yes
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.4: Analysis of Guzelyurt Public Library**

SITE PLAN			PLAN		ELEVATION	
						
INDOOR ENV. QUALITY PARAMETERS			PHOTOS			
<p><b>Spatial Comfort;</b> Highly required space distribution for adequate air exchange.</p> <p><b>Lightning;</b> Lightning condition requires modification</p> <p><b>WC;</b> Old, dirty, and hygiene needs improvement</p> <p><b>Windows;</b> Double face glass is recommended for the building structure</p> <p><b>Floors and Walls;</b> Needs remodification too</p> <p><b>Ventilation;</b> The room requires better ventilation system</p> <p><b>Hygiene:</b> The overall cleaning and hygiene of the library is not adequate. Hygiene directly impacts health</p> <p><b>Space Design;</b> The space design requires modern touches</p>			<div></div> <p><b>Children Section</b><b>Cafeteria</b></p>			
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES			SWOT ANALYSIS			
<b>Entrance Hall</b>	<b>2 X 3.5</b>	<b>Stairs</b> -	<b>STRENGTH</b> <ul style="list-style-type: none"><li>ceramic floors</li><li>good lighting</li><li>good color schemes</li></ul>	<b>WEAKNESS</b> <ul style="list-style-type: none"><li>very compact space</li><li>glass-low riding windows</li><li>small compact door</li><li>The book shelves and stacks due to the limited space are poorly oriented to provide adequate ventilation and cross ventilation</li><li>Poor thermal condition due to the space</li></ul>	<b>OPPORTUNITY</b> <ul style="list-style-type: none"><li>The stacks and shelves orientation can be improved upon</li></ul>	<b>THREAT</b> <ul style="list-style-type: none"><li>The casted deck ceiling poses a major risk to the users.</li><li>The deck also inhibits good thermal comfort of the users</li><li>Lack of resources</li></ul>
<b>Corridor</b>	<b>1.5 X 5</b>	<b>Elevation</b> -				
<b>Children Section</b>	<b>3.5 X 4</b>	<b>Library Stand</b> 0.6 x 1m				
<b>Toilet</b>	<b>5 X 2.5</b>	<b>Computer Room</b> -				
<b>Ramp</b>	-	<b>Classroom</b> x				

### ***Summary of Findings at Güzelyurt Public Library***

Güzelyurt kutuphane was once a residential home before it was converted to a library. There is very sparse information on the library as the people living around it does not use it because they do not like it. Güzelyurt kutuphane library is a very compact space re-tasked into a library. Its features include, glass-low riding windows that opens onto a busy tarred road, ceramic floors, good lighting complemented by natural lighting from the glass window, small compact door and limited spacing. The book shelves and stacks due to the limited space are poorly oriented to provide adequate ventilation and cross ventilation and the compact nature discourages good thermal comfort except on artificial sources of heat control which may be hazardous to the health of its users. A deck-in serves as the ceiling of the building which poses more risks of poor ventilation and limits the options of decoration. The color schemes used complemented by the loose decorations hanging here and there made the interior of the library warm, and homely. The walkway is sturdy and firm to prevent slipping.

The walkway was made of stone and ceramic tiles. The exterior wall was painted with warm color, which provides a crisp, clean first impression. The white paint reflects the luminous energy cast on it by the light rays and thus gives a bright welcoming reflection, which may induce good mood and improve productivity. The waiting room and circulation desk is roomy and have a good choice of furniture, ceramic floor and ceilings which helps condition the acoustic noise and helps maintain the thermal comfort of the users of the library.

**Table 4.5:** Interview on Akdogan Public Library with (E. Bey)

<b>Akdogan Halk Kutuphanesi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	No
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	No
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	Yes
Is the circulation area located near the library's entrance?	No
Is the circulation area clearly visible and identifiable from the library's entrance?	No
Is there comfortable adult seating for use in the library?	Yes
Does the space allow a variety of comfortable seating options?	Yes
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	Yes
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	No
In addition to general and task lighting, do certain areas of the library have special lighting?	Yes
Are the lights used to highlight display cases and exhibits non-glaring?	No
Is lighting adequate at the lower shelf areas in book stacks?	No
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	Yes
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	No
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	Yes
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	Yes
Does flooring minimize noise and enhance building acoustics?	No
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	No
Is matte, or dull, finish used where reflectivity is a concern?	Yes
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.6: Analysis of Akdogan Public Library**

