ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

ASSESSMENT OF NOISE POLLUTION FROM RELIGIOUS INSTITUTIONS AND PERCEIVED EFFECTS ON HUMAN HEALTH IN ADDIS ABABA CITY: THE CASE OF BOLE MICHAEL AND BOLE BULBULA

By

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ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY
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PROJECT MANAGEMENT DEPARTMENT

ASSESSMENT OF NOISE POLLUTION FROM RELIGIOUS INSTITUTIONS AND PERCEIVED EFFECTS ON HUMAN HEALTH IN ADDIS ABABA CITY:
THE CASE OF BOLE BULBULA AND BOLE MICHAEL

A thesis Submitted to the School of Commerce of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Project Management

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This is to certify that the thesis prepared by Ermias Kiros Gebremariam entitled: ASSESSMENT OF NOISE POLLUTION FROM RELIGIOUS INSTITUTIONS AND PERCEIVED EFFECTS ON HUMAN HEALTH IN ADDIS ABABA CITY: THE CASE OF BOLE BULBULA AND BOLE MICHAEL submitted in partial fulfillment of the Requirements for the degree of Master of Art in Project Management complies with the regulations of the University and meets the standards concerning originality and quality.

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Declaration

I, the undersigned, declare that this thesis work is my original work carried out by me. All the resources and materials used as a reference for this thesis have been fully acknowledged and stated.

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Table of Contents

List of Tables

List of Figures

Lists of Abbreviations

A.A..... Addis Ababa

ANOVA ……Analysis of Variance

BB .....Bole Bulbula

BM .....Bole Michael

CSA… ..... Central Statistical Agency

dB (A)…..... A weighted decibel

FDRE…..... Federal Democratic Republic of Ethiopia

FGD.....Focus Group Discussion

GIS ..... Geographical information survey

Hz..... Hertz

NIDC… ..... Noise-Induced Disease Case

NIHL ..... Noise-Induced Hearing Loss

NS….....Not Specified

SPL..... Sound Pressure level

SPSS.....Statistical Package for Social Science

TTS….....Temporary Threshold Shift

WHO ..... World Health Organization

Abstract

This study investigated the perceived effect of noise generated by religious institutions on the health of the people of Bole Michael and Bole Bulbula in Addis Ababa City, Ethiopia. The research design used for this study was a descriptive survey and the instrument for data collection was a self-developed and structured questionnaire, site observations, focus group discussions, and document analysis. A total of three hundred thirty-seven (337) respondents were selected randomly and out of which 250 participants sampled and responded. Qualitative and quantitative techniques were used to analyze the data gathered. The analysis of the quantitative data was conducted using the MINITAB and SPSS software. According to the research finding, the area's four major religious institutions emitted a noise ranging from 70.5 dB(A) to 83 dB (A) which is significantly above the WHO's (1999) and the Ethiopian standard limits. The respondents perceived and experienced negative side effects that interfered with their peace to sleep, focus, or maintain good mental health. The study also found the availability of difficulty in the interface or misbalance between religious freedom and the right to a safe and peaceful environment, a significant gap between law's enforcement and maintaining the community's health, a lack of community awareness of noise pollution and its health effects, people's rights to live in a peaceful environment, as well as a lack of coordination between government agencies. Therefore, it is recommended that noise levels in residential areas need to be kept to a minimum, with stakeholders involved and doing their part. Training and education for the community and religious institutions should be provided, noise-reducing technologies should be put into place, and environmental and social impact studies should be done before any licenses are issued to reduce the noise pollution's effect on the community.

Keywords: *Sound, Noise, Noise pollution, sources of noise, effect of noise.*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

One of the most significant issues today that affects humans and other life forms on our planet is environmental pollution. Environmental pollution is the contamination of the physical and biological elements of the environmental system to the pointwhere it adversely affects the regular functioning of the environment (Kumar ,2015).

Pollution is a state produced by altering any aspect of the environment's physical, radioactive, thermal, chemical, biological, or other properties in contravention of any requirement, restriction, or limitation outlined in that proclamation or under any other applicable law (EPA 2002). This condition may be hazardous or potentially hazardous to human health, safety, welfare, and living things.

Noise pollution is one such pollutant emerging and growing rapidly in secrecy without leaving a residue like other pollution types, and as a result, most people accepted it by default.

Noise is a louder-than-normal sound that is unwanted or useless. Typically, it is produced from sources such as local religious activities, transportation, industry, construction, and commercial activities. The most recent addition of religious centers is a source of noise pollution.

Residents living close to religious institutions in urban areas are increasingly concerned about the noise pollution they produce. The noise that these institutions generate from their bells, loudspeakers, and other activities may affect residents' health (Babisch ,2002).

This thesis examines the health and quality of life impacts of noise pollution from places of worship on nearby residents. This study aimed to assess the noise levels produced by these institutions and their effects on residents' physical and mental health. This study will help spread knowledge about the significant, but frequently disregarded, noise pollution-related factors that affect public health. By bringing this issue to light, this study aims to offer insightful analysis and suggestions for reducing the negative effects of noise pollution from religious institutions on surrounding communities.

According to Field (1993), noise pollution is an excessively unwanted harmonious sound that negatively affects people's physiology and social structures. According to Hamza (2008), it is also several tonal components disagreeable to man and more or less intolerable to him, because of discomfort, fatigue, and disturbances. It is also regarded as a slow poison because it negatively affects the health of humans and the environment (Oyati and Stephen, 2017).

Among the four major religious groups in Ethiopia, Christianity and Islam are the key players in noise pollution during the day and night, as they mount loud speakers and amplifiers to public address systems on their places of worship. This was done to propagate their messages as far as possible to residents around the worship centers without disclosing their interest or disinterest in the messages. The livability of nearby residents where such religious centers are located is at risk because the clustering of these churches produces a high level of noise in terms of loudness.

In Ethiopia, particularly in Addis Ababa, religious houses are being built or opened at an alarming rate in all available locations, including stores, streets, and unfinished structures. Worships can be found in public spaces such as streets, hotels, abandoned movie theaters, studios, and warehouses. The use of sophisticated tools like loudspeakers, musical instruments, and microphones, among others, that project the worshipers' voices from inside the religious centers to the residents with deafening intensity, sometimes even by purposefully opening doors and windows, also contributes to the noise produced by these places of worship. Therefore, noise from loudspeakers, automobiles, and religious activities are significant sources of noise pollution.

Noise has become a very significant stress factor in the environment, to the extent that the term noise pollution has been used to signify the hazard of sound and its consequences in modern-day development (Mohammed & Amna, 2008).

According to medical experts, prolonged noise exposure may result in noise-induced hearing loss and stress-related illnesses such as hypertension, diabetes, and psychiatric issues. For this reason, the average noise level should never exceed 60 dB because anything higher poses a risk to a person's hearing and health. In the last ten years, the average lifespan in developing countries has decreased from 51.56 years in 2000 to 46.94 years in 2010 and 55.2 years in 2018 (WHO, 2018). Therefore, it is imperative that authorities and the general public take serious action to address these contributing factors, such as lowering the area's elevated noise levels as a community.

The Ethiopian Orthodox Church is by far one of the biggest sources of noise pollution in Addis Ababa city, a cosmopolitan city with more than five million people who are home to the African Union's headquarters as well as other international and regional organizations. This is because the Churches begin services at 4:30 am, sometimes even earlier, and continue for the next four hours.

The other, which people also highly complain about being woken up at 5:00 am, is the Mosques' call to prayer, following the Evangelical churches impulsive sound amplifier beat

that restless the community. Every Friday, mosques also have a higher level of noise, which causes many students to complain and move their class times. Therefore, it is crucial to pinpoint the causes and effects of noise pollution and examine how environmental laws are being applied to noise pollution controls in the city of Addis Ababa.

1.2 Statement of the Problem

The Bole Michael and Bole Bulbula areas in Addis Ababa City have experienced significant urban growth in recent years, leading to an increase in the number of religious institutions within their vicinities. While these religious institutions serve as places of worship and community gathering, there is a growing concern about the potential noise pollution they generate, negatively affecting the quality of life for residents in the area.

The excessive noise emitted from religious institutions, especially during prayer calls, ceremonies, and events, has become a major source of disturbance, causing physical and psychological discomfort among the residents (Doda, 2017). As a result, many complaints were found filed to the nearby environmental protection and police offices in Bole Michael residential area. However, there is a lack of comprehensive research on the assessment and evaluation of noise pollution from religious institutions specifically in the Bole Michael and Bulbula areas. Hence, it is crucial to investigate the extent and impact of noise pollution emanating from religious institutions in this area in order to understand the severity of the problem and develop appropriate mitigation measures for a sustainable and harmonious coexistence between religious activities and the surrounding community.

In assessing the noise pollution impacts; project management knowledge and skills are applied effectively. Areas such as stakeholder management, risk management, environmental impact assessment, project planning, scheduling, and legal compliance were found relevant when evaluating noise pollution from religious institutions as part of a project.

1.3 Research Questions

The research will try to develop a few fundamental questions from the research statement provided above that the respondents expected to react. It is obvious that these questions will act as a road map to help the researcher ask the respondents the proper questions and help themuse various data-gathering technologies.

1. What are the main sources of noise pollution from religious institutions in the Bole Michael and Bole Bulbula areas of Addis Ababa City?

2. What are the potential perceived health impacts of noise pollution from religious institutions in the Bole Michael and Bole Bulbula area of Addis Ababa City on nearby residents?
3. How do noise pollution levels from religious institutions in the Bole Michael and Bole Bulbula areas vary throughout the day?
4. What are the attitudes and perceptions of nearby residents towards noise pollution from religious institutions in the Bole Michael and Bole Bulbula areas?
5. Are there any existing regulations or guidelines in place to regulate noise pollution from religious institutions and how are these enforced?
6. Are there any mitigation measures or technologies available to reduce noise pollution from religious institutions in the Bole Michael and Bole Bulbula areas?
7. To what extent do the noise levels from the religious institutions exceed the World Health Organization (WHO) recommended noise standards?
8. What strategies can be implemented to effectively reduce noise pollution from religious institutions while maintaining religious freedom?

1.4 Research Objectives

1.4.1 General Objective

The main goal of this research is to examine the level of noise emitted from loudspeakers of religious institutions, how it affects residents' health, and the safety steps people take in Bole Michael and Bole Bulbula neighborhoods in the Bole district.

1.4.2 Specific Objective

- To identify the types of religious institutions, present in the Bole Michael and Bulbula areas.
- To measure and analyze the noise levels generated by the different religious activities in the areas and compare them with the World Health Organization limits.
- To assess the perceived impact of noise pollution from religious institutions on residents and nearby establishments.
- To investigate the adherence of religious institutions to noise pollution regulations and guidelines.
- To propose recommendations and strategies for mitigating noise pollution from the religious institutions.

- To raise awareness among religious institution leaders and community members about the importance of minimizing noise pollution and its effects on the environment and public health.

1.5 Significance of the Study

Noise pollution is a major problem that exposes the community to a variety of acute health problems, such as hearing problems, sleep disturbance, disturbance of mental health, reduced task performance, negative social impact, and annoyance.

Therefore, it is important for people in the community to know that noise can be harmful to both their immediate and long-term health, and to cooperate with government bodies to act and regulate even religious institutions. Therefore, following the recommendations of this study may help reduce noise pollution by teaching people how to reduce it and stay safe.

This research is anticipated to be helpful in the following major areas.

- This may contribute to a better theoretical understanding of the overall features of noise pollution and its associated problems.
- Identify the challenges the controlling authority is facing in the process of noise pollution control from religious institutions' loudspeakers
- The findings of this study could provide policymakers, public administrators, and pollution regulators with a better understanding of how to enforce existing laws and regulations on noise pollution, which may also help city planners and managers be aware of noise pollution sources so they can figure out ways to better control it.
- The research is thought to provide some initial data for the next project that could be used as a starting point for people who want to conduct more in-depth examinations, either in the city or in other research areas.
- This could potentially lower the number of people affected by health issues owing to noise.
- It may provide insight into environmental noise and its health consequences, which could help key stakeholders such as the central government, National Environmental Protection Authority, and Parliament in creating more effective legislative actions and plans to tackle noise pollution.
- This may also be useful for people who want to examine environmental noise or related topics.
- This research can lay the groundwork for getting different groups together to discuss potential solutions.

1.6 Scope of the Study

The scope of study this study involves investigating and evaluating the extent and impact of noise pollution caused by religious institutions in a specific area of Addis Ababa, namely the Bole Michael and Bole Bulbula areas.

The study will be focused on the Bole Michael and Bole Bulbula areas in Addis Ababa City, Ethiopia. Bole Michael and Bole Bulbula areas have a diverse range of religious institutions, including churches and mosques making them an appropriate location for assessing noise pollution from religious activities.

The study will involve measuring and assessing noise levels from various religious institutions in both selected areas. Sound level meters will be used to gather objective data on noise pollution.

Noise measurements will be taken during different times of the day, including prayer times, sermons, and other religious activities. The study will consider outdoor noise levels to assess the impact on nearby residents and the overall soundscape.

The study aims to identify the primary sources and factors contributing to noise pollution from religious institutions. Factors that may be considered include amplified sound systems, live music, loudspeakers, calls to prayer, and rituals involving noise-generating instruments.

Interviews with worshippers and nearby residents will be conducted to gather information about noise sources and their impact.

The study will evaluate the impact of noise pollution on the surrounding community and residents living near religious institutions

Surveys, questionnaires, and interviews will be conducted to gather subjective data on the perception and negative effects of noise.

Health issues, disturbance of daily activities, sleep disruption, and psychological impacts will be considered when assessing the community's response.

This study will examine the existing legal and regulatory framework in Ethiopia regarding noise pollution. The study will assess the extent to which religious institutions comply with noise regulations and guidelines.

The effectiveness of noise control measures implemented by religious institutions will also be evaluated.

Based on the findings, the study will propose appropriate mitigation strategies to address noise pollution from these religious institutions.

These strategies may include implementing noise control measures, improving insulation in

religious buildings, enforcing existing regulations, or creating new guidelines tailored specifically to religious institutions.

The study may make recommendations for collaboration between religious institutions, local authorities, and the community to find mutually agreeable solutions.

Overall, the scope of this thesis will involve comprehensive research into the assessment of noise pollution from religious institutions in the Bole Michael and Bole Bulbula areas of Addis Ababa, with a focus on understanding its sources, impact on the community, compliance with regulations, and proposing possible mitigation strategies.

1.7 Limitations of the Study

The data and information were collected through questionnaires and checklists focused on noise pollution from religious activities. Therefore, there were problems or biases with one's own religion to provide information, budget limitations to do the research, unavailability of data from the concerned authorities regarding noise level from religious institutions, and respondents' refusal to provide detailed information.

Despite these challenges, measures have been taken to minimize these problems and arrive at reasonable findings. Some of the measures taken to minimize the problems include:

- To enhance the study's generalizability, random sampling technique was adopted to ensure a representative sample from different parts of the area to increase the diversity and inclusivity of the study participants.
- Both subjective (surveys and questionnaires) and objective (using sound level meters) assessment methods were employed to get a more comprehensive understanding of noise pollution. This approach helped to triangulate data and reduce the potential bias of subjective perceptions.
- Establishing a positive collaboration with the community members and explaining the aim of the study and leaving those who were not willing even to receive the questionnaire facilitated access for data collection and avoided bias.
- It was explained that and ensures the privacy and dignity of the participants and religious institutions are respected.

1.8 Organization of the Study

The main body of the research is organized into five chapters and several sub-chapters, as follows.

Chapter.1. Background, description of study areas, statement of the problem, objectives of the study, research questions, significance of the study, scope, and limitations of the study, and organization of the study.

