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SCHOOL OF GRATUATE STUDIES

DEPARTMENT OF CONSTRUCTION THECHNOLOGY AND MANAGEMENT

(COTM)

"Factors affecting accessibility of building infrastructure for persons with disabled: the case of Africa Avenue, Addis Ababa, Ethiopia.''

By

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A Research Submitted to School of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Science in Construction Technology and Management (COTM).

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Declaration

I the undersigned, hereby declare that this thesis paper entitled "Factors affecting accessibility of building infrastructure for persons with disabled: the case of Africa Avenue, Addis Ababa, Ethiopia" is my original work and that all sources of materials used for this study have been identified and acknowledge as complete references. This research study has not been previously submitted in full or partial fulfillment for a degree in this or any other recognized educational institution. This research study is being submitted in partial fulfillment of the requirement for a master of science in Construction Technology and Management.

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THESIS APPROVAL FORM

This is to certify that the thesis Entitled "Factors affecting accessibility of building infrastructure for persons with disabled: the case of Africa Avenue, Addis Ababa, Ethiopia", is carried out by TESFAYE SOLOMON GULUMA MSc student at Addis College, with ID No GSR/017/2011.

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ABSTRACT

People pass though being elderly, pregnant women, children and with a temporary sickness or injury and need of help from others to maneuver in built environments. Thus, public buildings should be accessible and barrier-free to both able and disabled people. Disabled people find it difficult to gain access into and operate freely without assistance in many public buildings in Addis Ababa. The aim of this research was to examine the extent to which the persons with Disability facilities have been incorporated in the designs and construction of public buildings of Addis Ababa, to identify the challenges with the implementation of accessible Building Facilities, challenges faced by of PWDs and to asses possible improvement solutions to achieve the study 's objectives, a comprehensive literature review, a questionnaires survey and observation were carried out. The total population of grade one consultant, contractors and Addis Ababa sub – city a number of (166) from federal construction minister of Addis Ababa in the year 2021 was taken to respond on the questionnaires. The study also sought to find out major challenges that person with disability is facing by purposively selected organizations, which are working on disability and individual disable persons 33 Peoples with disability were given the questionnaires and interview based on their disability type. In addition, the study took inventory of facilities available for disabled people in purposively selected fifteen critical public buildings. The inventory covered the identification and ascertaining the functional state of the facilities. Findings from the research shows that almost half of the respondents who were responsible for taking decision on the design of built environment has got little or fair knowledge about the inclusive, accessible, universal buildings and disability concerning laws. Therefore, most the building being provided are not disability-friendly. Even, if there are consideration of the disability in design the frequently considered is mobility. And some of the challenging factors for implementing accessible buildings are ranked as follow; lack of enforcement of the law, lack of public awareness about the law and weakness in the provisions of the law. Public education, review of the disability law and active involvement of disability groups in decision making were some of the recommendations made.

Keywords: Disability-friendly; Facilities; Public Buildings

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LIST OF ACRONYMS

ADA	American Disability Authority
ANSI	American National Standard for Accessible
CABE	Commission for Architecture and the Built Environment
CAE-1	Consulting Architects and Engineers Grade 1
CRPD	Convention on the Rights of Persons with Disabilities (United Nations)
CSA	Canadian Standard Association
DQI	Design quality indicator
ECDD	Ethiopian center for disability and development
ILO	International Labor Organization
ISO	International Organization for Standardization
Mo FED	Ministry of Finance and economic development
PWDs	Person with disabilities
SPSS	Scientific Package for Social Science
WHO	World Health Organization
UN	United Nations
ENDAN	Ethiopian National Disabilities Action Network
UNICEF	United Nations' Education, Social and Cultural Organization
FGD	Focus Group Discussions
GRB	Government Regulatory Body
MOLSA	Ministry of Labor and Social Affairs

CHAPTER - ONE

1. INTRODUCTION

1.1 Background

A disability is a physical, cognitive, intellectual, mental, sensory, developmental, or a combination of these impairments that limits an individual's capacity to participate in what is deemed "normal" in their daily lives. A disability might be present from birth or develop over the course of a person's life (World Health Organization, 2016).