SITE PLAN			PLAN		ELEVATION			
								
INDOOR ENV. QUALITY PARAMETERS			PHOTOS					
<p><b>Spatial Comfort;</b> Entrance hall need improved corridor to reduce noise distribution</p> <p><b>Lightning;</b> Insufficient lightning condition</p> <p><b>WC;</b> The toilet condition requires immediate attention</p> <p><b>Windows;</b> The glass installation is in moderate condition</p> <p><b>Floors and Walls;</b> The walls and floors's condition is in adequate condition</p> <p><b>Ventilation;</b> The room air ventilation system is in good conditon with the installation of air condition in the reading rooms</p> <p><b>Hygiene:</b> The overall cleaning is in a good condition</p> <p><b>Space Design;</b> Building reading chairs is present</p>			 <b>Toilet</b>				 <b>General Reading Room</b>	
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES			SWOT ANALYSIS					
Entrance Hall	-	Stairs	-	<div><div>STRENGTH</div><ul style="list-style-type: none"><li>• Ceramic flooring and ceiling.</li><li>• a wide doorway</li></ul></div> <div><div>WEAKNESS</div><ul style="list-style-type: none"><li>• bad shape of the library toilet;</li><li>• generally is in an obvious state of neglect</li><li>• aged wall;</li><li>• color: are dull</li><li>• The shelves are poorly arranged and the stacks are disoriented</li><li>• the hall: are poorly lit and the wall: are poorly decorated</li></ul></div> <div><div>OPPORTUNITY</div><ul style="list-style-type: none"><li>• obvious need for renovation and remodelling</li><li>• The stacks and shelves orientation can be improved upon</li></ul></div> <div><div>THREAT</div><ul style="list-style-type: none"><li>• inadequacy of resources from the government</li></ul></div>				
Corridor	1.5 x 6.5	Elevation	-					
Children Section	-	Library Stand	0.6 x 1m					
Toilet	3 x 4	Computer Room	3 x 4					
Ramp	-	Classroom	x					
Store 5 x 4								


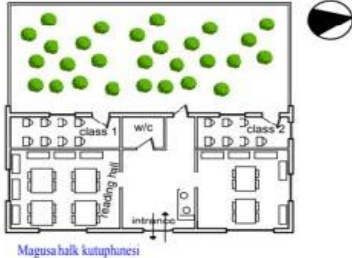



### ***Summary of Findings at Akdogan Public Library***

The library has been in existence before turkey took over the North Cyprus. It was previously a club /restaurant bar before the Turkish government converted it to a library. The most obvious feature of the library is the bad shape of the library toilets. The toilets are below standard and in a dismal condition. This as suggested by the management is as a result of inadequacy of resources from the government. The library generally is in an obvious state of neglect, owing to the very obvious need for renovation. The walls have aged and the colors are dull and this could affect the psych of its users. The shelves are poorly arranged and the stacks are disoriented and this could cast a shadow effect on the indoor lighting, have deleterious effect on the indoor air quality, with dust and aerosol allowed to drift the air. The windows are low and are the typical home fittings, which reduces the ventilation of such public places. Ceramic flooring and ceiling, roomy and a wide doorway, no visible walkway, the halls are poorly lit and due to the depression of the building and the shadows of adjoining buildings casting on the library. The walls have dull colors which also affect the lighting of the library reading rooms and general room. The walls are poorly decorated with only frames visible on the walls.

**Table 4.7:** Interview on Magusa Public Library with (E. Brandon)

<b>Magusa Kutuphanesi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	Yes
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	Yes
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	Yes
Is the circulation area located near the library's entrance?	Yes
Is the circulation area clearly visible and identifiable from the library's entrance?	Yes
Is there comfortable adult seating for use in the library?	Yes
Does the space allow a variety of comfortable seating options?	Yes
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	Yes
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	No
In addition to general and task lighting, do certain areas of the library have special lighting?	Yes
Are the lights used to highlight display cases and exhibits non-glaring?	No
Is lighting adequate at the lower shelf areas in book stacks?	Yes
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	Yes
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	Yes
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	Yes
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	Yes
Does flooring minimize noise and enhance building acoustics?	Yes
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	Yes
Is matte, or dull, finish used where reflectivity is a concern?	Yes
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.8:** Analysis of Magusa Public Library