Chapter.2. Literature Review: deals with brief explanations of environmental noise pollution of present and past secondary data sources, types, and impacts it causes on human and animal lives regarding noise pollution. The information shall be collected from different reference sources and finally analyzed in context with selected topics

Chapter.3. Research Methodology: The research design and sample size determination, primary and secondary data collection methods will be carried out, and noise measurement devices will be applied in the study area.

Chapter.4. Data analysis and presentation: Personal observations, questionnaires, interviews, and focus group discussion analysis will be conducted in depth.

Chapter.5. Summary of Findings: Conclusion and Recommendations. Here, what has been found in the literature review is carried out in connection with new research findings.

1.9 Definition of Key Terms

Sound: is a type of energy transmitted through air or any other medium that can transmit sound waves. It is a form of vibration that stimulates a sense of hearing in living organisms. The vibration produced by any object or sound source creates pressure waves that travel through the medium and reach the ear. Sound can be described in terms of its frequency, amplitude, and wavelength. Here are some key definitions related to the specific issue.

Noise: refers to any unwanted or unimportant sound or disturbance that interferes with the desired or intended sound.

Noise pollution: is an excessive or unwanted sound that disrupts the normal functioning of humans and animals or causes damage to the environment. It is a type of environmental pollution that can adversely affect health, well-being, communication, and productivity.

Nuisance: A disturbance or annoyance that interferes with the comfort, enjoyment, or health of neighbors or the public (Legal Information Institute).

Sound pressure level: a measure of the average pressure of sound waves, expressed in decibels (Occupational Safety and Health Administration).

Acoustic barriers: These are physical barriers, such as walls, fences, or plants that can block or reduce the amount of noise that passes through.

Religious Institutions: Religious institutions are establishments or organizations that contribute to religious activities, such as churches, mosques, or any other place of worship.

Religious freedom: The right to practice any religion and manifest one's beliefs, protected under the First Amendment of the United States Constitution.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1 An Overview of the Environment, Pollution, and Related Concepts

2.1.1 Environment

The environment refers to the natural and physical features of the earth, including air, water, land, and living organisms, as well as human-made surroundings, such as buildings, roads, and cities. It is everything living and non-living that affects an organism's ability to stay alive, grow, and develop.

The environment is a dynamic system that constantly changes because of natural and human-induced causes. It provides essential natural resources that support life, including clean air, water, and soil as well as food, shelter, and energy. The environment is home to millions of plant and animal species that play crucial roles in ecological balance and biodiversity.

The health and well-being of living organisms, including humans, are interconnected with environmental health, making it critical to protect and preserve the environment (Merriam-Webster, 2021).

2.1.2 Urban Environmental Problems

Rapid urban changes do not necessarily produce serious environmental problems. However, environmental problems become particularly serious when there is a rapid expansion in urban population and production, with little or no consideration either for the environmental implications or for the political and institutional framework that is needed to ensure that such environmental problems are addressed (David, 2021). In low- and middle-income countries, expansion in their urban population has occurred without the need for expansion in services and facilities that are essential to an adequate and healthy urban environment (Fawzi, 2017).

Urban expansion without effective urban governance leads to a substantial proportion of the population facing high levels of risk from natural and human-induced environmental hazards (Jorge 2010). This can be seen in most major cities in Africa, Asia, and Latin America, where a significant proportion of the population lives in neighborhoods with inadequate polluted environments.

2.2 Environmental Pollution

Polluting the environment means putting items in the air, water, and land that are not supposed to be there. It can be done on purpose or by accident, and it causes harm to human health,

plants, and animals, and messes with things that people use like buildings and beaches (UNEP, 2018).

According to the United States Environmental Protection Agency (EPA), environmental pollution can have a range of harmful effects on humans, wildlife, and ecosystems, including respiratory and reproductive problems, high rates of cancer and other diseases, and reduced biodiversity and habitat destruction (EPA, 2021).

There are various types of pollution that have been recognized and studied over the years. However, one of the more recent types of pollution to gain attention is noise pollution. According to a study conducted by the World Health Organization (WHO) in 2018, noise pollution has become a pervasive problem in many cities around the world (WHO, 2018).

The WHO defined noise pollution as excessive or disturbing noise that may cause a negative impact on human health and well-being. It is caused by various sources such as traffic, construction, industrial activities, religious and even recreational events. The study further revealed that noise pollution can lead to numerous health issues including stress, sleep disturbances, cardiovascular problems, and impaired cognitive development in children (WHO, 2018).

In recent years, increasing urbanization and industrialization have contributed to the rise of noise pollution, making it an emerging concern for public health and quality of life. Efforts are being made by governments, organizations, and communities worldwide to address and mitigate noise pollution through various noise control measures and regulations.

Overall, noise pollution has gained recognition as a significant and troubling form of pollution in modern society due to its detrimental effects on human well-being.

2.3 Noise Pollution

The Latin term "nausea," which means disgust or discomfort, is the root of the English word "noise." Later, in Middle English, the phrase came to apply explicitly to unwelcome and undesirable noises (Harper, 2021).

When high noise levels from sources including traffic, construction, religious buildings, and businesses, among others, disrupt daily life and have a negative impact on health by causing hearing loss, stress, and sleep problems, this is known as noise pollution (WHO, 2021).

Although it may not seem as harmful as other forms of contamination and pollution, noise pollution negatively influences people's health and welfare and worsens the environment. Noise pollution is a serious side effect of modern life. Whether someone is at home, in their neighborhood, or at work can still have an impact on them.

Industrialization, poor urban planning, social and religious events, transportation, construction activities, and household tasks are causes of noise pollution. Noise pollution can cause many issues like hearing problems, health issues, sleeping disorders, cardiovascular issues, communication difficulties, and negative impacts on animals (Conserve Energy Future, 2018). Living in an urban area can sometimes be a real challenge, especially when it comes to noise pollution. It can cause health and social problems, and according to surveys and studies on the quality of life in cities, it is often listed as one of the most uncomfortable things to deal with (Maria, 2015).

2.3.1 Impact of Noise Pollution on Environment and Human Health

2.3.1.1 Impact of Noise Pollution on the Environment

High levels of noise, which are harmful to the environment and human health, are referred to as noise pollution. This is brought on by a number of factors, including industrial, commercial, religious, and transportation-related activities. According to previous studies, noise pollution has a significantly negative influence on ecosystems, including wildlife, plants, and habitats.
It was found that Noise pollution can negatively affect birds' communication and reproduction, leading to a decline in their populations (Francis,2013).
It can impact soil quality and decrease the presence of beneficial microorganisms, which affects the growth and survival of plants (Francis & Barber ,2013). Noise pollution can also cause changes in the behavior of animals, such as reducing their foraging and breeding activities, leading to a disruption in the food chain and ecosystems. Furthermore, it can lead to stress in animals and affect their health and overall well-being.
In conclusion, noise pollution has significant impacts on the environment, including habitat disruption, changes in animal behavior, and adverse effects on plants Noise pollution can also cause changes in the behavior of animals, such as reducing their foraging and breeding activities, leading to a disruption in the food chain and ecosystems. Furthermore, it can lead to stress in animals and affect their health and overall well-being.
In conclusion, noise pollution has significant impacts on the environment, including habitat disruption, changes in animal behavior, and adverse effects on plants and microorganisms. Therefore, there is a need for effective strategies to minimize noise pollution and protect the environment (Francis & Barber, 2013).

2.3.1.2 Impacts of Noise Pollution on Human Health

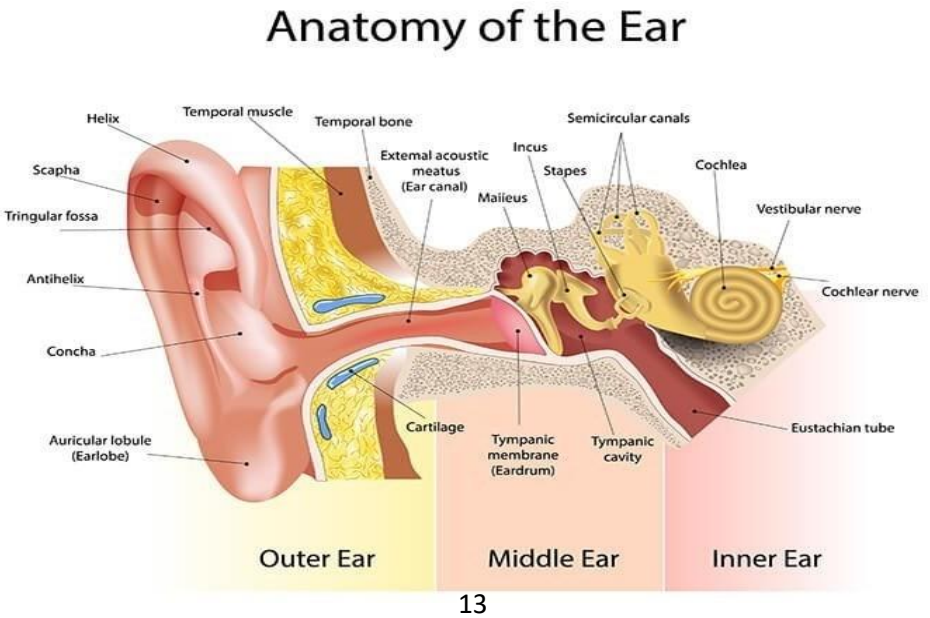
Noise pollution has detrimental impacts on human health, including physical and mental health. Exposure to excessive noise pollution has been linked to several health problems, including hypertension, hearing loss, cardiovascular diseases, sleep disturbance, cognitive impairment, stress, and anxiety (Basner, et al., 2014).

Numerous studies have examined the effects of noise pollution on health. For instance, children exposed to high levels of airplane noise pollution had a higher prevalence of hypertension than those living in quieter areas (Kempen et al.,2002). Similarly, Clarket (2012) found a link between cardiovascular disease risk and exposure to traffic noise pollution.

Additionally, it has been established that long-term exposure to noise pollution is harmful to mental health. According to Stansfield (2013), prolonged exposure to aircraft noise islinked to higher levels of anxiety and depression in adults. According to research by Hume, et al, (2012), persistent exposure to environmental noise has also been associatedto sleep disorders, which can cause a variety of physical and mental health issues like wearinessand poor concentration.

Noise pollution has a substantially negative impact on human health. Studies have shown a connection between noise pollution and high blood pressure, heart disease, hearing loss, cognitive decline, stress, anxiety, and sleep disorders. These findings highlight the urgent requirement for effective noise control measures to be implemented to protect human health and well-being. Both types of sound have the potential to cause psychological harm. While prolonged, low-volume noises can harm the middle ear, loud, fast noises can damage the eardrum (WHO 2001).

Figure:2.1 Anatomy of the Human Ear



The incidence of being momentarily "deafened" by a loud noise is said to have happened to everyone at some point. Despite frequently being accompanied by ringing in the ears, this "deafness" is not permanent, and if one speaks louder, others can be heard. Similar to normal hearing, it returns after a few hours, at most. Temporary Threshold Shift (TTS) is used to describe this type of partial hearing loss (Bugliarello, 1976).

A TTS may occur after using a firearm or during a long trip in a vehicle with windows down. The risk of developing permanent hearing loss may not be taken into account if exposure to this kind of loud noise occurs eight hours a day, five days a week. This kind of noise exposuredoes not have to be as loud as a gunshot; it may be someone shouting across the room. Any level of hearing loss, from partial to total, falls within this category.

Most of the time, this loss is irreversible and cannot be adequately rectified using tools such as hearing aids. The organ of the cortex, which is located inside the cochlea, loses the delicate hair cells and their auditory nerve connections.

Each loud noise exposure kills some cells, but repeated exposure kills more cells and eventually leads the organ of the cortex to collapse, resulting in deafness (Berglund and Lindvall, 1995).

However, exposure to loud noise can result in noise-induced hearing loss (NIHL), a permanent hearing impairment. Hearing loss may result from chronic exposure to noise levels > 85 dB. Both sensorineural (injury to the hair cells in the inner ear) and conductive (damage to the eardrum or middle ear) hearing losses are possible.

NIHL is common in many occupations and sectors, including industry, entertainment, and leisure pursuits such as going to concerts, firing guns, and wearing loud headphones.

The World Health Organization (WHO) estimates that, due to exposure to loud noises from personal audio devices and noisy entertainment venues, roughly 1.1 billion young people are at risk of hearing loss. Furthermore, 432 million people suffer from debilitating hearing loss globally. To prevent NIHL, the WHO recommends reducing exposure to loud noises, wearing protective hearing equipment, and taking breaks in high-noise environments.

Hearing loss is classified into different types and degrees based on the severity of the hearing loss. The degree of hearing loss is measured in decibels (dB) and is typically categorized as mild, moderate, severe, or profound (WHO, 2021). According to the American Speech-Language-Hearing Association (ASHA), the degree of hearing loss is defined as follows:

- Mild hearing loss (26-40 dB): Individuals with mild hearing loss may have difficulty understanding soft or distant speech, particularly in noisy environments.
- Moderate hearing loss (41-55 dB): Individuals with moderate hearing loss may struggle to understand speech at normal conversation levels and often need assistance with

communication.

- Severe hearing loss (56-70 dB): Individuals with severe hearing loss may rely heavily on visual cues and may have difficulty understanding speech without the use of hearing aids or other assistive devices. Profound hearing loss (71 dB or greater): Individuals with profound hearing loss may relyalmost entirely on visual communication and may benefit from cochlear implants or otheradvanced hearing devices (ASHA, 2021).

Table:2.1 Noise pollution level and its effects

No	Level (in db)	Effect
1	Up to 30 decibels (dB)	No harmful effects
2	30-40 dB	Mild disturbance
3	40-50 dB	Irritation and annoyance
4	50-60 dB	Interference with speech and hearing
5	60-70 dB	Disruptive to daily activities and concentration
6	70-80 dB	Risk of hearing loss
7	80-90 dB	Significant hearing damage
8	90-100 dB	Risk of permanent hearing damage
9	100+ dB	Can cause instant hearing damage

Source: Adapted from WHO (2011)

Stress, disturbed sleep, hearing loss, high blood pressure, cardiovascular issues, reduced cognitive function, and communication challenges are among the negative effects of noise pollution. Additionally, it may be detrimental to the environment and wildlife. Furthermore, loud noises may result in accidents caused by distracting workers and drivers.

According to the World Health Organization (WHO), there are several adverse health effects of noise pollution on humans, including

- **Hearing Loss:** Exposure to high levels of noise for an extended period can cause hearing loss, especially in the elderly population.
- **Cardiovascular Diseases:** Noise pollution can lead to an increase in blood pressure and heart rate, which can cause cardiovascular diseases such as heart attack and stroke.
- **Sleep Disturbances:** Noise pollution can cause sleep disturbances such as difficulty falling asleep, frequent awakenings, and disrupted sleep patterns, which can lead to the development of several other health problems.
- **Mental Health Disorders:** Exposure to chronic noise pollution can increase stress, anxiety, depression, and other mental health disorders.

- **Cognitive Impairment:** Exposure to high noise levels for a prolonged period can impair cognitive functions, such as memory, learning, and attention.
- **Interference with Communication:** Noise pollution can interfere with communication, leading to misunderstandings and reduced productivity in work and personal life.
- **Developmental Disorders:** Prenatal exposure to noise pollution can lead to developmental disorders in fetuses, affecting their growth and development.

These adverse health effects of noise pollution highlight the need for sound management practices to minimize the impact of noise pollution on human health.