According to Anjlee Agarwal and Andre Steele. (March, 2016), Infrastructure is crucial to social functioning, affecting social well-being, incomes, education, and health. When infrastructure is inaccessible to a social group, that group faces social exclusion, making it difficult for that group to participate in and contribute to society. Building is an important component of infrastructure since it provides access to other services such as health, education, work, and living. The term "building" refers to any human-made structure used or intended for sustaining or sheltering any person in the fields of architecture, construction, engineering, real estate development, and building technology. Buildings serve a variety of functions in society, including providing shelter from the elements and general living space, as well as providing privacy, storing personal items, and allowing people to live and work comfortably. The cities without universally accessible building systems were exclude persons with impairments, marginalizing them and violating their human rights.

According to the 2011 World Report on Disability by the World Health and the World Bank Organization, 17.6% of Ethiopia's population is disabled. According to Ethiopia's National Plan of Action for Persons with Disabilities (2012-2021), 95 percent of Ethiopia's people with disabilities live in poverty. Like the rest of the country, it is estimated that 84 percent of the population lives in rural areas with poor access to essential services. In addition, rehabilitation services in the country are scarce and focused in major cities.

According to the World Report on Disability, more than one billion people, or 15% of the world's population, live with a disability, with approximately 200 million of them experiencing it

Significant problems with functioning. Disability was become even more of a worry in the coming years as its prevalence rises. This is due to the global increase in chronic health conditions such as diabetes, cardiovascular disease, cancer, and mental health disorders, as well as the world's ageing population and higher risk of disability in older people (World Bank and World Health Organization (WHO), 2011: xi, United Nations' Education, Social and Cultural Organization, 2011: xi) (UNICEF, 2013).

According to UN estimates, Ethiopia has approximately eight million individuals with disabilities. This represents around ten percent of Ethiopia's entire population. One of the disadvantages of unemployment in Ethiopia is that an estimated 95 percent of PWDs live in poverty. Malnutrition is responsible for 20% of the country's disability (Yohannes, 2012). Contrary to popular belief, according to Yetneberish (2013), the World Report on Handicap estimates that 17.6% of Ethiopians live with a disability. According to studies, this discrepancy was caused by the metrics used to classify and categorize people with and without disabilities, or by a data collecting information gap. According to the Ethiopian National Disability Action Network (ENDAN, 2010:32), inconsistencies are primarily explained by differences in how people think about disability, as well as differences in the measurements and classifications used to collect disability data, as well as families' reluctance to expose PWDs during the survey.

According to the universal design approach, persons with a variety of disabilities should be able to use buildings and locations pleasantly and safely, as much as feasible without requiring special help. People should also be able to navigate smoothly, understand how to utilize building amenities such as intercoms or lifts, ramps, stairs, and restrooms, and comprehend what constitutes a pedestrian facility. They should also be aware of where they can face traffic. However, In the construction industry, where men, materials, machinery, money, and management work together to build a construction industry that provides an inclusive facility service to society, there is a vast scope for improving performance through knowledge. The construction industry is crucial to Ethiopia's socioeconomic development. It is also considered that the majority of the capital budget is spent on infrastructure development, as infrastructure development is thought to be the backbone of the economy. Growth of the nation

Economic growth of the nation. According to the Ministry of Finance and Economic Development, the construction industry contributed 5.6 percent to Ethiopia's economy. As a result, construction companies are constantly working to bring about quick change in the industry. However, excellent construction project performance is achieved when all stakeholders, individually and together, meet their objectives.

Clients, consultants, contractors, suppliers, end-users, and the community are all possible stakeholders in construction projects. As a result, the success of building construction projects is contingent on meeting the needs of end-users, including those with disabilities.