SITE PLAN				PLAN				ELEVATION																																					
																																													
INDOOR ENV. QUALITY PARAMETERS						PHOTOS																																							
<p><b>Spatial Comfort;</b> Entrance hall need improved corridor to reduce noise distribution</p> <p><b>Lightning;</b> Insufficient lightning condition</p> <p><b>WC;</b> Old structure that needs remodification.</p> <p><b>Windows;</b> Installation of double face glass is preferable</p> <p><b>Floors and Walls;</b> The walls and floors needs improvement</p> <p><b>Ventilation;</b> The room requires better ventilation system</p> <p><b>Hygiene:</b> The hygiene of the Library is in moderate condition Hygiene directly impacts health</p> <p><b>Space Design;</b> Architectural design of the building requires comfortable reading chairs, sofas, internet installation, and modern technology</p>						 																																							
						<p>Logged Ceiling of the library</p> <p>Classroom</p>																																							
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES						SWOT ANALYSIS																																							
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### ***Summary of Findings Magusa Public Library***


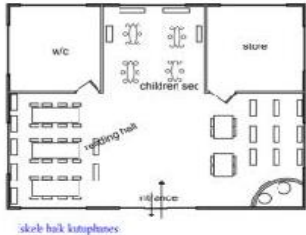

Magusa library was formerly a school. It is seemingly an historical building with a very old structure. The building was designed with bricks, which is symbolic of vernacular architecture of the 20<sup>th</sup> century and has a major effect on the indoor thermal comfort. The walkway was made with stones which gave it a firm, slip free and sturdy and the elevation of the building provides the interior with bright indoor lighting seeping through the panes of the glass doors and windows. The choice of fine wood interior gave that ancient feel and appeal to the interior of the library and the perfect stacking and array of books on the book shelves suggests a high organization of this library. The stacks and shelves were well arranged and oriented to give proper lighting of the reading rooms and general rooms. The choice of wooden seats could be a distraction to reader as the creaking of the chairs could impede concentration. Also, the seats are susceptible to degradation and wears as opposed to using steel chairs. The library sits near green vegetations and tree which allows for exchange of pure breathable air and gives it a serene appeal.

The entrance stairs is made bricks and aesthetically arranged to form stairs which leads into the library. The bricks make a firm and sturdy surface which helps prevent slippery. The logged ceiling is made with beams of planks which run parallel and holds the ceiling in place. The wood is susceptible to wear and attack from mites, which makes the choice of wooden logs dangerous for long term usage.

**Table 4.9:** Interview on Yeni Iskele Public Library

<b>Yeni Iskele Halk Kutuphasnesi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	Yes
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	Yes
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	Yes
Is the circulation area located near the library's entrance?	Yes
Is the circulation area clearly visible and identifiable from the library's entrance?	Yes
Is there comfortable adult seating for use in the library?	Yes
Does the space allow a variety of comfortable seating options?	Yes
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	Yes
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	Yes
In addition to general and task lighting, do certain areas of the library have special lighting?	Yes
Are the lights used to highlight display cases and exhibits non-glaring?	Yes
Is lighting adequate at the lower shelf areas in book stacks?	Yes
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	Yes
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	Yes
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	Yes
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	Yes
Does flooring minimize noise and enhance building acoustics?	Yes
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	Yes
Is matte, or dull, finish used where reflectivity is a concern?	Yes
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.10: Analysis of Iskele Public Library**

SITE PLAN		PLAN		ELEVATION	
					
INDOOR ENV. QUALITY PARAMETERS				PHOTOS	
<b>Spatial Comfort;</b>		Entrance hall need improved corridor to reduce noise distribution			
<b>Lightning;</b>		Sufficient lightning condition			
<b>WC;</b>		Old structure that needs remodification.			
<b>Windows;</b>		Installation of double face glass is preferable			
<b>Floors and Walls;</b>		The walls and floors needs improvement			
<b>Ventilation;</b>		The room has good ventilation system due to the presence of A.C			
<b>Hygiene:</b>		The overall cleaning and hygiene of the library is dequate. Hygiene directly impacts health			
<b>Space Design;</b>		Architectural design of the building requires comfortable reading chairs, sofas, internet installation, and modern technology			
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES				SWOT ANALYSIS	
Entrance Hall	4.4m	Stairs	12 x 0.15	STRENGTH	
Corridor	2.14m	Elevation	-	WEAKNESS	
Children Section	-	Library Stand	0.6 x 1m	OPPORTUNITY	
Toilet	2.5 x 2	Computer Room	-	THREAT	
Ramp	-	Classroom	2 x (2.5 x 5)		
				<ul style="list-style-type: none"><li>• good landscape</li><li>• bright color designs</li><li>• aesthetically pleasing</li><li>• thermal comfort</li><li>• good choice of interior décor and furniture</li><li>• ceramic flooring and ceiling</li><li>• exchange of pure breathable air with the presence of trees</li></ul>	
				<ul style="list-style-type: none"><li>• low placed windows</li><li>• small doorway</li><li>• poor orientation of the stacks and shelves</li><li>• casts a shadow on the indoor lighting conditions</li></ul>	
				<ul style="list-style-type: none"><li>• The fortified windows could serve as a safety measure from thieves</li><li>• The shelves and stack orientation could be improved upon</li></ul>	
				<ul style="list-style-type: none"><li>• Inadequacy of resources</li></ul>	