2.4 Experiences of Developed Country's Actions Against the Use of Loudspeakers

Although they were created in the early 1900s, loudspeakers were first used widely in churches and mosques in the 1920s. Some mosques feature loudspeakers for calls to prayer that can be heard up to 5 km away (Adhan & Iqamat, 2010). The experiences of some developed countries with the use of loudspeakers are as follows:

- **India:** India is a diverse country with diverse religious beliefs and practices. The country has different laws and regulations for noise pollution control during religious events and festivals. The Central Pollution Control Board (CPCB) has established acceptable noise levels for various zones in India.
- **Saudi Arabia:** Islamic prayers are an essential part of Saudi Arabian culture, and the prayer adhan (call to prayer) is broadcast five times daily from mosques. However, noise levels in mosques have raised concerns among citizens. The Saudi government has introduced regulations to control the maximum sound level of the Adhan, and mosques violating these regulations are subject to penalties and fines.
- **Indonesia:** Indonesia is home to the world's largest Muslim population, and its experience in religious noise level control is noteworthy. The government has established a set of rules and regulations for community and religious events and festivals' permitted sound levels. Religious institutions must also obtain permits from the local government before conducting any loud religious activities, including call-to-prayer and religious ceremonies.
- **Singapore:** Singapore is a secular country with a multicultural society. The country's constitution guarantees citizens freedom of religion but also regulates religious practices that may cause noise pollution. The country's National Environment Agency (NEA) has set strict noise-level regulations for religious and cultural events.
- **Germany:** The German government has regulated loudspeaker use since the 1980s. In 2017, stricter noise pollution laws were introduced, including limiting the use of

loudspeakers in public spaces to certain times of the day (usually between 8 am10 pm) and setting decibel limits. Violators face penalties of up to 50,000.

- **Sweden:** The Swedish Environmental Protection Agency has issued guidelines for noise levels from musical events, including loudspeakers. These guidelines recommend a maximum allowable noise level of 100 dB for concerts and festivals (Swedish Environmental Protection Agency, 2010)
- **Japan:** The Japanese government introduced noise pollution regulations in 1967, and reinforced them in 2007. Under these regulations, the use of loudspeakers in public places is restricted to certain times of day and night. In addition, the maximum permitted sound pressure level was 60 dB during the day and 50 dB at night.
- **United States:** Several states and cities in the US have noise ordinances that regulate the use of loudspeakers in public spaces. For example, New York City has a noise code that limits the use of loudspeakers in residential areas to certain times of the day and has maximum allowable sound levels for various types of establishments and events.

2.5 Addis Ababa's Noise Pollution in Relation to Other Cities and Countries

Addis Ababa, the capital city of Ethiopia, faces the serious problem of noise pollution. There are numerous sources of noise pollution in the city, including transport systems, construction sites, factories, religious activities, and street businesses, and the high volume of noisegenerated by these sources negatively impacts the health of residents, disrupts sleep patterns, and causes stress and annoyance. This problem has been exacerbated in recent years owing to rapid urbanization and population growth in the city.

According to a study conducted by Addis Ababa University, noise levels in a city exceed the maximum allowable limits set by the World Health Organization. The study found that noise levels in some areas of the city, particularly around major roads and intersections, reached up to 85 dB, which is equivalent to the sound of a diesel locomotive (Mulugeta, et al. ,2019).

The negative effects of noise pollution on human health are well documented. Prolonged exposure to high levels of noise can cause hearing loss, hypertension, and cardiovascular disease. It can also cause sleep disturbances that can affect the immune system and lead to chronic diseases.

Efforts to tackle noise pollution in Addis Ababa have been limited, and there is a lack of awareness among the public regarding the negative effects of noise pollution.

The average noise level near major roads during daytime hours was found to be significantly higher than the WHO recommended level of 55 decibels (dB). As per (Doda ,2017), the noise

level was measured at various locations throughout the city. The location with the loudestnoise had an average noise level of > 87 dB. In Addis Ababa, industrial operations, religious prayers, preaching, and construction sites are additional sources of noise. It was also found that noise levels near construction sites frequently exceeded 100 dB, which is extremely dangerousto human health.

2.5.1 Noise Pollution in Addis Ababa as Compared to Other Cities

According to the study conducted by Gebremariam and Akalu (2020), the status of noise pollution from religious institutions in Addis Ababa, Ethiopia, was compared to other cities and countries.

The research revealed that noise pollution from religious institutions in Addis Ababa was considerable and had a significant impact on the surrounding environment and residents. The study found that the noise levels exceeded the recommended limits set by national and international standards in many cases.

Compared to other cities and countries, Addis Ababa had higher noise levels from religious institutions. This could be attributed to multiple factors, including the rapid urbanization and population growth in the city, leading to the increased number of religious institutions and their activities.

In comparison to other cities and countries, where noise pollution from religious institutions is also a concern, Addis Ababa exhibited higher levels of noise due to religious activities.

The current study will conduct on noise pollution from religious institutions specifically that made this thesis different. In addition, the assessment of noise pollution from religious institutions requires a special approach that acknowledges the cultural, religious, and legal aspects associated with such noise sources.

2.6 Noise Measurement

Noise assessment is a key component of noise-control technology. The most useful instruments for noise measurement are briefly discussed here.

A common unit for measuring sound is the decibel(dB), which is the logarithmic ratio of the sound power to the power at the threshold of human hearing. Noise is quantified in terms of frequency and sound intensity; dB (A) weights sound that falls within the human audible range (Bhatia, 2014).

2.6.1 Noise-Measuring Instruments

Sound pressure level (SPL): The sound pressure level (SPL) or the intensity of sound waves is measured in decibels (dB) using a sound level meter, which is a machine. It is frequently used to monitor and measure noise levels in various settings, including factories, concerts, places of worship, public roads, and construction sites.

An analog-to-digital converter (ADC), display, microphone, and data storage devices comprise a typical sound-level meter. The preamplifier amplified the electrical signals that the microphone first converted into sound waves. The digital signal, which is shown on the screen of the meter, was created by the ADC from the analog signal. The captured sound data can be recorded and stored on a data storage device for subsequent analysis. Sound-level meters are crucial tools for evaluating how noise affects both human health and the environment.

Sound level meter standard: The standard for sound level meters is the International Electrotechnical Commission (IEC) 61672. This standard specifies the general requirements for sound-level meters, including accuracy, frequency weighting, time weighting, and measurement range. It also covers the calibration and verification procedures for the sound-level meters. The IEC 61672 standard ensures that sound level measurement is consistent and accurate across different instruments and applications. The types of sound level meters used were as follows:

- **Type 0 Sound Level Meter:** This advanced and precise category of sound level meter. It is utilized in strict measuring environments, where the precision of the measurements is crucial. This type of sound-level meter is frequently employed in research, development, and reference measurements for regulatory purposes.
- **Type 1 Sound Level Meter:** Although frequently used to measure environmental and industrial noise, this class of sound level meters is also extremely accurate and precise. It is designed to precisely measure noise levels in a range of environments and provide information for noise control and mitigation.
- **Type 2 Sound Level Meter:** This class of Sound Level Meters is less accurate than type 1 sound level meters but is still highly reliable and useful in a wide range of applications. It is suitable for measuring noise levels in industrial environments, workplaces, and public spaces.
- **Type 3 Sound Level Meter:** The basic category of sound level meters. It is frequently used to measure the amount of noise in homes, workplaces, and public areas because it is used for straightforward noise-assessment tasks.

- Although it does not measure noise levels as accurately as type 1 or type 2 Sound Level Meters, it is still helpful for general noise-levelmonitoring.

2.6.2 Noise-Weighing Networks

A noise-weighing network is a set of filters used to adjust the sensitivity of a noise level meter to different frequencies of sound. The purpose of this is to more accurately represent the manner in which the human ear perceives different frequencies of sound. This is important because different sound frequencies have different effects on human hearing and health.

Several different types of noise-weighing networks are commonly used in noise-level meters. The most common of these are A-weighting, B-weighting, and C-weighting.

A-weighting is the most commonly used and is designed to represent the way in which the human ear perceives sound at low to moderate levels. B-weighting is designed to represent sound at moderate to high levels, whereas C-weighting is designed to represent sound at very high levels. In addition to these weighting networks, some noise-level meters also include frequency- weighting networks. These were used to adjust the sensitivity of the meter to different frequencies. Examples include octave and third-octave band filters.

Overall, the use of noise-weighing networks in standard noise-level meters is essential for accurately measuring and characterizing noise in various environments and ensuring that noise is kept within safe levels for human health and well-being. International Electrotechnical Commission (2013). We used the A- weighing for this specific research.

2.7 Noise Management

Noise management refers to the efforts made to control and minimize the negative effects of noise pollution on humans and the environment. The goal of noise management is to maintain acceptable levels of noise for human health and safety while minimizing its impact on the environment.

According to the World Health Organization (WHO), noise pollution is a major environmental health hazard that can lead to several adverse effects including hearing loss, stress-related illnesses, sleep disturbances, and impaired cognitive function (WHO, 2011).

Noise management seeks to address environmental and public health issues associated with noise pollution by implementing effective control measures to mitigate the effects of noise.

Some strategies used in noise management include noise barriers, soundproofing, and zoning regulations that restrict high-noise activities in designated areas.

Overall, the primary goal of noise management is to maintain a healthy and safe environment, while ensuring that the benefits of economic activities are not compromised. In this way, people can live, work, and play in a harmonious and peaceful environment, free from the negative impacts of noise pollution. To achieve this, legal and policy arrangements are critical.

2.7.1 Environmental Legal Frameworks in Ethiopia

2.7.1.1 The 1995 FDRE Constitution

The significance of environmental protection has been emphasized in both the National Economic Policy and Strategy and Ethiopia's 1995 Constitution. The objective is to ensure that all Ethiopians live healthy lives and that the nation can continue to develop while protecting the environment and its resources.

Even though the Constitution, laws, and proclamations contain excellent ideas regarding pollution, not enough institutions have been established and implemented to safeguard citizens' peace. Examples from constitution articles are as follows:

- Article 44 of the FDRE Constitution on the title 'Environmental Rights ''proclamation declares as follows;

Article 44(1): 'All Persons have the right to a clean and healthy environment ''.

- Article 92 states the general Environmental Objectives of Ethiopia as follows:

Article 92(1): The government shall endeavor to ensure that all Ethiopians live in a clean and healthy environment ''.

Article 92(2): The design and implementation of programs and development projects shall not damage or destroy the environment ''.

Article 92(3): 'People have the right to full consultation and to the expression of views in the planning and implementation of environmental policies and projects that affect them directly

Article 92(4): 'Government and citizens shall have the duty to protect the environment ''.

Because pollution and other problems can disrupt daily life, citizens have the right to live in a peaceful environment. Therefore, citizens have the right to complain and encourage government authorities to take action against polluters.

2.7.1.2 The Ethiopian Environmental Policy of 1997

Ethiopia's environmental policy was developed in 1997 to achieve sustainable development. The policy recognized that natural resources are crucial for economic growth and development and must be managed sustainably.

The policy also acknowledged that Ethiopia's ecosystem is vulnerable to overutilization, pollution, and degradation due to population growth,urbanization, and industrial activities.
This policy identified the main environmental problems in Ethiopia, including deforestation, soil erosion, waterlogging, water pollution, and biodiversity loss. Several strategies have been proposed to address these challenges, such as conserving natural resources, promoting renewable energy, reducing pollution, and sustainably managing forest resources. The policy also aimed to increase the capacity of people and institutions responsible for implementing environmental programs. Every person has the right to live in a clean and healthy environment, which is incorporated as the main guiding principle of the policy.

2.7.1.3 Proclamations Regarding Environmental Pollution Reduction

Currently, environmental issues are being considered in almost all declarations for various reasons. However, some declarations have been made specifically to protect the environment, as follows:

- Environmental Pollution Controls proclamation (No.300/2002),
- Environmental Impact Assessment proclamation (No, 299/2002) and
- Solid waste management proclamation (513/2007).

According to the Environmental Pollution Control Proclamation (No. 300/2002), the environmental regulatory body must develop workable environmental standards based on scientific and environmental principles by consulting relevant agencies. Therefore, they have the ability to formulate standards and are approved by the concerned bodies.
Article 3/1 of the Environmental Impact Assessment Proclamation (No. 299/2002) states that no one may begin working on a project that necessitates an EIA, as determined by a directive issued in accordance with Article 5 of this Proclamation, without permission from the Authority or the relevant regional environmental agency. Therefore, before issuing the license, concerned government parties must control and approve the environmental and social impact of the planned establishment in accordance with Articles 7/1 and 2 of the proclamation.

2.8 Standard for Noise Emission Limits

2.8.1 WHO and Ethiopian Noise Level

The World Health Organization (WHO) has established guidelines for recommended noise levels in different settings. These guidelines vary depending on the type of noise and duration of exposure. Some examples of WHO noise level standards are as follows:

Table:2.2 WHO Standard for Noise

Environment	Average noise level (dB)		Remark
	Day time	Night time	
General outdoor	55	45	Residential area
Indoor	</= 35		Schools, hospitals
Occupational area	</=85		eight-hour work day

Table 2.3 Ethiopian Standard for Noise

Area Code	Area Category	Limits in decibel (dB	
		Day time (6.00 am to 9. 00p.m)	Night time (9. 00p.m.to 6.00am)
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45

Table 2.4. Environmental, Health, and Safety (EHS) Guidelines

Category of Area	Limits in decibel (dB)	
	Daytime (07:00 - 22:00)	Night time (22:00 - 07:00)
Residential; institutional; educational	55	45
Industrial; Commercial	70	70

Notably, prolonged exposure to noise levels above these standards can lead to hearing loss, stress, and other health problems. Therefore, it is important to regulate and manage noise sources in various settings to protect public health.

2.9 Conceptual Frame Work on Noise Pollution Management

In recent years, urbanization and population growth in Addis Ababa City, specifically in the Bole Michael and Bole Bulbula areas, have led to an increase in noise pollution from various sources. One notable contributor to this issue is the presence of religious institutions, such as churches and mosques, that regularly conduct religious activities and events accompanied by loud noise emissions.

The assessment of noise pollution from religious institutions is of utmost importance in developing effective strategies for mitigating its adverse effects on human health and overall well-being. Therefore, a conceptual framework is necessary to guide the comprehensive assessment of noise pollution arising from the establishments in the Bole Michael and Bole Bulbula areas of Addis Ababa City.

The conceptual framework will provide a systematic and standardized approach for assessing noise pollution from religious institutions. It encompasses various aspects, including the identification of noise sources, measurement techniques, data analysis methods, and the formulation of appropriate noise control measures.

The first step in this framework involves conducting a survey to identify and locate all religious institutions in the Bole Michael and Bole Bulbula areas. This will be followed by a detailed noise measurement, utilizing appropriate measuring instruments and techniques, to determine the noise levels generated during religious activities.