In Addis Ababa, the majority of the infrastructure, including highways, residential neighborhoods, business centers, schools, health centers, and work places, as well as the transportation system, is full with barriers, making it difficult for people with disabilities to move freely and access services. Persons with disabilities were find it difficult to live independently, receive an education, find work, move wherever they want, and participate in political, religious, social, and recreational activities in such a metropolis. The main reason of this problem is a lack of understanding in the community, including the government, where some regard accessibility as a charitable issue, while others regard it as a luxury, and still others regard it as a source of additional costs (A. Sisay 2012)

Disabled persons, particularly those with mobility problems, are frequently stuck inside their homes. This is frequently due to the difficulties that PWDs confront when using locations outside of their homes. Their difficulties stem from a variety of factors, including damaged pavements, congested thoroughfares, the lack of wheelchair ramps, and inaccessible transportation. These hurdles restrict people with disabilities from participating in mainstream social activities. Furthermore, these physical impediments in public areas serve to perpetuate the social perception that disabled persons are a minority and a financial burden on their families. This mentality, to some extent, confines disabled people to 'their place,' limiting their ability to advocate for accessible public places and the redevelopment of existing and new needs in order to design for the future (According to baris and Uslu (2009). There are many critical public buildings in Addis Ababa city that provide various services to the society. And it's all about the efficiency, usability, and accessibility of a building facility that's supposed to be available to everyone. As a result, the focus of this study would be on determining how efficient and usable existing building facilities

are, as well as the major challenges faced by designers (architects, engineers, and others) in ensuring that they meet industry standards, and what improvement strategies should be implemented to make these public buildings more accessible to all.

1.2 Statement of the problem

Since Addis Ababa was chosen to develop many multipurpose structures, as well as residents of the diplomatic and capital city of Africa, people have been flocking from all over the world to attend global conferences and to visit the African continent's capital. It's important to note that some of these visitors have special needs. It's also worth noting that Ethiopia was one of the first countries to sign the UN Convention on the Rights of Persons with Disabilities (CRPD), which aims to make the built environment more accessible to people with disabilities, preventing them from being cut off from jobs, housing, health care, and education. As a result, any built environment in the city must be accessible, inclusive, and comfortable for foreign and local PWDs, as per the globally signed convention and Ethiopian norm, demonstrating our city's infrastructure growth as well as its integrity, Ethiopia's construction sector should be accessibility and usability of infrastructure, such as buildings, because it is a sign of a country's success when facilities solve problems for disabled people rather than creating them. Because it benefits society, it should be for everyone, not just the majority. In Addis Ababa, there are numerous private and public structures that are neither accessible nor useful to people with disabilities. As a result, better accessibility to constructed environments helps the entire society, including the elderly, pregnant women, those with temporarily impaired mobility, children, and others (According to A. Molla July, 2012).

The majority of Addis Ababa's roads, resident areas, business establishments, schools, health centers, work places, and transportation system, to name a few, are full of barriers that make it difficult for people with disabilities to travel freely and access services. Persons with disabilities were find it difficult to live independently, acquire an education, find work, travel anywhere they choose, and engage in political, religious, social, and recreational activities in such a metropolis. The main cause of this problem is a lack of understanding in the community, including the government, where some perceive accessibility as a charitable issue, while others see it as a luxury, and still others see it as an additional cost (A. Sisay 2012).

The majority of the time, people with physical disabilities finds it challenging to acquire admission to public places. Barriers include restricted access and small doorways, steps, substandard disabled

ramps, toilet seats, and staircases. As a result, disabled persons are simply dissatisfied and hampered as a result of the way their environment accentuates their impairment. And urban restrictions have made it difficult for persons with disabilities to participate in social activities, which have a negative impact on society as a whole. (A. Sisay 2012)

According to the World Report on Disability, the following are some of the hard aspects that contribute to the failure to implement inclusive building: Policies and practices that aren't up to snuff, Existing policies and standards are not consistently enforced, or policy formulation does not always take into account the requirements of people with disabilities. Negative attitudes, complexity, and cost are all factors to consider. Barriers include stereotypes and beliefs, as well as a lack of funding and participation of PWDs in decision-making. In Ethiopia's construction sector, little research has been done on the impact of these problematic circumstances on building accessibility. The data above illustrate that, despite the existence of a legislative framework (i.e., disability) supporting the rights of PWDs, the constructed environment at educational institutions, city centers, backs, hospitals, and other locations fails to meet their needs. PWDs' access is still restricted in a variety of ways. (A. Sisay 2012)