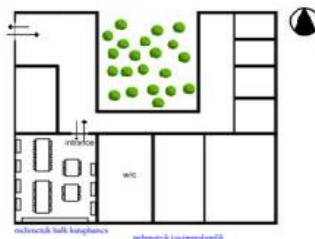


### ***Summary of Findings Yeni Iskele Public Library***

The library boasts of good landscape. It has bright color designs, that makes the interior warm and the walls have good design which makes the users comfortable and easily adept to the library. It is mostly a children's library and the design is aesthetically pleasing. The choice of interior furniture, flooring, walls and ceiling all culminate to the comfort of the users here. The ceramic flooring mitigates acoustic disturbances, the presence of trees around helps in exchange of breathable air. However, the lowly placed windows, small doorway and the poor orientation of the stacks and shelves casts a shadow on the indoor lighting conditions of the library which may impede reading and the general comfort of the users. The children's section was beautifully designed with bright colors and beautifully ornamented. The librarian and the children's section at the new pier public library, the spaces are in good conditions in terms of architecture, interior furniture and painting and the IEQ of the rooms. The walls are well designed with warm bright colors while the rooms are well lit, with the windows of the general reading room complementing the lighting conditions with natural light seeping through the glass windows. The floors and ceilings are made of ceramics, which helps condition the acoustic disturbance and the rooms are spacious for comfort, cross ventilation and freedom of expression of personal space.

**Table 4.11:** Interview on Mehmetcik Public Library with (M. Mustafa)

<b>Kultur Dairesi Mehmetcik Halk Kutuphanesi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	No
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	Yes
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	Yes
Is the circulation area located near the library's entrance?	Yes
Is the circulation area clearly visible and identifiable from the library's entrance?	Yes
Is there comfortable adult seating for use in the library?	No
Does the space allow a variety of comfortable seating options?	No
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	No
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	No
In addition to general and task lighting, do certain areas of the library have special lighting?	No
Are the lights used to highlight display cases and exhibits non-glaring?	No
Is lighting adequate at the lower shelf areas in book stacks?	No
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	Yes
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	Yes
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	Yes
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	Yes
Does flooring minimize noise and enhance building acoustics?	Yes
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	No
Is matte, or dull, finish used where reflectivity is a concern?	Yes
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.12:** Analysis of Mehmetcik Public Library

SITE PLAN		PLAN		ELEVATION																													
																																	
INDOOR ENV. QUALITY PARAMETERS				PHOTOS																													
<p><b>Spatial Comfort;</b> Entrance hall need improved corridor to reduce noise distribution</p> <p><b>Lightning;</b> Insufficient lightning condition</p> <p><b>WC;</b> Old structure that needs remodification.</p> <p><b>Windows;</b> Installation of double face glass is preferable</p> <p><b>Floors and Walls;</b> The walls and floors needs improvement</p> <p><b>Ventilation;</b> The room requires better ventilation system</p> <p><b>Hygiene:</b> The overall cleaning and hygiene of the library is not adequate. Hygiene directly impacts health</p> <p><b>Space Design;</b> Architectural design of the building requires comfortable reading chairs, sofas, internet installation, and modern technology</p>																																	
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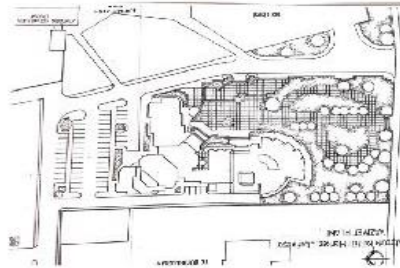