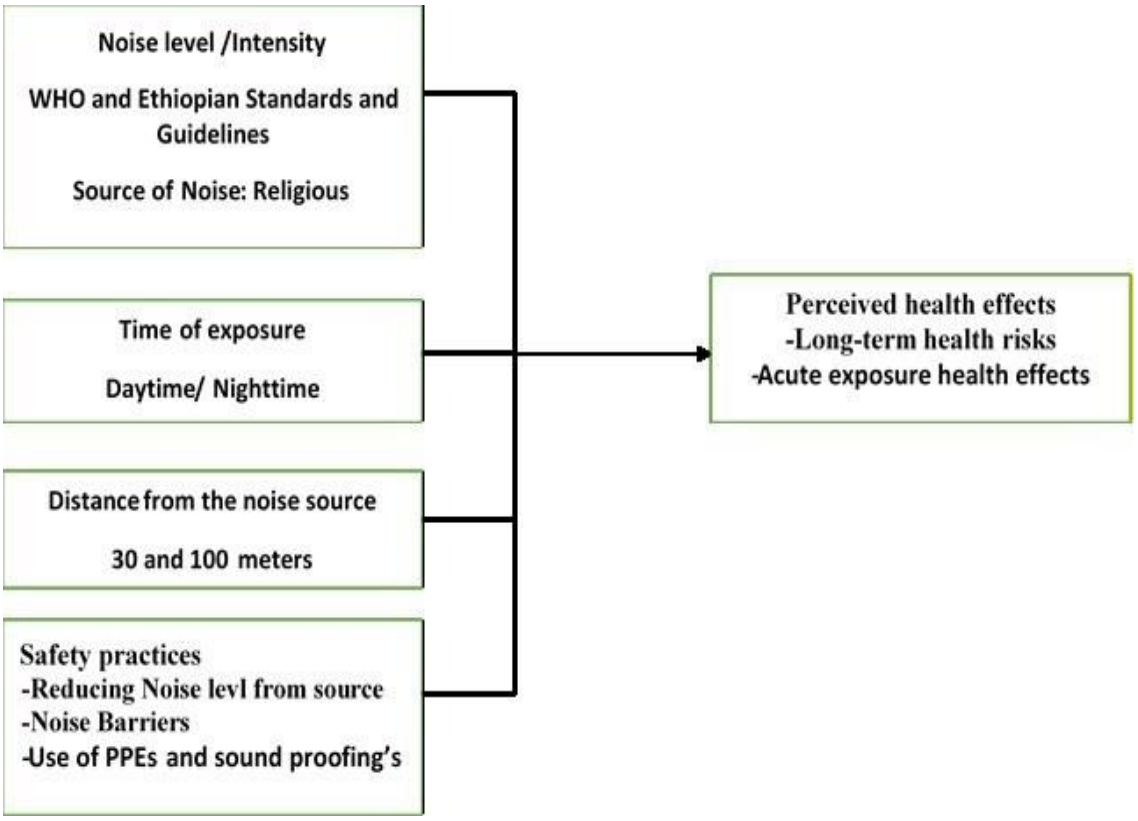
The captured noise data will then be subjected to analysis, considering key parameters such as sound pressure levels, frequency spectra, and temporal patterns. The results of this analysis will provide valuable insights into the extent and characteristics of noise pollution from religious institutions.

Based on the assessed noise levels and survey findings, noise control measures will be proposed and evaluated. These measures may include building modifications, sound insulation techniques, and the enforcement of noise emission regulations for religious institutions.

Moreover, stakeholder engagement and community involvement will be essential components of this conceptual framework. Consultation with religious institutions, residents, local authorities, and other relevant stakeholders will be crucial in developing feasible and sustainable noise control strategies that consider the cultural and religious significance of these institutions.

Ultimately, the conceptual framework for the assessment of noise pollution from the religious institutions in the Bole Michael and Bole Bulbula areas of Addis Ababa City aims to provide a comprehensive understanding of this issue and guide the implementation of effective noise control measures. By addressing noise pollution from religious institutions, the well-being and quality of life of the community can be enhanced, fostering a more peaceful and harmonious environment in the city (UNEP,1999).

Figure 2.2: Conceptual Framework



CHAPTER THREE

3. RESEARCH METHODOLOGIES

3.1 Introduction

In this section, we examine how the research was conducted, the plan of action, who was involved, the environment, how the data were collected and analyzed, and the ethical concerns that were taken into consideration.

3.2 Brief Description of Addis Ababa, Study Area, and Target Population

Description of Addis Ababa City

The busy metropolis of Addis Ababa is the capital of Ethiopia, which is located in the middle of the country. It is home to an estimated 5.4 million people and is a major diplomatic center, hosting more than 100 embassies and consulates. The city is known for its blend of modern and traditional cultures, with the contrast between emerging high-rise buildings and informal street markets.

Addis Ababa is a city of surprises with a rich history and culture that is often overlooked by visitors. The city has several museums and sites of historical interest, including the National Museum of Ethiopia, which houses the fossilized remains of Lucy/Dinknesh, the earliest known human ancestor.

Addis Ababa is also known for its vibrant and dynamic city, which offers a unique blend of history, culture, and modernity. Although Addis Ababa City is in tremendous development, the large expansion of industrialization, urbanization, motor vehicles, and religious activities has contributed to an increase in noise levels, which has aggravated the negative impact on urban citizens.

The Study Area is located in the capital city of the Addis Ababa Bole. This study focuses on two (2) areas which are specifically the Bole Bulbula and Bole Michael residential areas. Both study areas cover about 15.05 square kilometers which is about 2.8 % of the total land area of the city (CSA 2007). These areas consist of churches, mosques, and evangelical churches, which reflect the diversity of the population composed of people from different ethnic and cultural backgrounds. In addition, Bole International Airport also contributes significantly to noise pollution in these areas.

Justification for the selection of the sub city and Wereda

The main reasons for selecting the Bole Michael and Bole Bulbula areas for the assessment of noise pollution from religious institutions in Addis Ababa city according to Yitayih, et al. (2016) include:

- Diverse religious institutions: Bole Michael and Bole Bulbula areas are known for their diversity in religious institutions, including mosques, and churches. This diversity makes it an ideal location to assess noise pollution from a wide range of religious practices and their respective sound systems.
- High population density: Bole Michael and Bole Bulbula areas have relatively high population density, which means more people are likely to be affected by noise pollution.
- Urban setting: Bole Michael and Bole Bulbula areas are located in the bustling area and tend to have higher noise levels due to various factors such as traffic, construction, airplanes noises and commercial activities.
- Representativeness: Bole Michael and Bole Bulbula areas can be representative of the overall urban landscape of Addis Ababa. The findings from these areas can be extrapolated to other similar neighborhoods in the city, providing a comprehensive understanding of noise pollution from religious institutions across Addis Ababa.

  The main target population of the study was residents and students of the area at all stages. These areas are composed of the institutions listed in Table 3.1.

Table: 3.1 Target Population in the Study Area

Study area	Type of impacted areas	Estimated number of populations in the study area	No of Religious Centers		Source of noise
			Total	Study area	
Bole Bulbula	Residential area	11,710	8	1	Loudspeaker
Bole Michael	Residential area	24,900	5	3	Loudspeaker
	School				
	Clinic				
	Shopping centers				

3.2.1 Research Design

This study employed a descriptive study design. Noise levels were measured at different times of the day in each of the selected religious institutions.

3.2.2 Data Type and Sources

Both primary and secondary data were used in the analysis. Primary data were gathered through a survey and an assessment form, while secondary data were sourced from published and unpublished documents, such as environmental manuals, brochures, WHO manuals, noise regulations, magazines, newspapers, e-books, and various national and international legal tools.

3.2.3 Description of Study Variables

3.2.3.1 Independent Variables

The independent variables in this study were noise level, noise source type, location, time of day, distance from the source, environmental conditions, number of residents, frequency, duration, and length of noise exposure.

3.2.3.2 Dependent Variable

The dependent variable was perceived health effects.

3.3 Sampling Technique, Sample Size and Study Area

3.3.1 Description of Survey Area

Because Addis Ababa is growing rapidly due to industrialization, urbanization, construction, religious activities, transport networks, and an increasing number of cars on the streets, they all cause more noise pollution, which has a negative effect on city residents.

The majority of Addis Ababa's residential areas are close to the noise source or the problem, including bus and taxi stops, markets, airports, and places of worship, such as churches, mosques, and bars and clubs, which contribute to a high level of noise pollution.

Bole Sub-city is one of the ten sub cities with a population of around 310,366 (census ,2007), however the population could have increased now. It comprised 14 Weredas. The sub-city is home to many Orthodox churches, a mosque, an Evangelical Church, and the Catholic Church. Given the above information, it is clear that Bole Michael and Bole Bulbula Community residential areas have been exposed to a lot of noise pollution because of their close proximity to the Bole International Airport, with planes taking off and landing all the time. Additionally, there are many religious institutions, such as Orthodox and Evangelical Churches and Mosques,

that are situated in the area, and they are known to blast their loudspeakers and amplifiers with music on a regular basis.

Therefore; Bole Sub-city in Addis Ababa is the study area. It is a sub-city comprising many religious institutions. Wereda 01 and wereda 12 are the focal points of this study. Bole Michael and Bole Bulbula are among the wereda selected for the study due to dense population and noise pollution exposure as stated in the justification for their selection above. The Bole sub-city covers approximately 52 square kilometers which is approximately 9.8% of the total land area of the city. It is also the most populated, with an estimated total population of 310,366 inhabitants (Population Census, 2007).

In this study, our main focus areas are Bole Bulbula, Wereda 12 around Maryam Church 20/80 condominium, and the Bole Michael Woreda 1 administration around Bole Michael Square. Bole Bulbula and Bole Michael community residential areas are surrounded by different sources of noise pollutants specifically from religious institutions. Concerning the number of populations of Woreda 1, there were about 35,313 residents in the area, according to the 2007 population census of CSA, and the estimated number of populations in Bole Bulbula wereda 12 was also 118,807. However, the data are now over 16 years and cannot be accurate. As per the World Bank, the average population growth rate of Ethiopia in the last 16 years has been 2.46 % per year. Therefore, we tried to gather information on the number of residents from the wereda in the specific study area (Table 3.2).

Table: 3.2 Population in the Survey Area

S/n	Community areas	No. of population	Noise Exposure level	Sources ofNoise	Main contributors
I	**Bole Michael Area**				
1	Apartment 66 village	7000	High	Amplifier Loudspeake r	Mosques, Evangelical Churches, Night clubs, Bars & Taxi station
2	Michael church area	5500	High	Loudspeake rAmplifier	Orthodox church Night clubs, Bars DSTV, Taxi station
3	Ayer Amba	5000	Calm	-	-
4	Nedaj Mehaber	4000	Calm	-	-
5	110 Community Area	2500	Moderate	In Airplane landing	Airplane
6	Kale hiwot school	900	Very High	Lode speaker	Mosque
	Total number of populations	**24,900**			
II	**Bole Bulbula**				
1	Biruh Tesfa Condominium (Block 22-28)	630			Church
2	Addis Raey Condominium (Block 73-75)	360			Church
3	Finote Selam condominium (Block 76-83)	720			Church
4	'Luel Building' area	10000			Evangelical churches
	Total number of populations	**11,710**			

3.3.2 Sample Size Determination

The random sampling method was used to determine the sample size from the population directly affected by the noise in Table 3.2. In this case, the base data for determining sample size are considered two areas from the two Wereda based on the distance from the noise source and pollution level namely, Apartment 66 villages and Kalehiwot school from Bole Michael and Biruh Tesfa Condominium and Finote Selam, Adis Raey from Bole Bulbula. The total number of populations directly affected by noise was selected for the analysis includinge 7900 from Bole Michael and 990 from Bole Bulbula community areas. Therefore, to determine the sample size, simple random sampling using Analysis of Variance, ANOVA in MNITAB software and the following formula was applied:

The formula was used to determine and calculate the sample size at a 93% confidence level and a precision level of ±7%. The accuracy of the estimate indicates how close it is to the actualvalue

of the population. The sample size was chosen in a methodical manner based on the following equation:

$$n = N/1+N(e)2$$

Where; **n = Sample size**

N = the total survey area population

e = Level of Precision

Based on this formula, the total survey area population was 26,600. However, it is necessary for the two Weredas separately and only for the directly affected communities. Therefore, for the Bole Michael and Bole Bulbula communities, the sample size was:

n=7900/1+7900*(0.07)2=199(Bole Michael)

N=990/1+990*(0.07)2=168 (Bulbula)

Therefore, based on this equation, the sample size is 199 for Bole Michael and 168 for Bole Bulbula. Kothari (1990) mentioned that when the population is large, it is good to use a finite population correction for proportions, so the sample size is reduced slightly. This is because larger populations require a proportionately larger sample size than smaller ones for the same amount of information. Therefore, we can adjust the population and sample sizes using this formula.

$$n = \frac{no}{1+(no-1/N)}$$ =199/ (1+(199-1/7900) =193 (bole Michael)

n=168/ (1+(168-1/990) =144 (Bulbula)

Where, n = sample size

N=target population size

no= adjusted sample size computed previously

We calculated a sample size of 193 from Bole Michael and 144 from Bole Bulbula to obtain good information through questionnaires from people in areas that have been strongly impacted by religious loudspeakers.

The data collection was carried out using 337 questionnaires distributed to the respondents randomly in Bole Michael and Bole Bulbula community residential areas, schools (Kale Hiwot School), and clinics. Out of the distributed 337 questionnaires two hundred fifty (250) respondents gave response and were sampled. Stratified sampling technique was used to pick a sub-city and two zones, one from each area in Bole Michael Wereda 1 and Bole Bulbula Wereda 12, and a simple random sampling technique was used to select one hundred seventy-five (175), from Bole Michael and seventy-five (75) respondents from Bole Bulbula. The Questioners was distributed to the residents of the targeted areas randomly.

3.4 Data Collection Methods and Instruments

3.4.1 Primary Sources of Data Collection

Primary Data were Collected by taking on-site measurements using sound level meters to assess the noise levels produced by religious institutions, surveys conducted among residents living near the religious institutions to gather subjective information about their perception of noise pollution. The other methods employed for collecting primary data collection were questionnaires distributed to the respondents who were randomly selected individuals faced severe problem in the study area and focus group discussion were carried out.

3.4.2 Secondary Sources of data collection

Secondary data were collected from many different sources, such as published and unpublished documents, research articles, environmental manuals, brochures, WHO guidelines, noise guidelines, web browsing, papers, books, government offices, and bureaus.

3.4.3 Data Analysis Techniques

Several data analysis software and tools have been used for noise pollution analyses in religious institutions. Software used to collect and analyze the data were Sound level meter Type G9406-LOG and Smart phone HUAWEY NOVA 9 Model NAM-LX9, MINITAB and Statistical Package for the Social Sciences (SPSS).

3.5 Noise Measurement Parameters

Noise can be characterized by many parameters, some of the common noise measurement parameters are Sound Pressure Level (SPL) which is the common unit used to measure the noise level. It is measured in decibels (dB), weighting filters by A, B, C, D, and Z. Filters are designed to simulate the way humans perceive loudness and adjust for particular frequency characteristics, such as low-frequency background noise. The other parameters for noise are time weighting, fast, slow, and impulsive to differentiate between steady-state noise, variable noise, and sudden impulsive noise. In addition, the equivalent continuous sound level (Leq) is the average SPL over a given period (typically 1 h). This provided a representation of the overall noise level during this period. The peak sound pressure level (Lpeak), which is the maximum noise level that occurs at any point in the time and time history, refers to the recording of noise levels over a period of time. This allows for the analysis of the pattern and changes in noise levels. Reverberation time is the time required for a sound to decay by 60 dBafter the source of the sound has stopped. It is particularly useful in enclosed spaces such as concert halls, where sound reflections and decay are important factors.

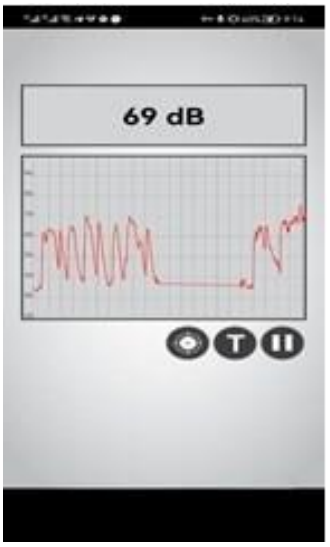
3.5.1 Religious Institutions Noise Pollution Measurement

3.5.1.1 Devices for Measurement

A calibrated sound level meter named GAZELLE Mode G9406-LOG and smartphone HUAWEY NOVA 9 Model NAM-LX9 were used to measure the noise level in dB (A). The investigation was done at the selected religious institutions loudspeakers and sound amplifier at 30- and 100-meters distance at a particular time and sound levels taken and recorded. The noise level at each institution was measured at three different times of the day for 5 times; morning (6-8am), noon (12-2.00pm) and late evening (6.00- 8.00pm) using sound level meter set to A-scale slow response.