In addition, much research has not been done in Evaluating the Effectiveness and Challenges of Implementing Available Building Facilities for Persons with Disabilities on public building of Addis Ababa. Therefore, the interest of the study is to Assessing the current Efficiency and Challenges with Implementing Accessible Building Facilities for Persons with Disabilities on public building of Addis Ababa. So that this research was serve as a resource to researchers interested in carrying out further research in this field

1.3 Research questions

The following research questions were taken into consideration:

1. Are persons taken into account in the design and construction of public buildings?
2. Is there a clear distinction between the kinds of building services and facilities that are required by regulations or law of most people with disabilities?
3. Does the construction industry have any disabled organizations to exercise with government bodies collaborate?
4. What are the challenges faced by the People with Disabilities regarding Public Buildings?

1.4 Objectives of the research

1.4.1 General objective

To access the barriers and efficiency of the implements of accessibility building facilities for disabled Persons on public buildings of Addis Ababa.

1.4.2 Specific objectives

These sub-objectives would help to achieve the main goal:

- To identify disability access is considered in the design and construction stage of public buildings.
- To identify the limitation issue affecting building accessibility for people with physical disabilities in Addis Ababa.
- To minimize the challenges of accessibility through building facilities, the government and PWD organizations work together throughout design up to construction stags.
- To evaluate potential solutions for making public facilities more functional and easily accessible to people with disabilities.

1.5 Limitations of the Study

The research is assessing the Efficiency and Challenges of Implementing Accessible Building Facilities for Persons with Disabilities on random selected public buildings of Addis Ababa. On chosen public buildings in Addis Ababa, the research looks at "Factors affecting accessibility of building infrastructure by physically challenged persons: the case of Addis Ababa city." Chosen of left and right sides of the Bole Road for G+5 and above public buildings were studied from "Meskel square" to Bole Bridge.

Wheelchair users, those with poor walking ability, people who use walking crutches, people who have limited use of their hands or arms, the visually impaired, and the hearing impaired was all be targeted in this study. The goal of this study is to look into elements that affect accessible building infrastructure, such as designers' (architects, engineers) and PWDs' experiences with providing convent facilities for disabled people in important public buildings in Addis Ababa.

The data collection was limited to primary data i.e., observation and questionnaires mainly for the public buildings., as well as secondary data. Primary data were gathered from semi-structured, in-depth interviews with 15 PWDs to determine the role of the building sector in providing a pleasant

environment for physically challenged people. Respondents were chosen based on their organizational responsibilities and professional involvement in the disability field. Data was be gathered from consulting firms, contractors, government regulatory bodies, and people with disabilities.

1.6 Significance of the study

The majority of Ethiopian buildings are built traditionally, and Ethiopian construction, particularly building constructions, employs only unskilled workers and contractors; the industry is easily delegated to non-technical workers, and professional ethics are questioned. As a result, the findings of this study were raised awareness about the current challenges that disabled people face as a result of building facilities that are not accessible to them, the reasons that architects and engineers have failed to implement accessible building facilities for the disabled, and suggestions on how they can be improved. As a result, this research is noteworthy for the following reasons.

- This research was useful to construction professionals and the general public because it was raised awareness about how inaccessibility and non-inclusiveness of buildings can have a negative impact on projects, economies, and societies.
- Also begin a study of existing procedures, codes (law), methods of work, and the management system of the government regulatory agency to improve the usability of public buildings in Addis Ababa. Because disability is something that we are all familiar with, we know when it occurred.
- People with disabilities have access to key services because of affordable and dependable transportation; all of these things are somehow possible: education, work, health care, housing, and communal life.
- This research was also assisted contractors, clients, consultants, and disability persons engaged in construction projects in determining how to improve their present design and construction methods.
- To provide insight for management bodies in the construction sector to incorporate the challenge of disability issues in their implementation up to the completion stages of projects and to learn about the challenges faced by PWDs so that one can know where to focus in order to overcome the challenges and improve current practice.

- To identify PWDs challenges so that one can know where to focus on to overcome the challenges and to expand existing practice.
- It was served as a resource for other researchers interested in conducting more research in this area.

1.7 Parts of the study

This study was be divided into 5 chapters. The first chapter contains the study's introduction (preliminary) sections: the study's background, the problem statement, the study's aims, significance, scope, and limitations. The Literature Review is the second chapter.