### ***Summary of Findings Mehmetcik Public Library***

There was little information on the history of the library or the building design. The library is under the shade of trees with foliage blocking the polarization of natural light into the building. It is slightly depressed and this affects the general lighting and impedes reading due to the poor indoor lighting of the library. From the entrance, the shadow effect of the depression and the trees is obvious, although the tree provides natural air for natural ventilation, the low windows blocks out the circulation of this air and renders ventilation difficult. Ceramic flooring and ceiling helps block out acoustic noise, while the ornaments on the windows further blocks out natural light and causes further lighting issues in the reading rooms. The walls are loosely decorated with just a few hanging photo frames, but the warm white colors used were largely ineffective due to the poor lighting effects in the rooms. The walkways is firm and sturdy and slip resistant due to the materials used and the general library is cramped up and small for the purpose of a library leading to poor ventilation and inadequacy of space for use and clustered arrangement of the shelves and stacks. The librarian's stand is poorly lit. The lighting situation is mostly because of the low windows which allows for minimal reflection of external light and the curtains and blinds used. The dull colored walls also have an effect on the lighting. The walls here are tiled and the ceilings made of ceramics, which then helps condition acoustic noise and helps maintain good thermal comfort in extreme weathers. The walkway is made of concrete and is slip resistant. The overlaying tree forms a canopy for pedestrians on the walkway but also forms a shadow and blows out external lighting from the library.

**Table 4.13:** Interview on Atatürk Central Library with

<b>Atatürk Kültürmerkezi</b>	<b>Answer</b>
Is the building aesthetically satisfactory during the day and night?	Yes
Will sunlight, glare, and excessive ultraviolet rays be controlled architecturally?	Yes
Are all exterior architectural features and surfaces constructed of easy to maintain materials?	Yes
Are all walkway surfaces stable and firm and are walkway surfaces slip resistant?	Yes
<b>Spatial Comfort Questions</b>	
Are queuing provisions made for a smooth traffic flow for entering and leaving?	Yes
Is the circulation area located near the library's entrance?	Yes
Is the circulation area clearly visible and identifiable from the library's entrance?	Yes
Is there comfortable adult seating for use in the library?	Yes
Does the space allow a variety of comfortable seating options?	Yes
<b>Lighting</b>	
Is the intensity of the general lighting sufficient for reading?	Yes
Is the tasks lighting adequate for carrels, workstations, separate desks, lounge furniture, and shelving area?	Yes
In addition to general and task lighting, do certain areas of the library have special lighting?	Yes
Are the lights used to highlight display cases and exhibits non-glaring?	Yes
Is lighting adequate at the lower shelf areas in book stacks?	Yes
<b>Windows</b>	
Are some of the windows placed close to the ceiling to allow a higher intensity of light?	Yes
Are some of the windows placed at high level, especially in reading areas and in areas occupied by the staffs for positive psychological effect?	Yes
Can windows be shaded on demand to prevent lighting from interfering with reading and other activities?	Yes
Are books stored away from direct sunlight to protect the bindings from fading and to prevent paper deterioration?	Yes
Are a limited number of windows operable to allow for maintenance and emergency situations?	Yes
<b>Flooring</b>	
Are special floor covering materials or systems used at the entry and places of heavy traffic to prevent dirt, mud, slush, and water from being tracked onto the carpet?	Yes
Does the carpet colour conceal soiling and resist fading?	Yes
Does flooring minimize noise and enhance building acoustics?	Yes
Is ceramic tile or a similar material used on the restrooms floors for its sanitary maintenance?	Yes
<b>Walls</b>	
Are the wall finishes, coverings, and surfaces appropriate for the room's function?	Yes
Is matte, or dull, finish used where reflectivity is a concern?	Yes
To add interest, are there special wall treatments such as stencilling, textures materials such as a woven fabric, or wood panelling?	Yes