Figure: 3.1. Sound Level Measurement Devices

Sound meter



Smart Phone Sound Meters

3.5.1.2 GAZELLE- G9406-LOG Sound Meter Features

The GAZELLE G9406-LOG sound-level meter can record and store sound-level measurements over time. This is useful for identifying patterns and trends in the noise levels. It's also a wide frequency range it has a frequency range of 10 Hz to 20 kHz, which covers most audible frequencies. In addition, it has a high accuracy of ±1.4 dB, ensuring reliable and precise measurements. It has a large easy-to-read display that shows the current sound level, aswell as the minimum and maximum values. In addition, it can be connected to a computer to transfer data, is portable, and has measurement settings, including time weighting(fast/slow/impulse) and range (low/high). This meter is available in the market at an average price of 30,000 birr in Ethiopia.

3.6 Reliability and Validity Analysis

3.6.1 Reliability

The reliability on the measurements or observations in the study of noise pollution from the religious organizations, was assessed by conducting repeated measurements over time in the same location (five times). Cronbach's alpha was calculated and used to measure the internal consistency of the questionnaire. The questionnaire employed to measure the construct, noise level pollution, consisted of twenty-five questions and 5 Likert scales. The scale had a high level of internal consistency, as determined by a Cronbach's alpha of 0.7889 (Values between 0.7 and 0.8 are good, indicating a high level of consistency among the measurement instruments or test items).

3.6.2 Validity

During conducting the study, assessing noise pollution from religious institutions, the following validity measurements were considered:

Sound Level Meter (SLM) Readings: The validity was ensured by using calibrated, accurate, reliable and maintained sound level meters to measure and record noise levels from the religious institutions.

Complaints collection: Collecting noise-related complaints from residents living near religious institutions from the Authorities provided valuable insights into the actual impact of noise pollution on the community so that confirmed and validate noise issues reported by the community.

Expert Feedback: opinions were received from noise pollution experts from Addis Ababa Environmental Protection and Green Development Commission who assessed the noise levels and impacts objectively. These experts provided professional support to the situation and help validate the measurements and findings.

Comparative Analysis: Comparative analysis was conducted to comparing noise levels during quiet times versus peak times to determine the validity and severity of the noise pollution from the institutions.

3.6.3 Ethical Consideration

Ethical considerations that should be considered are addressed while conducting research on noise pollution from religious institutions. Participants were informed of the purpose and nature of the research, its benefits, and the possible risks they perceived. They provided informed consent to participate and were free to withdraw their participation at any point in the study.

The privacy of the research participants was respected and any identifiable personal information was kept confidential. Participants were also informed of their right to remain anonymous and respected.

The research was conducted with cultural and religious sensitivity, recognizing the diversity of beliefs and practices within religious communities. After all, it was agreed on the aim of the research has the potential to bring about positive change or improve the health and well-being of individuals and hence the community. Finally, the research was conducted in a transparent manner without any conflicts of interest, impartially, or bias.

CHAPTER FOUR

4. DATA ANALYSIS AND INTERPRETATION

This part of the thesis presents the results of a study on the existing situation of noise pollution from religious institutions in Bole Sub-city (Bole Michael and Bole Bulbula selected sites) and the related health impacts in the city of Addis Ababa.

4.1 Quantitative Data Analysis

4.1.1 Religious Institutions Noise Level Measurement

A survey was conducted to determine how noisy the Bole Michael and Bole Bulbula selected neighborhoods come from religious houses. Based on the measurement results, the large polluters from these locations are listed below.

Table:3.3 Religious Houses Noise Level Measurement Result

S/n.	Religious institution	Measured Distance	Measurement			Frequency of Observation	Sound dB(A) Pressure		
			Date	Time			MIN	MAX	AVG
				Day	Night	(N)			
1	**Religious Institutions at Bole Michael**								
	Orthodox Church (St. Michael)	100m	April 15-18, 2023	4-6pm	5am	5	75	88	**81.5**
	Jafar Mosque	100m	April, 20, - 27,2023	12:30 AM	5pm	5	76	90	**83**
	Kale Hiwot Bole	30m	April 22- 24 ,2023	10-12 Am	-	5	66	75	**70.5**
	Biftu Oromyia Congregation church	30m	April 29-May 01,2023	10-12 Am	-	5	68	79	**73.5**
2	**Religious Institutions at Bole Bulbula**								
	Mariam church	100m	May 6-8 ,2023	6:00 AM	3:00 PM	5	74	89	**81.5**
	Bulbula Medhanialem church	100m	May 13-14 ,2023	6am	5pm	5	70	78	**74**
	King juesus Embassy	100m	May 14 ,2023	4:00 AM	-	5	75	90	**82.5**
	Bole Bulbula Ethiopian Amanuel church	100m	May 20 ,2023	4:00 AM	-	5	74	88	**81**

Source: Own Survey Data, 2023

Interpretation of the Data

The standard for noise level

The World Health Organization (WHO) recommends the following noise level standards for residential areas:

Table :3.4 WHO Noise Level Standard

Measuring position	Daytime (6am-10pm) decibels (dB)	Nighttime (10pm-6am) decibels (dB)	Remarks
Outdoor noise level	50 or less	40 or less	Guidelines and regulations may vary from country to country or even within regions
Indoor noise level	35 or less	30 or less	

Source: World Health Organization (WHO)

The noise levels at Bole Michael's and Bole Bulbula Orthodox churches, Bole Michael Mosque, and King Jesus Embassy, Ethiopian Emanuel church in Bulbula, were measured at adistance of 100m during different times of worship. The results showed that the Orthodox churches hadan average of 81.5 db(A), while the Mosque was at 83 db(A) and King Jesus Embassy at 82.3 db(A) and Ethiopian Amanuel church was 81db(A).

Both the Mosque and Church put loud speakers at the top of the tower, and the King Jesus and Ethiopian Amanuel churches put their amplifiers on the second floor of the buildings to the public. Data were collected during their respective worship times. The 5 days observations indicate that all religious organizations release noise, which is much higher than the standard limit set by the WHO/ EPA. All Religious institutions face complaints from residential areas, especially mosques, as they are immediately behind the Bole Kale Hiwot school from the school community. As per the interview results, the administration of the schools tried to solvethe problem by shifting the teaching and learning process time out of worship time, but the noise still disturbs students even at lunch time.

The researcher also checked two evangelical churches at Bole Michael, Kale Hiwot, and the Biftu Oromiya Congregation. An attempt was made to maintain a distance of 30 m while taking noise-level readings. The reason why the distance was reduced to 30 m is that they do not put their loudspeakers outside of the public; instead, they put it inside their hall, separating the preaching stage and prayer place.

Therefore, the noise level is comparatively lower than that of Orthodox churches, mosques, and other evangelical churches in Bulbula but is still as high as the WHO/EPA standard level in the residential area.

So, apart from the St. Michael church, which is a kilometer away and not in the same area, the other three institutions (Jafar, Kale Hiwot and Biftu) are really close together and their fences are linked, so during their prayer or worship times they let off really loud noise from loudspeakers and amplifiers to all the neighborhood especially to the Bole Kalehiwot school that shares fence with them and creating a big problem.

As a result, the noise pollution from these three different directions from the institutions is very high, causing many health problems for the locals, such as restlessness, sleep disturbances, and hindering the teaching and learning processes (hindered communication and disturbance). When the institutions use their loud speakers and sound amplifiers all the time, they turn the residential areas into a chaotic environment and people like babies, the elderly, patients, kids, and workers cannot get any rest.

Here, it is critical to note that the most affected community members due to noise pollution are the students of Bole Kalehiwot Comprehensive School with about 900 students, as they are located adjacent to the three churches in addition to the neighboring community.

Generally, this study found that religious institutions do not meet the standards set by the WHO/EPA for daytime and nighttime residential areas.

4.1.2 Interview Analysis and Presentations

4.1.2.1 Addis Ababa Environmental Protection and Green Development Commission

The Addis Ababa Environmental Protection and Green Development Commission is responsible for handling all issues related to various forms of pollution, including noise, in the city. We interviewed persons who were responsible for overseeing the Addis Ababa city administration's pollution cases. We made complaints of the community due to noise pollution as a discussion agenda.

The commission has its own noise pollution control guidelines, which the experts explained were adapted from the WHO community noise pollution guidelines set for noise sensitive receivers such as residential areas, healthcare centers, schools, and courts, as well as for those most vulnerable groups in a society such as infants, patients, schoolchildren, and the elderly, based on the guidelines of WHO (2001). According to the information gathered from these

specialists, the authority's current practice is that, after receiving complaints, they attempt to examine the problem by personally visiting the location and taking all required actions in accordance with the authority's rules and regulations. The experts clearly explained that there is a big gap in controlling religious institutions, but they are taking action against other noise sources that violate the standard. Additionally, the experts added that because religious institutions are the subject of the majority of complaints from locals, the government has a plan to build positive relationships with them, educate them on the effects of noise pollution, and raise their awareness of the need to keep noise levels within legal limits and yet there is no fruitful action so far. They also explained the main challenges or difficulties they encounter in reducing noise pollution from religious institutions, such as a lack of trained human resources and facilities, community and commission awareness, government commitment, and a clear and robust legal framework.

4.1.3 Analysis of Focus Group Discussion

To gain a thorough understanding of the perceived impacts of noise pollution in the research area, focus group discussions were conducted. As a result, the researcher chose five locals and two teachers from a nearby school to participate in the discussion, as they were most affected. The biggest sources of noise pollution in the area, according to the group, are loudspeaker and amplifier sounds from religious institutions installed on towers and the noise caused by planes landing and taking off. In addition, they said that night clubs, beggars near mosques, taxi calls, etc., are also problems in the area.

The group identified the following crucial concerns regarding the issue that the regulatory agency does not penalize violators:

- Aversion to religious institutions interfering with religious matters
- Being indecisiveness to take action against fault makers in religious activities
- The method used to persuade religious institutions about the circumstances in the residential area was unsuccessful.
- Fail to train them, counsel them, or otherwise provide them with information about how noise pollution affects the lives of the community and sound-proofing devices

In general, the group concluded that noise pollution is a national critical concern that youth are becoming aggressive and bringing about behavioral change as an example. This may be one of the reasons why the government must recognize and address such a problem nationwide. Meanwhile, they recommended as a remedial action that the government has to work in

cooperation with religious leaders, the community, and other stakeholders on the actions to be taken. The second point is licensing for the upcoming churches and how to offer licenses; before providing the license, social and environmental impacts must be investigated.

The third concern was that for people to live in a quiet environment, existing religious organizations must prevent or ban their use of loud speakers and limit noise levels.

4.2 Qualitative Data Analysis

4.2.1 Questionnaires Data Analysis

Of the 337 questionnaires distributed in both study areas, 75 (52%) were replied to Bole Bulbula, and 175 (51%) were replied to Bole Michael. In total, 250 questionnaires were completed, that is, 74.2% of respondents replied. This means that only 87 (25.8 %) did not respond and were not considered in this study. The responses were analyzed using Minitab and SPSS software, and the data are presented in the form of frequency and cross-tabulation tables.

4.3 Background of the Respondents

Gender

In this research, there was no gender difference or bias, both genders were relevant, and only the information was required.

Table 4.1: Gender of respondents

Gender of respondents	Frequency		Percent		Total
	B.M	BB	BM	BB	
Male	115	65	65.71	86.67	180
Female	60	10	34.29	13.33	70
Total	**175**	**75**	**100.00**	**100.00**	**250**

Source: Own Survey, 2023

Interpretation:

Among the total number of respondents (250), 180 (72 %) were male and 70 (28 %) were female. Therefore, most questionnaires were completed by male respondents.

Age:

Age can have an impact on questionnaire responses because people in different age groups may have different life experiences and perspectives that can affect the way they answer questions.

Therefore, as per the table below, respondents' age can give confidence with regard to reliability.

Table 4.2: Age of respondents

Age	Number of respondents/frequencies		Percent	
	BM	BB	BM	BB
18-30	55	15	31.4	20.0
31-50	65	35	37.1	46.7
>50	53	25	30.3	33.3
Not specified	2		1.1	0.0
Total	**175**	75	100.0	100.0

Source: Own Survey, 2023

Interpretation:

The table above shows that the majority of people replied between the ages of 31-50 at Bole Michael (65 out of 175, i.e., 37.1%), and at Bole Bulbula, the age 31-50 replied most (35 out of 75, i.e., 46.7%), followed by age–18-30 at bole Michael and >50 at bole Bulbula.

Education level:

Individuals with higher education levels tend to provide more accurate responses, have a greater willingness to participate in surveys, and tend to offer more detailed answers than thosewith lower education levels.

Table:4.3 Education Level of Respondents

Education level of respondents	**Frequency**		**Percent**	
	BM	**BB**	**BM**	**BB**
Reading, writing to certificate	33	25	18.9	33.3
Diploma & Degree	45	21	25.7	28.0
MA & above	25	18	14.3	24.0
Students	65	5	37.1	6.7
Non-Specified	7	6	4.0	8.0
Total	**175**	**75**	**100.0**	**100.0**

Source: Own Survey, 2023

Interpretation:

The table above shows that the majority of the respondents at Bole Michael (n=65 ,37.1 %) were students, followed by diploma and degree holders (n=45,25.7%) Likewise in Bole Bulbula, the majority (n=25,33.3%) respondents are those who can read, write, and up to certificate, followed by (n=21,28%) are diplomas and first degree's holders. Therefore, we can say that the questioners were intentionally answered with due attention and knowledge.

Religious Respondents

As in some cases, a respondent's religion may affect the responses to a questionnaire, especially in research such as our case, it is important to note that an individual's religious beliefs are just one of the factors that could influence their responses, and the conclusions about the influence of religion are based on the data collected and the specific questionnaire.

Table 4.4: Religion of respondents

Descriptions	Frequency		Percent	
	BM	BB	BM	BB
Orthodox	68	42	38.9	56.0
Muslim	47	17	26.9	22.7
Protestant	40	13	22.9	17.3
Catholic	13	3	7.4	4.0
Non-Specified	7	0	4.0	0.0
Total	175	75	100.0	100.0

Source: Own Survey, 2023

Interpretation:

The table above shows the most popular religions in the country. Orthodox faith is most popular, followed by Muslims, Protestants, and Catholics. Four % of the respondents did not specify their religion in Bole Michael. The survey found that all religious institutions agreed that noise pollution existed in the area. The main sources of this noise pollution are loudspeakers and impulsive amplifiers put on towers to the public.

The Orthodox and Evangelical churches and mosques are all guilty of neglecting people's rights in the neighborhood by broadcasting their services and music via loudspeakers.

Noise Pollution awareness

It is knowledge and understanding of the negative effects of excessive and unwanted sounds on human health and the environment. It involves recognizing the different sources of noise pollution, specifically religious noise pollution, and its harmful impacts on the physical and

psychological well-being of people. Noise pollution awareness aims to promote solutions and practices to mitigate noise pollution.

Table 4.5: Awareness level of respondents

Respondents	Very low (1)		Low (2)		Moderate (3)		High (4)		Very high (5)		Total	
	BM	BB	BM	BB	BM	BB	BM	BB	BM	BB	BM	BB
Noise pollution Awareness level	45(25.7%)	15(20%)	28(16%)	10(13.3%)	38 (21.7%)	15(20%)	34(19.4%)	20(11.4%)	30(17.1%)	15(17.1%)	**175**	**75**
Awareness levels on the availability of environmental policy, related laws and right to peaceful environment	50(28.6%)	13(18%)	28(16%)	20(27.8%)	38(21.7%)	13(18.1%)	34(19.4%)	10(5.7%)	25(14.3%)	16(14.3%)	**175**	**72**

Source: Own Survey, 2023

Interpretation

The table above shows the awareness levels of the respondents about noise pollution from religious institutions and the availability of standards, laws, proclamations, and issues related to noise pollution.