The third chapter provides a full description of the research area; the sample selection, as well as the research design; the information gathered and assessed. The presentation, analysis, and discussion of findings are covered in Chapter 4.

Finally, in chapter five, find a broad review of the findings, as well as a conclusion and a recommendation.

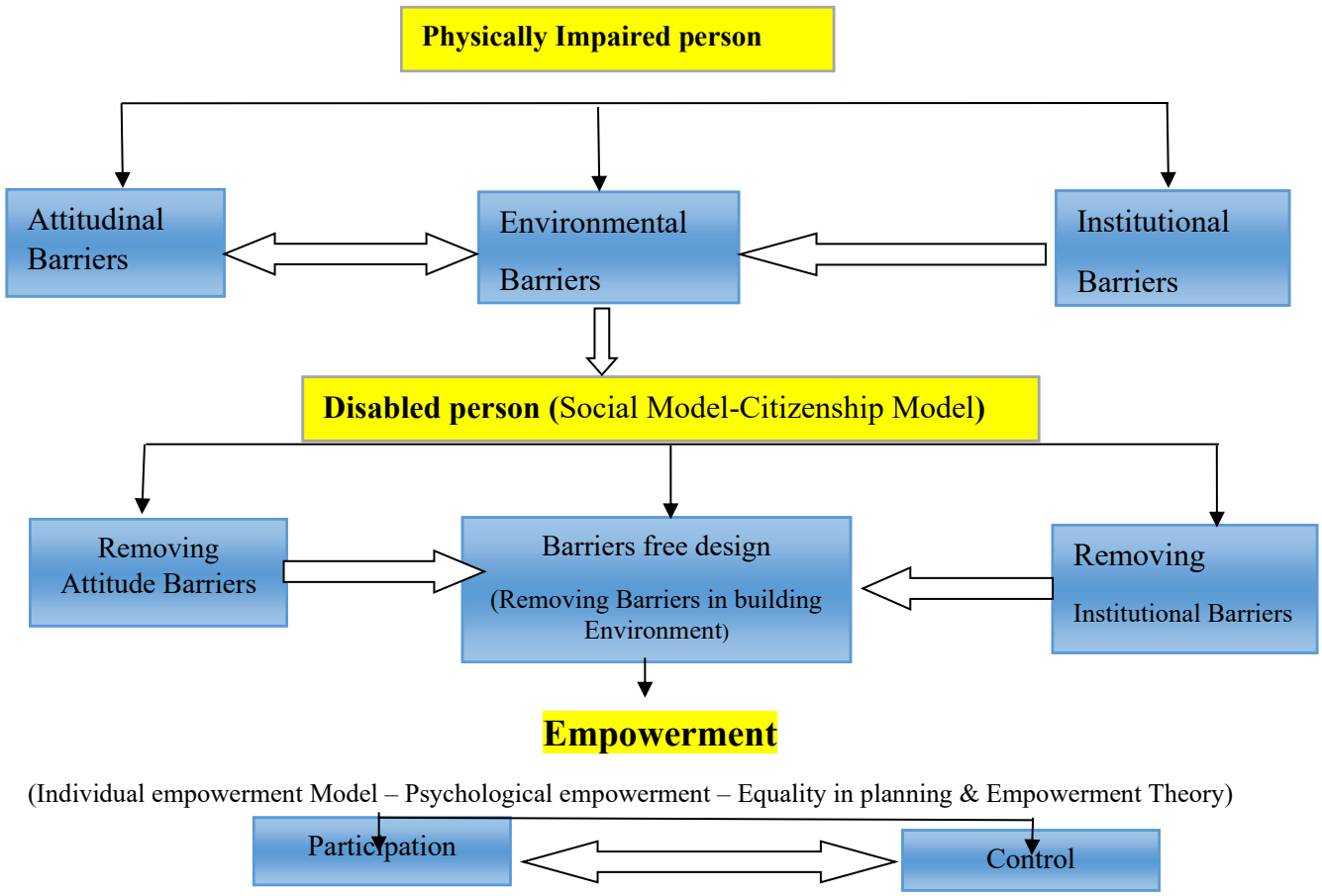
CHAPTER - TWO

2 LITERATURE REVIEW

2.1 Conceptual Framework

Disability is the results of an impaired person's inability to overcome obstacles. Environmental Obstacles, as one of the three types of barriers, are significant impediments to disabled people becoming self-sufficient and empowered. Social segments must remove these man-made built-environmental barriers in order to empower disabled people and give them with "Opportunity" in accordance with the "Social" and "Citizenship" models. Because all three disability barriers, namely "Environmental," "Attitudinal," and "Institutional," are intertwined, removing "Environmental Barriers" can be explained as a multidisciplinary strategy lead by "Barrier Free Design," which must be implemented in a methodical manner (Amila S. N. Badungodage[1] Kopalapillai Amirthalingam[2], 2012) Figure 2.1

Figure 2.1 Conceptual framework



(Source: Amila S. N. Badungodage1 & Kopalapillai Amirthalingam2, 2012)

2.2 Theoretical background

As a significant minority population in the globe, disability is an extensively debated issue. Many international and local organizations, including the United Nations Organization (UNO), have provided various interpretations, explanations, and concepts on the subject.

Disability: is the outcome of a negative interaction between a person with an impairment and his or her social or physical environment. According to (Wilkoff and Abed, 1994). This was the strong impression of the "Social Model," which added a new dimension to the way "Disability" and related issues were addressed (Figure 2.2).

Figure 2.2: Relationship between Impairment and Disability

According to Wapling,2009 "Disability Barriers" can be divided into three categories: "Attitudinal Barriers," "Institutional Barriers," and "Environmental Barriers" (Wapling, 2009). Non-disabled people's negative attitudes toward disabled people and their needs are known as a "attitudinal barrier." Systematic exclusion or neglect in social, educational, legal, religious, and political institutions is defined as a “institutional barrier.” The term "environmental barrier" refers to concerns with physical accessibility and functionality in buildings and the built environment (Wapling, 2009). These three forms of handicap barriers are all linked and interconnected. Each obstacle has a substantial impact and influence on the others. People with disabilities can also be divided into two categories: physically disabled and