**Table 4.14: Analysis of Ataturk Public Library**

SITE PLAN		PLAN		ELEVATION											
															
INDOOR ENV. QUALITY PARAMETERS				PHOTOS											
<p><b>Spatial Comfort;</b> Corridor is implemented to reduce noise distribution</p> <p><b>Lightning;</b> Sufficient lightning condition</p> <p><b>WC;</b> Modern Toilet</p> <p><b>Windows;</b> Installation of double face glass is preferable</p> <p><b>Floors and Walls;</b> The walls and floors needs is enabled</p> <p><b>Ventilation;</b> The room requires better ventilation system</p> <p><b>Hygiene:</b> The overall cleaning and hygiene of the library is adequate. Hygiene directly impacts health</p> <p><b>Space Design;</b> Architectural design of the building has comfortable reading chairs, sofas, internet installation, and modern technology</p>				 <b>Stairs</b>		 <b>Library stand</b>									
(SPACE ANALYSIS) SIZES OF SECTIONS IN METRES				SWOT ANALYSIS											
<p><b>Entrance Hall</b> 10x 5</p> <p><b>Corridor</b> 5x10</p> <p><b>Children Section</b> 5 x 8</p> <p><b>Toilet</b> 4 x 8</p> <p><b>Ramp</b> 2 x 4</p>		<p><b>Stairs</b> -</p> <p><b>Elevation</b> -</p> <p><b>Library Stand</b> 15 x 8</p> <p><b>Computer Room</b> -</p> <p><b>Classroom</b> 6.5 x 8</p>		<table><tr><th>STRENGTH</th><th>WEAKNESS</th><th>OPPORTUNITY</th><th>THREAT</th></tr><tr><td><ul style="list-style-type: none"><li>The cement building structure gives strength to the building.</li></ul></td><td><ul style="list-style-type: none"><li>Loose environmental air impact in the building</li><li>Window curtains and blinds further blocks the exchange or sunlight</li></ul></td><td><ul style="list-style-type: none"><li>Ramps can be provided to improve the library.</li><li>The walkway could be improved by introducing better lighting condition to the place.</li></ul></td><td><ul style="list-style-type: none"><li>Stairways can be harmful for disabled interested people</li></ul></td></tr></table>				STRENGTH	WEAKNESS	OPPORTUNITY	THREAT	<ul style="list-style-type: none"><li>The cement building structure gives strength to the building.</li></ul>	<ul style="list-style-type: none"><li>Loose environmental air impact in the building</li><li>Window curtains and blinds further blocks the exchange or sunlight</li></ul>	<ul style="list-style-type: none"><li>Ramps can be provided to improve the library.</li><li>The walkway could be improved by introducing better lighting condition to the place.</li></ul>	<ul style="list-style-type: none"><li>Stairways can be harmful for disabled interested people</li></ul>
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### ***Summary of Findings at Atatürk Central Library***

The library has the model architecture with the purpose and use for which it was constructed fashioned into construction. It has glass walls and is elevated for a conducive lighting and the creation of a natural environment with the similitude of reading leisurely in a park environment. The walls have mostly been double coated to provide that thermal comfort from cold and provide an aesthetic and appealing balance. The floors and ceilings were made of ceramics, which provides the cushion and absorbance of acoustic disruption which may be irritating and distracting. The library boasts of a spacious interface which allows the freedom of expression, comfort and legroom, allowing for personal spacing and satisfaction. The doorways are big and are decorated to appeal and invited the sense of aesthetic gratification and give a welcoming environment for productivity. The stacks, shelves, stalls and seating arrangements were given much consideration and culminate to the class of library standard this falls into. The walkway was firm and sturdy and made of concrete.

The children's section and the general reading room are in good conditions in terms of architecture and the IEQ of the rooms. The walls are well designed with warm bright colors while the rooms are well lit, with the windows of the general reading room complementing the lighting conditions with natural light seeping through the glass windows. The floors and ceilings are made of ceramics, which helps condition the acoustic disturbance and the rooms are spacious for comfort, cross ventilation and freedom of expression of personal space.

### **4.10 Comparison of The Features Present at The Case Study**

Presented below are the distinguished features of the libraries at North Cyprus. A comparison was made from the observation of the researcher and this presented below

**Table 4.15:** Comparison of Libraries in North Cyprus

LIBRARIES	Degimenlik	Guzelyurt	Akdogan	Magusa	Yeni Iskele	Kultur	Aturuk
CRITERIUM							
Children's section	✓	✓	✗	✓	✓	✗	✓
Corridor	✓	✗	✓	✓	✓	✓	✓
Toilet	✓	✓	✓	✓	✓	✓	✓
Ramp	✗	✗	✓	✗	✗	✗	✗
Elevator	✗	✗	✗	✗	✗	✗	✗
Library stand (for books)	✓	✓	✓	✗	✗	✓	✓
Computer room	✓	✗	✗	✓	✓	✗	✓

## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATION**

#### **5.1 Conclusion**

There seems to be a bridge between the recent trends in sustainable architecture and Indoor Environmental Quality (IEQ) and the current state of the architecture, design and considerations for better design strategies to ameliorate the effects of global warming and providing an ecofriendly, conducive and enabling learning environment in the libraries of North Cyprus.