The score on the awareness level of the community in Bole Michael shows that majority (25%) were unaware of noise pollution, and 28.6 % of the community doesn't know the availability of laws, standards, and proclamations for noise pollution. In Bole Bulbula at the specific study area 20% of the respondents have very low awareness on noise pollution and 18% doesn't know the availability of laws and standards for noise pollution.

This implies that the communities as a whole have a low awareness level of the concepts of noise pollution and its impacts in the study area and in the city of Addis Ababa as a whole.

Noise Reduction Ways

Reducing noise pollution from religious institutions can significantly improve the quality of life of residents living in the vicinity. This can lead to a more peaceful and conducive environment. Therefore, it was critical to obtain feedback from residents about their feedback in this regard.

Table:4.6 Reducing the noise level of loudspeaker in religious houses by Sex

Do you think religious institutions must turn down the volume of their loudspeakers?											
Gender		Yes		No		No idea		Not answered		Total	
		BM	BB	BM	BB	BM	BB	BM	BB	BM	BB
SEX	Male	80	46	25	6	20	2	15	-	**140**	**54**
	Female	20	17	10	2	3	-	2	-	**35**	**21**
Total		100	63	35	4	23	2	17	-	**175**	**75**

Source: Own Survey, 2023

Interpretation:

Out of the total 250 people surveyed, 163 (100 at Bole Michael and 63 at Bole Bulbula) said that noise levels from loudspeakers during religious ceremonies can and must be reduced, with the majority being male, and 37 females at both sites. In contrast, 39 respondents (35 in Bole Michael and four in Bole Bulbula said no need to reduce religious noise). The other 25 (23 at bole Michael and 2 at bole Bulbula) had no clue, and 17 at bole Michael weren't too clear on their stance.

Noise level rating by perception

Humans can rate noise levels in different ways, such as by measurement, hearing, or perception. Respondents were asked to rate the noise level by perception. Noise perception is subjective, and varies from person to person. Some people may be more sensitive to noise than others, and factors such as age, sex, and previous exposure to loud noise can influence sensitivity. Therefore, the following responses were collected:

Table: 4.7 Rating Noise pollution level

How do you Perceive the level of noise pollution in your residential area?				
Noise level	Frequency		Percent	
	BM	BB	BM	BB
Very high	115	25	65.7	33.3
Moderately high	15	25	8.6	33.3
Low	25	15	14.3	20.0
Very low	20	10	11.4	13.3
Total	175	75	100.0	100.0

Source: Own Survey, 2023

Interpretation:

The table above indicates that the majority of people surveyed,140 (115 at Bole Michael and 25 at Bole Bulbula or 56 % in total), perceive the noise pollution in both sites to be loud. Another 30 (15 at Bole Michael and 25 at Bole Bulbula, or in total 12%) said it was moderately high, 12% said it was low, and the other 12 % said it was very low. This means that the area is severely affected by noise, although some of the respondents are reserved even though they know it is very loud or noisy.

Sources of noise pollution

The respondents were asked to identify the sources of noise pollution in their surroundings, and their responses are presented in the following table.

Table:4.8 Opinions on the Sources of severe noises

Noise Level	Frequency/No. of respondents		Percent	
	BM	BB	BM	BB
Religious institutions loudspeaker	88	45	50.3	60
Night club	30	10	17.1	13.3
Air plane landing and take off	25	14	14.3	18.7
Vehicles	10	6	5.7	8
Taxi call for passengers	7	0	4	0
Beggars around the Religious organizations	15	-	8.6	
TOTAL	175	75	100	100

Source: Own Survey, 2023

Interpretation

The table above shows the main sources of noise pollution in the residential areas of Bole Michael and Bole Bulbula. Most of the people surveyed 133 (88 in Bole Michael and 45 in Bole Bulbula (and 53.2% said that religious institutions with loudspeakers and amplifiers were the largest noise pollution sources. The next most perceived pollutant by the respondents was night clubs (n=40,16%) in the area. Planes taking off and landing were the third highest at 15.6%.

Opinion by Religion to the noise source

Table: 4.9 Religious groups and their opinions on noise sources

Religious Institution	What's causing more noise in Bole Michael's and Bulbula's neighborhood?													
	Religious institutions loudspeaker		Night club		Airplane landing and take off		Vehicles		Taxi call for passengers		NS		Total	
	BM	BB	BM	BB	BM	BB	BM	BB	BM	BB	BM	BB	BM	BB
Orthodox	41	28	8	4	8	7	8	3	3				68	42
Muslim	8	3	20	7	6	2	8	1	5			4	47	17
Protestant	10	6	3		4	1	2		3		18	6	40	13
Catholic	3	1	2		2	1	3		1		2	1	13	3
Not specified	7												7	0
Total	62	38	33	11	20	11	21	4	12		20	11	175	75

Source: Own Survey, 2023

Interpretation

The table above shows that the majority of respondents from Orthodox, Muslim, Evangelical churches, and Catholics believe that religious institutions using loudspeakers and amplifiers are the most annoying sources of noise pollution in the Bole Michael and Bole Bulbula community areas. On the other hand, nightclubs, bars, people watching soccer, and other sources of noise pollution also cause many disturbances. Seven respondents did not comment on the noise sources in the area.

Recommended Remedial Action

Respondents were asked what to do with the prevailing noise problems. The respondents gave their feedback, and the data were organized in the following pattern.

Table: 4.10 Recommended ways to reduce noise level

Description	Frequency		Percent	
	BM	BB	BM	BB
Noise level must be reduced	95	45	54.3	60
Noise level has to be continued	25	20	14.3	26.7
Neutral	14	5	8	6.7
It has to be completely closed	35	0	20	0
Non-Specified	6	5	3.4	6.7
Total	175	75	100	100

Source: Own Survey, 2023

Interpretation:

The table above shows what should be done to decrease noise pollution from religious institutions' loudspeakers in the surveyed neighborhood. Most people stated that the current level needs to be reduced to the standard set by the WHO and local regulatory body (56 %), while many (14 %) thought that the noise should be completely banned from residential areas. In the other group, 18 % wanted the noise to remain the same, and 7.6 % were neutral.

Complaint Presentation

The respondents were asked if they were reporting disturbances arising from noise pollution at some time. Their responses are presented in the following table.

Table: 4.11 Compliant done to responsible authority

Descriptions		Did you complain to any concerned body? if yes to which authority did you report?									
		Woreda Executive		Environmental protection bureau		Justice Bureau		Police		TOTAL	
		BM	BB	BM	BB	BM	BB	BM	BB	BM	BB
Have you ever reported to someone in charge about the noise pollution?	Yes	10	5	50	0	0	0	10	0	**70**	**5**
	No	-	-	-	-	-	-	-	-	**105**	**70**
Total		10	5	50	0	0	0	10	0	**175**	**75**

Source: Own Survey, 2023

Interpretation:

In the cross-tabulation table above, only 75 respondents (or 30 %) out of a total of 250 respondents at both sites registered their complaints about noise pollution from religious institutions to the appropriate authorities; of those, 10 respondents (4%) filed complaints with the Woreda Executive Officer, 55 respondents (22%) with the Environmental Protection Bureau, which is directly responsible for noise pollution, and the remaining 10 respondents (4%) with the Justice Bureau.

Government Authorities Response

When community members complain about religious noise levels, government authority is responsible for investigating and assessing the situation. The government should work to balance the religious freedom of individuals and the rights of the community to the peaceful and quiet enjoyment of their homes.

The authorities may initiate discussions with religious leaders to raise awareness and find solutions to noise problems. In the case of a complaint, authorities should refer to local noise regulations and work to enforce them. Authorities should also conduct measurements to

determine if noise levels exceed the established limits. If the noise levels are found to be excessive, government authorities may issue a warning to religious facilities. If a warning is ignored, appropriate legal action, such as fines or suspension of permits, should be taken.
The process should be conducted in a fair, transparent, and objective manner to ensure respect for religious beliefs and community rights. Therefore, data were collected to see what the authorities do in response to the complaints of the community as follows:

Table: 4.12. Action taken by the responsible authorities

What steps had the accountable government agencies taken to address the problem?											
Descriptions		Action Taken		Warning		No action taken		Not specified		Total	
		B.M	B.B	B.M	B.B	B.M	B.B	B.M	B.B	B.M	B.B
Is there any action taken ?	Yes	0	0	0	0	0	0	0	0	0	0
	No	0	0	0	0	175	75	0	0	175	75

Source: Own Survey, 2023

Interpretation:

As shown in the cross-tabulation Table above, it can be seen that 75 (30%) of the 250 respondents from both sites who complained about noise pollution did not receive a response from the relevant authorities, who should have taken action to reduce noise levels in the area. This chart shows that the community's responsible authority ignored applicants' complaints out of concern for not interfering with their religious activities.

Community complainant response satisfaction level

The satisfaction level of the community for compliant responses depends on various factors such as the severity of the noise pollution, the effectiveness and efficiency of the actions taken by the authority, the transparency in conveying information to the public, and the responsiveness to the feedback from the affected community. Therefore, we gathered data on the satisfaction level of the community as shown in the table below.

Table: 4.13 Satisfaction Level with government efforts to lower noise

How satisfied are you with the work the relevant authority has done?				
Description	Frequency		Percent	
	BM	BB	BM	BB
Highly Satisfied	-	-	-	-
Satisfied	-	-	-	-
Moderately Satisfied	-	-	-	-
Not satisfied at all	160	70	91.4	93.3
Non-Specified	15	5	8.6	6.7
Total	175	75	100	100

Source: Own Survey, 2023

Interpretation:

The satisfaction of the respondents with the efforts made by the accountable body to reduce noise pollution in the region is shown in the above table. As we can see from the above table, the vast majority of respondents (n=230 or 92%) said that they were completely unsatisfied with the responsible organ's attempts to reduce noise pollution in the area, while (n=20 or 8%) chose not to answer the question. This shows that no overt attempts have been made by the appropriate government to intervene and compel local religious institutions to reduce their level of noise.

Community recommendation for Noise pollution mitigation

Although the community has the right to live in a peaceful environment, they still only recommend that religious institutions limit the hours of loudspeaker use, use low-volume speakers, and encourage soundproofing. Intellectuals in the community can also promote education and awareness about the negative impacts of noise pollution and encourage religious institutions to consider the impact of their activities and work in collaboration to minimize disturbance to the community. Therefore, to determine the recommendations from the community, we collected feedback using the questionnaire, which is presented in the table below.

Table: 4.14 Respondents' suggestions on noise prevention measures

What remedial action do you suggest to minimize noise pollution?				
Description	Frequency		Percent	
	BM	BB	BM	BB
Law enforcement body has to take decisive action	100	35	57.1	46.7
Community has to take its own action incollaboration with leaders of religious institutions	25	15	14.3	20
Joint	50	25	28.6	33.3
Total	175	75	100	100

Source: Own Survey, 2023

Interpretation:

The table above demonstrates that the relevant authority in the study areas was silent in response to community complaints, so the researcher of this survey paper wanted to give respondents a chance to freely express their internal feelings in the open-ended questionnaire section.

In the response, we can see (n=135 or 54%) advised that the legal system must move swiftly against criminals, and (n=40 or 16%) added that the community must act independently while working with religious authorities to address the issue that arose in the study area. The remaining respondents (n=75 or 30%) recommended that a joint committee be formed with representation from all parties, including the government, victimized community, and religious institutions.

Noise disturbance time

Noise pollution can annoy people at any time when they try to focus, relax, or sleep. It is subjective to individual preferences and situations, but sleep disturbances may be the most annoying. To check the time of maximum disturbance and annoyance, respondents were asked to give their opinions as per the following table:

Table: 4.15 Time noise pollution makes residents' annoyed

Description	Frequency		Percent	
	BM	BB	BM	BB
Day time	15	10	8.6	13.3
Midnight	75	35	42.9	46.7
Evening	25	15	14.3	20
Early Morning	30	15	17.1	20
Day break	30	0	17.1	0
Total	175	75	100	100

Source: Own Survey, 2023

Interpretation:

As we can see from the table above, respondents are more irritated at times when religious institutions generate noise pollution at times, (n=110 or 44%) agree that noise released at midnight is very annoying, (n=40 or 16 %), early morning the other group (n=40 or 16%), in the evening, and the remaining (n=30 or 12 %) most the of students said at the break time .

Perceived Health Effects of Noise Pollution

Noise pollution from religious institutions may have various effects on the neighborhood community, such as sleep disturbance, health problems (hearing problems, high blood pressure, and other health issues), interference with other activities/hinders communication (conversation, studying, and working in homes or workplaces) may create religious bias (discomfort for people with different beliefs), and lowering property values around the noise source and other environmental impacts. These effects are also prevalent in our country, since noise pollution is widespread and the controls are poorly designed. Therefore, communities are also exposed to this problem. To check these impacts, the community members were asked to explain their perceived health effects associated with the noise pollution generated from nearby religious institutions as follows:

Table: 4.16 Perceptions on the Negative effects of Noise pollution

Description	Frequency		Percent		Cumulative Percent	
	BM	BB	BM	BB	BM	BB
Interference with spoken communication	40	5	22.9	6.7	22.9	6.7
Sleep disturbance	65	48	37.1	64	60	70.7
Impaired task performance	21	9	12	12	72	82.7
Negative social behavior,annoyance action and health effects	32	10	18.3	13.3	90.3	96
All	17	3	9.7	4	100	100
Total	175	75	100	100	-	-

Source: Own Survey, 2023

Interpretation:

The respondents indicated in the table above the categories with the worst impact on people's health. According to the respondents, noise pollution was the primary cause of sleep disturbance (n=113 or 45.2. %) , the other respondents (n=45 or 18 %) said it has a big impact with Interference with spoken communication the other group(n=42, 16.8%) said negative

social behavior and annoyance action concur and the other (n=30, 12%) said it impairs or interferes with their task and the remaining (n=20, 8%) said it is impossible to differentiate one from the other, meaning that all of the aforementioned categories have a negative impact on people's health.

Noise pollution vulnerability

Noise pollution from religious institutions is a vulnerability that affects communities livingclose to these institutions. The levels of noise pollution from religious institutions can be particularly high during religious festivals, prayers, and other ceremonies. Noise pollution cancause hearing damage, sleep disturbances, and other adverse health effects. Vulnerability is particularly high in urban areas, where religious institutions are often located close to residential neighborhoods, as in our case. Noise pollution from these institutions can disturb residents who are trying to sleep or work in peace. In some cases, noise can affect the overall quality of life of residents, leading to increased stress and reduced well-being. To check the vulnerability, the respondents were asked to give their responses and their perceptions and organized as per the table below.

Table: 4.17 Noise Pollution Vulnerability

Which sections of the population are more likely to be affected by noise pollution?						
Description	Frequency		Percent		Cumulative Percent	
	BM	BB	BM	BB	BM	BB
Infant	45	22	25.7	29.3	25.7	29.3
Students	23	13	13.1	17.3	38.9	46.7
Aged People	20	17	11.4	22.7	50.3	69.3
Patients	65	23	37.1	30.7	87.4	100
All	22	-	12.6	-	100	-
Total	175	75	100	100	-	-

Source: Own Survey, 2023

Interpretation:

According to the above table, out of all respondents (n=88 or 35.2%) think that patients are more vulnerable, followed by infants (n=67, 26.8 %), the other respondents (n=36, 14.4%) said students (n=37,14.8) said aged people are vulnerable, and the remaining respondents said all have an equal amount of exposure to noise pollution (n=22 or 8%).