mentally disabled. Physical disabilities include vision, hearing, and speaking impairments, as well as limitations of the hands, legs, and other body parts. The physical impaired are the focus of this study because they are disproportionately affected by built-environmental (architectural) barriers. There have been multiple models developed to study the various causes, ramifications, development, and empowerment of people with disabilities.

Any country's development is dependent on the construction industry. The construction of physical infrastructures, such as buildings, roads, rail lines, hydropower plants, and bridges, can be used to assess a country's economic growth rate. Numerous parties, methods, multiple phases and stages

of work, and a great deal of input from both the public and private sectors are all involved in the development of a construction project, with the main goal being to bring the project to a successful finish. The level of success in carrying out construction project development activities were be heavily influenced by the quality of the respective parties' managerial, financial, technical, and organizational performance, as well as user satisfaction, while taking into account risk management, the business environment, and economic and political stability. (Wapling, 2009)

According to the World Bank and the World Health Organization's World Report on Disability, Ethiopia has an estimated 15 million children, adults, and elderly people with disabilities, accounting for 17.6% of the population. Despite this, a survey done by the Ethiopian Center for Disability and Development (ECDD) on existing buildings and transportation in Addis Ababa revealed that the majority of buildings and transportation are inaccessible to people with disabilities. The researcher feels that having accessible transportation is pointless if the buildings are not, and that having accessible education centers, health centers, and other facilities is pointless. If public transportation is not available. As a result, it is critical to concentrate on both building development and mobility options in order to fully improve the lives of people with disabilities. Persons with disabilities are not fully included, according to the ECDD, if they are unable to use community facilities and services. However, in most countries, there are several challenges and restrictions that prevent people with disabilities from taking advantage of public services. Stairs, a lack of information in accessible formats such as Braille and sign language, and community services supplied in a language that persons with disabilities cannot understand are just a few examples. While some of the more expensive accessibility provisions can be introduced over time, there are a number of low-cost, low-tech accessibility options that can be deployed right now.