While the world is steadily improving on the standards for sustainable architecture, with relevant examples of such monumental, conforming and redefining edifices all over the world (e.g Yin Yang library and other libraries across the UK and Europe generally), it is pertinent to enact such measures and countermeasures towards creating a sustainable environment in residents as well as of utmost importance in public places.

The body of the research aimed to answer the broadly, two research questions, viz;

- What is the current state of the North Cyprus Library in terms of indoor environmental quality?
- How does the IEQ of libraries in North Cyprus Library affect the general use of library?

Conclusively, there is a growing awareness on the need for measures that ensures sustainability of the environment, especially in public buildings and offices. It is the submission of the researcher that the status of the Indoor Environmental Quality in North Cyprus Public Libraries is rather under the benchmark of the standards and can be improved upon. It is also the conclusion of the researcher from observations made on visits to the libraries, that, there is an overwhelming neglect, misuse and absence of library users. This may be due to many factors, ranging from lack of awareness on the merits of the use of libraries and its facilities, to inadequacies, but the most generic reason as aggregated from the responses of the librarians and the handful users present, all blame the low turnout on the architectural deficits of the libraries from inaccessibility for the disabled,

poor indoor conditions of the libraries, absence of toilets among other things. It was also gathered that some people prefer the use of university libraries and private libraries because these offer better environment, technology and comfort. Furthermore, of all the visited and analyzed library, the most preferred Library according to the author's perspective is the Ataturk Public Library with its modern touch of elegance and proper air quality adequacy. Deductively, these aforementioned reasons amount to a defective indoor environmental quality which has in turn affected the use of the public libraries.

The overall condition of the libraries with respect to environmental impact quality seems very close to poor in ranking. This is due to lack of proper management of the libraries most of which was reported by the workers there to be due to lack of proper flow of funds from the government. The grand Ataturk library stands significantly better amongst its peers with its modern innovative equipment.

## **5.2 Recommendations**

The bulk of the improvement of IEQ in libraries in North Cyprus borders around innovativeness, conscious efforts made precisely to improve on the architecture of these libraries to fit world standards while improving on future designs and improving on the existing ones. With proper analysis of the several case studies, the researcher suggests improvement on the analyzed library which includes the following;

1. Implementation of modern computer equipment for the libraries
2. Improvement on the lightening condition in the libraries
3. Chairs, tables, reading sofas and other comfortable reading furniture is encouraged for the analyzed libraries in North Cyprus
4. The toilet conditions require several enhancements more importantly, standards installation of handles, entrance, ramps for disabled users
5. The entrance of the libraries requires wider automated doors, ramps and other required quality
6. The researcher found few Libraries too old to be renovated, thereby a total reconstruction is encouraged.
7. Nearby available lands upon approval by the government is encouraged to be development as an extension of the library.

8. For further development of libraries in general, the researcher having weighed the pros and cons of the research context, thus recommend that;
9. There should be reviewed legislation on sustainable architecture to meet user needs and world standards.
10. University libraries should be used as models for design of public libraries
11. The government should encourage public-private partnership to further boost investment in the infrastructural development of these libraries.
12. Further research should be carried out, intricately testing the indexes for good IEQ of public offices
13. The impact of climate change, energy consumption and conservation are the probable idea for future directions which is intended to be directed towards an automated climatic control system
14. A certain need for the creation of contentious training in the building technology region as required by the user
15. The future environmental should incorporate A.I (Artificial systems) for proper monitoring of the IEQ.

Conclusively, the development of the environment towards sustainability with energy efficient and healthy technologies needs to take the front in discussions, paying utmost attention to the effectiveness of these technologies.

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## **APPENDICES**

## Appendix 1

### ETHICAL COMMITTEE APPROVAL



BİLİMSEL ARAŞTIRMALAR ETİK KURULU

27.06.2019

Dear Khaled Martini

Your application titled “Post Occupation Evaluation of Government Libraries in North Cyprus” with the application number YDÜ/FB/2019/68 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

**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

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