Rules and Regulations to control noise pollution

Several rules and regulations can be implemented to control noise pollution from religious institutions. Some of the measures implemented in other countries include timely noise

measurement, noise limiting, soundproofing, time restricting, education and awareness, enforcement, and work in coordination with community and religious institutions. (Central Pollution Control Board,2017). Therefore, the respondents were asked to give a reply on why the authorities were reluctant to take corrective actions for the pollution, and replied as follows:

Table: 4.18 Rules and Regulations to Control Noise Pollution

Description		Why authorities are reluctant to the noise pollution problems from Religious houses?											
		Not interested to enforce the use of technology		Awareness gap		indecisiveness and lack of implementation		Fear to interfere in religious activities		Not specified		Total	
		BM	BB	BM	BB	BM	BB	BM	BB	BM	BB	BM	BB
Do you believe noise pollution is governed bylaws and regulations?	Yes	20	15	23	13	45	10	87	37	0	0	175	75
	No	0	0	0	0	0	0	0	0	0	0	0	0
Total		20	15	23	13	45	10	87	37	0	0	175	75

Source: Own Survey, 2023

Interpretation:

However, more respondents (n=124, 49.6 %) claimed that the relevant authority was fearful of religious institutions and reluctant to get involved in their problems. Others (n=55, 22%) said indecisiveness and lack of implementation (n=36, 14.4%), who responded to the open-ended questions, said that the government's weakness in raising awareness of, educating, and training religious institutions about how noise pollution affects community life. The other question posed was whether there are laws or regulations in the nation regarding noise pollution; all respondents believed that there are laws and regulations.

Perceived Effects of Noise pollution on schools

Noise pollution can have a detrimental impact on the teaching and learning processes. Studies have shown that high levels of noise can affect students' ability to concentrate and retain information as well as contribute to stress and fatigue in both teachers and students (Murphy & King, 2016). Additionally, noise pollution can create communication barriers, making it difficult for students to hear and understand information presented by their teachers (Boman, & Enmarker, 2003).

To determine the impact of noise pollution on schools, a question was asked, and the following response was obtained.

Table 4.19: Problems faced in teaching- learning Process due to noise pollution

Description	Frequency		Percent		Cumulative Percent	
	BM	BB	BM	BB	BM	BB
The teacher forced to end the teaching- learning process	50	10	28.6	13.3	28.6	13.3
Students could not afford to fully understand.	44	23	25.1	30.7	53.7	44
Shifting teaching and learning hour	45	23	25.7	30.7	79.4	74.7
All	35	19	20	25.3	99.4	100
Annoyance	1		0.6		100	
Total	175	75	100	100		

Source: Own Survey, 2023

Interpretation:

As per the observations in the above table, (n=68 or 27.2%) of the respondents from the school area pointed out that teachers in their teaching-learning process are forced to shift the class time, especially at Fridays, stop it, while at prayer loudspeakers are released from nearby mosques. The other respondents (n=60 or 24%) were forced to end the teaching when loudspeakers were released in the teaching period, while the other (n=67,26.8%) the students could not afford to comprehend properly, and (n= 54, 21.6%) said all and a few in number (n=4or 3.57%) suggested that the students face retardation in their mental ability. Finally, (n=1, 0.4 %) respondents reported annoyance.

Prevention of noise pollution to schools

Noise pollution from religious institutions can have a negative impact on the teaching-learning process in nearby schools. According to Mogaji et al. (2018), noise pollution can lead to reduced concentration and cognitive performance among students, increased stress levels, and decreased academic achievement.

The study found that the noise levels in some religious institutions were higher than the recommended limit of 60 decibels (dB), and in some cases reached 85 dB. This high level of noise can distract students and make it difficult for teachers to communicate effectively in the classroom. Moreover, this study highlights that high noise levels from religious institutions can disrupt the learning environment, leading to poor academic performance and increased absenteeism. Researchers suggest that noise pollution from religious institutions should be regulated to ensure a conducive learning environment for nearby schools. Therefore, to check for the prevention of the impact of noise pollution at a nearby school, a questionnaire was distributed and get the reply as follows:

Table: 4.20. Solutions Suggested from School Area

What solution do you suggest for the problems in the School area?						
Description	**Frequency**		**Percent**		**Cumulative**	
	BM	**BB**	**BM**	**BB**	**BM**	**BB**
Government, religious organizations, and others must collaborate to keep the noise level within a certain range	35	22	20	29.3	20	29.3
Ensure religious organizations abide by laws and regulations,and the government must first educate then instruct the to limit their noise level	51	26	29.1	34.7	49.1	64
The religious institutions & business centers should not allow to be established/licensed near schools and residential area /Environmental and social impact studies must be compulsory	45	10	25.7	13.3	74.9	77.3
Use technology to absorb or block the noise level	44	17	25.1	22.7	100	100
Total	175	75	100	100		

Source: Own Survey, 2023

Interpretation:

As we can see from the above table, the respondents who were asked to suggest a solution to the noise problems caused in the school area by noise pollution (n= 77 or 30.8 %) said that religious organizations must abide by laws and regulations, and the government must first educate and instruct them on these matters. and the others (n=57 or 22.8 %) said that the government, religious institutions, and other stakeholders should collaborate to control noise so that it does not exceed legally allowed levels. However, considering that schools and residential areas are sensitive noise receivers, the respondents (n=55 or 22%) recommended against licensing religious organizations and commercial areas that emit noise. Finally, the respondents (n=61, 24.4 %) said that religious institutions must use technology to absorb or block the noise level.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

In this part of the thesis; the results will be discussed, and conclusion and recommendations were drawn for the noise pollution from religious institutions and their perceived effects on neighborhood residents in the Bole Michael and Bole Bulbula selected community areas in Addis Ababa city, Ethiopia are discussed in this chapter.

5.1 DISCUSSIONS

Noise pollution is a major environmental concern in numerous urban areas. Unfortunately, due to unplanned urbanization, increased religious activities, rapid population growth, industrialization, technological advancements, and an explosion in the number of private and public vehicles, it is expected that the volume of noise and related complaints will rise significantly in the near future.

The impact of noise on human health and well-being is significant. It not only affectsindividuals but also has negative consequences for future generations. Noise pollution can damage residential, social, and learning environments, resulting in financial losses (Goines andHagler, 2007).

Researchers across the globe have explored the issue of urban noise pollution, which is becoming an increasingly significant problem in urban areas. However, there is a lack of comprehensive research on the effects of noise pollution on human health specifically in Addis Ababa city.

In an effort to determine the impact of noise pollution from religious institutions in the Bole Michael and Bole Bulbula areas of Addis Ababa, research was conducted to measure the volume of noise and its effects. Additionally, methods were tested to reduce the noise levels in the area.

Our study aimed to address the issue of noise pollution caused by loudspeakers and booming sounds in religious places in Bole Michael and Bole Bulbula. We specifically targeted Apartment 66 Village and the Kale Hiwot School area in Bole Michael, as well as the Condo sites of Finote Selam and Adis Raey in Bole Bulbula. These areas have a total population of 26,600 individuals and were selected due to their higher noise pollution levels compared to other community areas.

To achieve the research goals, a mixed research design employing a survey design was used by the researcher. Both primary and secondary sources were utilized to collect data. Four zoneswere selected from Wereda 1 and Wereda 12, and out of the total 26600 residents in these areas, we took a sample of 337 individuals. Unfortunately, 87 participants did not respond to the questionnaire. Simple random sampling was used, and data collection methods included questionnaires, interviews, focus group discussions, and field surveys. Descriptive statistical analyses such as frequency distribution, percentage, and cross tabulation were conducted using in MINITAB and SPSS 23 versions.

Noise levels were measured using a Sound Level Meter GAZELLE Mode G9406-LOG and a smartphone HUAWEI NOVA 9. The measurements were taken three times a day - in the morning from 6 a.m. to 7 a.m., at noon from 12 p.m. to 1 p.m., and in the evening from 4 p.m. to 5 p.m. Additionally, five readings were taken during each institution's worship period. The study utilized a questionnaire, which is attached in Annex 1.

The research findings reveal that the four major religious institutions in the study area produce sound at an average level of 70.5 dB (A) to 83 dB (A). Comparing this to WHO/EPA guidelines, which recommend a noise level of 40 dB at night and 45 dB duringthe day in residential areas, the noise level in the study area exceeds the permissible limits.

- It was also found that majority of the respondents have personally experienced sleep disturbance, difficulty in communication, and disruption in the learning process in schools due to the high noise level. They believe that this can have negative effects on health, particularly for vulnerable groups such as patients, infants, and the elderly.
- According to the research finding, 40 percent of respondents from the four well-known religious institutions thought that loudspeakers and sound amplifiers were to blame for the high level of noise pollution from religious institutions, and 56 percent of them recommended reducing the pollution level at its sources.
- In this regard, only 30 % of the 250 respondents reported their noise pollution complaints to the various woreda bureaus responsible for handling them, and 100 % said that the woreda responsible authority had taken no action to address the pressing issue of noise pollution.

- The researcher confirmed that no solution had been provided for the complaints made by the residents of the survey area, and 92 percent of the respondents expressed their complete dissatisfaction with the efforts made by the responsible organs.
- Participants in the focus group discussions further confirmed that the regulatory body is hesitant to take action against offenders out of concern for religious institutions not interfering in religious matters. They also confirmed that the regulatory body is inactive in approaching friendly to convince, raising religious leaders' awareness, and teaching them about the detrimental effects of noise pollution on people as well as the environment.
- The study revealed some of the issues that hindered regulatory bodies' attempts to control noise pollution in the study area, including a lack of human and material resources, financial restrictions on nighttime allowance, and transportation and coordination were bottlenecks for accessibility and outreach, where noise pollution problems were reported.
- Among the general problems associated with noise pollution, the most common problem was sleep disturbance by 45.2 % of the total respondents.

5.2 CONCLUSIONS

Two wereda and four selected areas were analyzed for religious noise pollution in Addis Ababa, Ethiopia, and were sampled for this study's measurement of noise levels.

This study confirmed the existence of noise-induced health problems in the general population and identified a number of perceived health effects of noise pollution. This study also showed that non-auditory health issues like hypertension, annoyance, headaches, and accidents exist and that they may have been caused by the city's high levels of noise pollution from religious loudspeakers.

The results of this study confirmed that the study area's noise levels exceed those recommended by the World Health Organization and local standards. According to the results of this study, placing residential areas, health centers and schools far apart and use technologies to ban or hinder the sound transmission and limit the volume of their loud speakers would help reduce noise levels because the proximity these to one another significantly contributes to noise generation.

This study confirms that noise control measures are not widely used by the generators and the controlling authority and the general public in terms of prevention.

On the other hand, this study has shown that there is a lack of public awareness regarding noise pollution and the right to leave in a peaceful environment. It has also been shown by this study that acting upon the existing laws and establishing new orders in religious activities would help to lower noise levels.

The study has also shown that issues related to noise pollution's effects on the environment and human health have not yet received adequate attention.

5.3 RECOMMENDATIONS

This study has demonstrated important findings from which the following recommendations have been drawn.

- The community, residents' religious leaders, and the general public need to be made aware of the risks and effects of noise on their health and the laws and regulations associated.
- In order to measure the spatial and temporal distribution of noise levels in the city of Addis Ababa, it is recommended noise maps be created so that they will give city officials, public works, and the general public crucial information they need to control noise pollution.
- Regulating agencies like Addis Ababa Environmental Protection and Green Development Commission and public health officials must regularly measure the amount of noise in the city's religious institutions and others with a focus on maintaining the recommended noise levels.
- It is also recommended to control the street loudspeaker religious preaching considering pedestrians and nearby community health.
- It is recommended to get the social and environmental impact study for business establishments and associated constructions and licensing and put a limit up to which floor shall for religious worship be used.
- It is also recommended to project planners and managers to consider the effect of noise pollution starting the planning phase.

5.4 IMPLICATIONS FOR FUTURE RESEARCH

- Longitudinal studies are required to evaluate the effects of noise exposure on health. Therefore; A system for the Annual spatial and temporal distribution of noise levels for ourcity limits needs to be shown through further research.

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ANNEX -1 QUESTIONER

ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

MA IN PROJECT MANAGEMENT RESEARCH

QUESTIONERS

Dear respondents:

The researcher is keen to do some research on the noise pollution from religious institutions in Addis Ababa, particularly in the Bole Bulbula and Bole Michael residential areas. Therefore; this research relies on your cooperation, so please do your best and Your name won't be revealed, so you don't have to write it down. Thanks a lot for helping out.

General Instructions with due respect:

- Pay close attention to the statements
- Answer the questions by selecting the correct spelling
- Feel free to give your opinion on open-ended questions, and don't forget you can use Amharic too!

Part one: Personal Data

1. **Sex** A. Male B. Female
2. **Age** A. 18-30 B. 31-50 C. Above 50 years old
3. **Educational Status**

A. From reading and writing to certificate level B. Diploma to First Degree and M.A degree and above

Part Two: Questions in details

4. **Which religion follower are you?**

A. Orthodox B. Muslim C. Protestant D .Catholic E. others (Please specify) _____

5. **Do you think it's possible to honor your religion while still respecting the peace and rights of others, by keeping the noise level of loudspeakers and amplifiers to a minimum?**

A. yes, I believe B. No, I do not believe C. I do not have an Idea

D. Others' rights and peace are not important to me.

6. **If no, what do you think the major reason is?**

A. Usage of high-level of loudspeaker or amplifier is a must

B. Low level of awareness among the religious leaders

C. Followers of that religion enforce the religious leaders

7. How do you rate Noise pollution in your community residential area?

A. Very high B. Moderately high C. Low d. Very low

8. How do you feel about religious groups turning up their speakers during the times you'd usually be sleeping?

A. The noise level needs to be reduced B. The noise level has to be continued

C. Neutral D. It has completely to be banned or closed.

9. Have you ever complained to someone in charge about the noise pollution from speakers that keeps you up at night? A. Yes B. No

10. If your answer for the above question is 'Yes', to which authority did you report?

A. To woreda 1 administration office B. Environment Protection Bureau.

C. To Trade Licensing Bureau. D. Other (specify)……..

11. What did the responsible authority do to try and take care of your complaint about the noise pollution?

A. Immediate action has been taken against fault makers.

B. The authority gave notification and warning to the offenders to reduce the level of noise pollution

C. No action has been taken for the complaints forwarded and noise disturbance has been continued

12. How happy are you with the work the responsible organization has done to cut down or stop noise pollution around here?

A. Highly satisfied B. Satisfied C. moderately satisfied D. Not satisfied at all

13. If your answer in the above question is not happy /not satisfied with the remedial action for the noise from religious institutions' loudspeakers and amplifiers late at night in residential areas, what do you suggest to try and reduce it?

A. The law enforcement body by its own account has to take decisive and sustainable action as soon as possible

B. The community has to take its own action in consultation with religious leaders, and business owners

C. A joint committee has to be established from all stakeholders that has the responsibility to control noise pollution in the area

14. If you have any other alterative ideas please specify.

---

15. At what time do you think the Noise pollution becomes harsh and annoying in the residential area?

A. day time B. mid night C. evening time

D. early morning E. dawn time (day break)

16. What major impacts the communities face due to Noise pollution in the residential areas? (More than one answer is possible)

A. Hearing impairment (Hearing damage) disturbances

B. Interference with spoken Communication (learning- teaching interruption)

C. Sleep disturbance

D. Disturbance in Mental Health

E. Impaired task performance (being unproductive)

F. Negative Social Behavior and Annoyance Reaction

17. Out of all above health problems, which one have you had the most? Please, list down in a sequential order.

1……..

2……..

3……..

4……

5……..

6…….

7…….