In 1980, the World Health Organization (WHO) published the International Classification of Impairments, Disabilities, and Handicaps (ICIDH), which was the first conceptual framework of its sort to encompass the effects of personal, societal, and environmental factors on people with disabilities. As a result, the ICIDH was the first paradigm for studying disability issues to be compatible with the increasing notion that medical restoration, rehabilitation, assistive technology, and personal assistance can help persons with disabilities minimizes their functional limitations. Increase their ability to take advantage of social and economic opportunities, and that social and environmental policies can change the societal contexts of disability (for example, social and

economic institutions, built environments, cultures, and beliefs) and thus increase the social and economic access of people with disabilities. The ICIDH defined disability as three distinct but interconnected components: impairments, disabilities, and handicaps. A constraint or lack of ability to do an activity in a way or within a range considered normal for a human being was characterized as disability (United Nations Statistical Office, 2003).

To ensure equitable access to the built environment, designers should take into account a variety of criteria that are as flexible as possible and provide a barrier-free environment for all users. Accessibility is frequently thought of as a separate issue to be addressed after a project's planning and development process is completed, but accessibility is a necessary component of creating an inclusive society in which everyone, including people with disabilities, is able to fully participate in all aspects of society. In addition, people' conformability and accessibility have been sacrificed for infrastructure system cost-effectiveness, despite the need for physical access to the built environment. Many factors influence a person's emotional and physical well-being, not the least of which is the quality of their living and working environment. Physical design and layout are an important aspect of this characteristic, as is the extent to which it facilitates people's mobility and movement around the house, as well as their use of various rooms and their amenities. (United Nations Statistical Office, 2003)

2.3 Definitions of basic terms and concepts Definitions

2.3.1 Disability, Impairment and Handicap:

"Impairment," "Disability," and **"Handicap"** are all phrases that are used interchangeably. They all signify something different. The WHO (World Health Organization) provides the most prevalent definition, which distinguishes between the three terms: disability, impairment, and handicap. (S. Manley, 2016)

- **Impairment:** It is defined as any injure or weakening of physiological, and anatomical functions or structure.
- **Disability**: It is defined as any limitation or inability to perform an activity due to mental or physical disability.
- **Handicap:** A handicap is a drawback for an individual which results from a disability or impairment and precludes an individual from being normal.

Disability in Ethiopian Context

According to the newspaper "Nagarit Gazeta", the Emperor Haile Selassie I, in the Order No. 70 of 1970, described the "disabled" as people who, because of limitations of normal physical or mental health, is unable to earn their livelihood and do not have anyone to support them; and shall include any persons who is unable to earn their livelihood because they are too young or too old.

In "Negarit Gazeta" the Transitional Government of Ethiopia, Proclamation No. 101 of 1994 referred to "a disabled person" as a person who is unable to see, hear or speak or is suffering from mental retardation or from injuries that limit him or her due to natural or manmade causes; provided, however, that the term does not include persons who are alcoholic, drug addicts and those with psychological problems due to socially deviant behaviors. Persons with disabilities in accordance with Article 1 of the UNCRPD, ratified by Ethiopia in June 2010, states that Persons with disabilities (PWD's) include those who have long term physical, mental, intellectual or sensory impairments which, in interaction with various barriers, may hinder their full and effective participation in society on an equal basis with others The terms "handicap" and "impairment" are used according to international standards.

Generally, "Disability is a state in which functional limitations and/or impairments are causative factors of existing difficulties in performing one or more activities that are generally accepted as essential, basic components of daily living, such as self-care, social relations, and economic activity, in accordance with the subject's age, sex, and normative social roles." (C. Agency,2002)

2.3.2 Public Buildings:

Buildings without impediments are referred to be public buildings. It must be accessible to those who are both physically able and physically impaired. In most cases, public buildings are viewed as barrier-free or environmentally friendly structures. Office buildings, commercial structures, assembly halls, hospitals and health facilities, libraries, sports buildings, public transit buildings, religious buildings, government administrative buildings, educational buildings, religious buildings, banks, and so on are all categorized as public buildings. (S. Manley, 2016)

2.3.3 Critical public building:

Education centers, health care centers, police stations, government buildings, community retail shops, and banks are examples of critical public building facilities that are crucial to the continued operation of essential services following a big event. (C. Buildings et al, 2013)