18. Which group of society do you think is the most hurt by noise pollution? (Please rate from 1-5 depending on the level of vulnerability 1 for more vulnerable, 5 for less vulnerable)

A. Infant …… B. School children……. C. Aged people…… D. Patients…… E. Adult….

19. Do you think there are any laws or regulations in Ethiopia about controlling noise pollution?

A. Yes B. No

20. If you said "yes" for the above question, why do you think the people in charge aren't listening to people's complaints and doing something about it right away?

.....

…….

21. If your institution's aim is focused on academics/school, what issues have you encountered because of noise pollution?

A. When there is high noise pollution, the teacher is forced to stop teaching-learning process

B. In the classroom, the students couldn't hear properly

C. The students faced health problem

D . The students faced mental retardation

22. What problems do you have because of too much noise (like speakers or an amp) when you're trying to teach or learn?

……

……

23. What solutions do you suggest for the problems occurred in your activities due to noise pollution?

.....

.....

24. If your institution's main objective is to take care of health issues, what problems did you face due to noise pollution?

A. The health problem is more aggravated

B. The person sick is more depressed

C. No problem occurred

25. What problems do you face due to noise pollution (loud speaker/ amplifier's beat) in treating your patients?

---

26. What ideas do you have for dealing with the problems you're facing because of noise pollution?

……..

N.B: If you don't have enough room to write, just flip this paper over and use the back side.

አስተያየትዎን በአማርኛ ቋንቋ ሊሰጡ ይችላሉ። **Thank you!**

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የፕሮጀክት ማናጅመንት የድህረ-ምረቃ መርሃ ግብር ለድህረ-ምረቃ ጥናት የተዘጋጀ መጠይቅ

ውድ መልስ ሰጪ፡

የጥናቴ ትኩረት በአዲስ አበባ ከተማ ፣ቦሌ ክ/ከተማ፣ ወረዳ አንድ አስተዳደር በተለይም በቦሌ ሚካኤል እንዲሁም በቦሌ ቡልቡላ ወረዳ 12 በተመረጡ ቦታዎች የህብረተሰብ መኖሪያ ሰፈር የሕዝብ የዕለት ተዕለት እሮሮና ጩኸት መነሻ በሆነው ድምፅ ብክለት ችግር ዙሪያ የሁለተኛ ዲግሪዬን "በፕሮጀክት ማናጅመንት " ለምሠራው ጥናት ማሟያ ይሆን ዘንድ ይህ መጠይቅ ተዘጋጅቷል፡፡

የዚህ ጥናት ስኬት እርስዎ ትክክለኛ መረጃ በሚሠጡት ላይ የተመሠረተ ስለሆነ ትብብርዎ አይለየን፡፡ ማንኛውም በዚህ ቅፅ የሚሰጡት ምላሽ በሚስጥር የሚያዝ መሆኑን እያረጋገጥኩ በቅፁ ላይ ስምዎን መፃፍ አስፈላጊ አይደለም፡፡

ቅፁን ለመሙላት ፈቃደኛ በመሆንዎ በቅድሚያ ከልብ ላመሰግንዎት እወዳለሁ፡፡

የቅፁ አሞላል መመሪያ፡ እባክዎን፡

- ጥያቄውን በደንብ ያንብቡ
- ጥያቄውን ሲመልሱ መልስ በያዘው ፊደል ላይ ያክብቡ ወይም በተሰጠዎት ክፍት ቦታ ላይ መልሰዎን ይፃፉት
- አስተያየት እንዲሰጡ በተሰጠዎት ክፍት ቦታ ላይ ስለድምፅ ብክለት ነፃ አስተያየትዎን ይሥጡ

ክፍል አንድ- የግል መረጃ፡

1. **ፆታ** ሀ/ ወንድ ለ/ ሴት
2. **እድሜ** ሐ/ 18-30 መ/ 31-50 ሰ/ ከ50 ዓመት በላይ
3. **የትምህርት ደረጃ**

ሀ/ ማንበብና መፃፍ እስከ ሰርቲፊኬት ለ/ ዲፕሎማና የመጀመሪያ ዲግሪ

ሐ/ ማስተርስ እና ከዚያ በላይ

ክፍል ሁለት፡- ስለድምፅ ብክለት ዝርዝር ጥያቄዎች

4. የየትኛው ቤተ-እምነት ተከታይ ነዎት?

ሀ/ ኦርቶዶክስ ለ/ ሙስሊም ሐ/ ፕሮቴስታንት መ/ ካቶሊክ ረ/ ሌላ (ይገለፅ)

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5. በኃይማኖቱ ስነ-ምግባር መሠረት ድምፅ ማጉያና አምፕሊፋዬር በመቀነስ የሌሎችን ሠላምና መብት መጠበቅ ይቻላል ብለው ያምናሉ?

ሀ/ አዎን ይቻላል፣ ለ/ አይደለም አይቻልም ሐ/ ሀሳብ የለኝም መ/ ለሌሎች ሰላምና መብት ግድ የለኝም

6. መልስዎ "አይቻልም" ከሆነ ምክንያቱ ምን ይመስልዎታል?

ሀ/ ድምፅ ማጉያን ወይም የሙዚቃ አምፕሊፋዬር ከፍ አድርጎ መጠቀም የግድ ነው።

ለ/ የእምነት መሪዎች ግንዛቤ ማነስ ነዉ

ሐ/ የቤተ-እምነቱ- ተከታዮች የሃይማኖት መሪዎችን ስለሚያስገድዱ

7. በ ህብረተሰብ መኖሪያ ሰፈር የሚለቀቀውን ድምፅ ብክለት እንዴት ይመለከቱታል?

ሀ/ በጣም ከፍተኛ ለ/ መካከለኛ ሐ/ዝቅተኛ መ/በጣም ዝቅተኛ

8. ሌሊት እንቅልፍ ላይ እያሉ ከሃይማኖት ድርጅቶች ከልክ ያለፈ የድምፅ ማጉያና ለሚለቀቀው ድምፅ ምን አስተያየት አለዎት?

ሀ/ የድምፅ ማጉያ / አምፕሊፋዬር ድምፅ መጠኑ ቢቀነስ

ለ/ ድምፅ መጠኑ በዚህ ሁኔታ ቢቀጠል ግድየለኝም ሐ/ ለመወሰን አስቸጋሪ ነው

መ/ በመኖሪያ ሠፈር ድምፅ ማጉያና ሌሎች ሙዚቃ መሳሪያዎችን መጠቀም አያስፈልግም

9. ስለድምፅ ብክለት ችግር ለሚመለከተው የመንግስት አካል አመልክተው ያውቃሉ?

ሀ/ አዎን ለ/ አይደለም

10. ከላይ ለተመለከተው ጥያቄ መልስዎ "አዎን" ከሆነ ለየትኛው የመንግስት አካል ሪፖርት አድርገዋል?

ሀ/ ለወረዳ ስራ አስፈፃሚ ለ/ ለአካባቢያዊ ጥበቃ ቢሮ ሐ/ ለንግድ ቢሮ

መ/ ለፍትህ ቢሮ ሠ) ለሌሎች ለሚመለከታቸው አካላት (ይገለፅ)_____

11. ለአቤቱታዎ ምን ምላሽ አገኙ?

ሀ/ ወዲያውኑ በአጥፊው ላይ እርምጃ ተወሰደ ለ/ አጥፊው ማስተካከያ እርምጃ እንዲወስድ መመሪያ ተሰጠው ሐ/ ምንም እርምጃ አልተወሰደም የ ድ ም ጽ ብ ክ ለ ቱ ም እ ን ደ ቀ ጠ ለ ይ ገ ኛ ል

12. የ ሚ መ ለ ከ ተ ው አ ካ ል የ ድ ም ጽ ብ ክ ለ ት ን ለ መ ቀ ነ ስ እ የ ወ ሰ ደ ባ ለ ው እ ር ም ጃ ም ን ያ ህ ል ረ ክ ተ ዋ ል ?

ሀ / በ ጣ ም ረ ክ ቻ ለ ሁ ለ / ረ ክ ቻ ለ ሁ ሐ / በ መ ጠ ኑ ረ ክ ቻ ለ ሁ መ/ በ ፍ ጹ ም አ ል ረ ካ ሁ ም

13. ከ ላ ይ ለ ተ መ ለ ከ ተ ው ጥ ያ ቄ መ ል ስ ዎ "በ ፍ ጹ ም አ ል ረ ካ ሁ ም " ከ ሆ ነ በ መ ኖ ሪ ያ ሰ ፈ ር በ ሚ ለ ቀ ቀ ው ድ ም ፅ ብ ክ ለ ት ላ ይ ም ን አ ይ ነ ት እ ር ም ጃ እ ን ዲ ወ ሰ ድ ይ ፈ ል ጋ ሉ ?

ሀ / ሕ ግ አ ስ ከ ባ ሪ ው አ ካ ል አ ፋ ጣ ኝ የ ሆ ነ ዘ ላ ቂ እ ር ም ጃ መ ውሰ ድ ይ ጠ በ ቅ በ ታ ል

ለ / ነ ዋ ሪ ው ሕ ብ ረ ተ ሰ ብ በ ራ ሱ ተ ነ ሳ ሽ ነ ት ከ ቤ ተ -እ ም ነ ት መ ሪ ዎ ች ና ከ ነ ጋ ዴ ዎ ች

ጋር በ መ ገ ና ኘ ት መ ፍ ት ሄ መ ፈ ለ ግ አ ለ በ ት ሐ/ ከ ሁ ሉ ም ባ ለ ድ ር ሻ አ ካ ላ ት እ ን ደ ዕ ድ ር ፤ የ ወ ጣ ቶ ች ና ሴ ቶ ች ፎ ረ ም ና ወ ዘ ተ ከ መ ሳ ሰ ሉ ት የ ተ ውጣጣ የ ጋ ራ ኮ ሚ ቴ ተ ቋ ቁ ሞ የ ድ ም ጽ ብ ክ ለ ት ን ለ መ ቀ ነ ስ ኃ ላ ፊ ነ ቱ ን መ ወ ጣ ት አ ለ በ ት ፡ ፡

መ/ ሌ ላ መ ል ስ ካ ለ ዎ ት በ ዝ ር ዝ ር ቢ ገ ል ጹ ል ን

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14. በ የ ት ኛ ው ጊ ዜ የ ሚ ለ ቀ ቀ ው ድ ም ጽ ብ ክ ለ ት በ ጣ ም ይ ረ ብ ሽ ዎ ታ ል / ያ ስ ቆ ጥ ዎ ታ ል ፡

ሀ/በቀን ለ/በእኩልሌሊትሐ/ጪትሊነጋጋሲል መ/ከነጋበኋላ ሰ/ማታሲመሻሽ

15. ከድምፅብክለትየተነሳህብረተሰቡበመኖሪያሰፈርበጣምሊጋለጥየሚችለውጤና መታወክየትኛውዓይነት ነውብለውይገምታሉ? (ከአንድመልስበላይሊሰጡይችላሉ)

ሀ/የመስማትሐይልመቀነስ ለ/የውይይትናየማስተማርሂደቱንማደናቀፍ ሐ/እንቅልፍ መከልከል መ/አእምሮህመምናጭንቀትሠ/ሥራአፈፃፀምማዳከምናምርታማነት መቀነስ ረ/ከሕብረተሰቡጋር በማህበራዊግንኙነትአለመግባባት፣ቁጣና የንዴት ስሜት ማስከተል

16. ከላይከተጠቀሱትየጤና መታወክ ችግሮች የገጠመዎት ካለቀጥሎ ባለው ባዶ ቦታ ላይ በቅደም ተከተል ያስቀምጡ

1_____

2. _____

3_____

4 _____

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6_____

17. **ከህብረተሰብ ክፍሎች ለድምፅብክለት የበለጠ ተጋላጭ የሆኑትየትኞቹ ይመስሎዎታል?** (እንደየደረጃቸውከ1-5ያስቀምጡ) ከፍተኛ1ዝቅተኛ5

ሀ/ጨቅላህፃን /ተማሪዎች ሐ/ሽማግሌዎችናአረጋዊያንሕሙማን ሠ/ጎልማሶች

18. በሀገራችንየድምፅብክለት መቆጣጠሪያ ደንብና መመሪያ አለ ብለውያምናሉ?

ሀ/አዎን ለ/አይደለም

19. መልሰዎ “አዎን” ከሆነ የሚመለከተው አካል ለሕዝብ እሮሮ ፈጣንምላሽለመስጠትችላያለበትምክንያትምንይመስለዎታል? የራሰዎንመልስይስጡት

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20. እርሰዎየሚመሩትተቋምትምህርትቤትከሆነከድምፅብክለትየተነሳምን ችግርገጠሞት?

ሀ.ድምጽ ብክለቱ ሲለቀቅመምህሩየመማር-ማስተማሩ ሂደትንለማቆምመገደድ

ለ.ተማሪዎች በክፍል ውስጥ በአግባቡ ማዳመጥ አለመቻል

ሐ.በተማሪዎች ላይ ጤና መታወክ ችግር ማስከተል

መ.የተማሪዎች የትምህርት አቀባበል አቅምን መቀነስ

21. **ከድምፅ ብክለት የተነሳሌሎችበትምህርት ቤት የተከሰቱ ችግሮች ካሉ በዝርዝር ቢገለፁ**

_____

22. እርሰዎየ ሚመሩት ጤና ተቋም ከሆነ በጤና ረገድ ከድምፅ ብክለትየ ተነ ሳ ምን ችግር ገጠሞት?

ሀ/የሕሙማንየጤና ሁኔታ ማባባስለ/በሕሙማንላይየባሰጭንቀትማስከተልሐ/ምን ም የጋጠመችግር የለም

23.እርሰዎ በሚመሩት ጤና ተቋም ከድምፅ ብክለት የተነሳ የገጠመዎትን ችግ ር ዘርዘር አድርገው ቢገልጹልን

_____
_____
_____
_____

24. እንደየ ተቋማችሁ የስራ ባህሪ ስለ ድምጽ ብክለት ምን መፍትሔ ይኖራል ብለው ያምናሉ?አስተያየትዎን ዘርዘር አድርገው ይስጡ።

ሀ/ትምህርትተቋም

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ለ/ጤና ተቋም

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አመሰግናለሁ!

ANNEX2: FOCUS GROUP DISCUSSION AND INTERVIEW

Interview Questions to Addis Ababa Environmental Protection and Green Development Commission

The primary objective out of the main ones of Addis Ababa's environmental protection and green development is to promote sustainable development. This includes balancing economic growth with environmental protection, ensuring that development is environmentally friendly, and conserving natural resources. Therefore; It's clear that noise pollution is the top priority of the Authority. Therefore; with respect to this mission the following interview questions are presented.

1. **Do places like schools, healthcare centers, residential areas, courts, and other sensitive institutions have any rules about how much noise pollution is allowed?**

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_____

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_____

2. **Is there awareness at the Authority level that in Addis Ababa; that many places, particularly in community residential areas, loudspeakers and amplifiers emanating from religious institutions, in the midnight highly disturbs the peace of the residents? If it is known, what course of action was taken?**

_____

_____

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3. **Have you ever gotten any compliant from the people living around about too much noise? Where in Addis Ababa is this happening?**

_____

4. **What did you do about the resident's complaints, and what kind of solution did you come up with?**

_____

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5. **Do you have a service /department or desk who handles complaints and checks out the issue?**

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6. **What does the Authority plan to do to keep the community safe from noise coming from religious places, bars, clubs, and music stores?**

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7. **What's the Authority's plan for the future to tackle noise pollution issues in residential areas, working with organizations like IDIR, religious groups, businesses, and other interested parties?**

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8. **Why do you think your Authority's reluctance with noise pollution control in religious institutions?**

Thank you!