2.3.4 Barrier:

A physical barrier, an architectural barrier, information or communications barrier, an attitudinal barrier, a technological barrier, a policy or practice are all examples of barriers that prevent a person with a disability from fully participating in all aspects of society due to his or her disability. (S. Manley, 2016)

2.3.5 Accessibility:

The word accessibility comes from the word access, which indicates "the ability to get into, enter, or enter a place." This suggests that you have the freedom to move around freely. An accessible environment is one that allows for entire freedom of movement and usage, regardless of age, gender, or impairments, of a space or product that can be utilized by anyone, with no barriers, dignity, and the maximum levels of independence possible. (H. International, 2009)

2.3.6 Usability:

The perceived fit between humans and architecture and the built environment is referred to as usability. It can be perceived through an intellectual and qualitative investigation of the architectural space that considers the adjustable level in architecture and built environment in terms of cognitive impairments and functional disabilities. Usability is a characteristic of the built environment that can be utilized by anybody in terms of ease, safety, and product quality in relation to users. (ISO Int. Organ. Stand., vol. 2011, 2011)

2.3.7 Inclusive design:

In the field of design education, the following definition of inclusive design has been adopted: It's critical to remember that "inclusive design" is a philosophy, not a set of ever-expanding design requirements. The goal of creating beautiful and functional environments that can be used equally by everyone, regardless of age, gender, or disability, necessitates a continuous expansion of the design process to accommodate a diverse range of users as we gain a better understanding of their needs, desires, and expectations. (H. Persson, H. Ahman, A. A. Yngling, and J. Gulliksen, 2014)

2.3.8 Universal design:

Ronald L. Mace, a highly important architect, product designer, and educator, invented the term "universal design." He defined universal design as the concept of developing products and places to meet the requirements of individuals of all ages, abilities, and socioeconomic level. (H. Persson, H. Ahman, A. A. Yngling, and J. Gulliksen, 2014)

Universal Design is a relatively recent paradigm that emerged from 'barrier-free 'or 'accessible design 'and 'assistive 'technology. It is a frame work for the design of places, things, information, communication and policy to be usable by the widest range of people operating in the widest range of situations without special or separate design. Universal design refers to a broad-spectrum solution that produces buildings, products, transportations and environments that are usable and effective for everyone, not just people with disabilities (M. E. Baris and A. Uslu, 2009)

According to (S. Manley, 2016), The Universal Design Principles are listed below; following the seven universal design principles was help practitioners address the demands of as many users as feasible. Designers working in poor nations must take into account various factors such as economics, engineering, culture, gender, and the environment in their design processes. These Principles provide designers with direction on how to better incorporate features that cater to as many people as feasible.

Principle 1: Equitable Use:

People of various capacities was finding the design useful and marketable. (S. Manley, 2016)

Guidelines:

a) Provide all users with the same means of operation: identical whenever practicable.
b) Do not isolate or stigmatize any users.
c) All users should have equal access to privacy, security, and safety features.
d) Make the design accessible to all types of users.

Principle 2: Flexibility in Use:

Individual tastes and abilities are accommodated by the design. (S. Manley, 2016)

Guidelines:

a) Give users the choice of using different techniques.

b) Allow for access and use by either the right or left hand.
c) Make the user's accuracy and precision easier.
d) Allow for flexibility in response to the user's pace.

Principle 3: Simple and Intuitive Use

Regardless of the user's experience, expertise, language skills, or present concentration level, the design is simple to understand. (S. Manley, 2016)

Guidelines:

a) Remove any unneeded complication.
b) Follow the user's expectations and intuition.
c) Take into account a wide range of reading and linguistic abilities.
d) Sort information according to its importance.
e) Provide prompts and feedback throughout and after the work is completed.

Principle 4: Perceptible Information

Regardless of ambient conditions or the user's sensory capacities, the design efficiently transmits important information to the user. (S. Manley, 2016)

Guidelines:

a) For redundant display of crucial information, use different modes (pictorial, verbal, tactile).
b) Make sure there's enough contrast between the important content and its surroundings.
c) Make crucial information as "legible" as possible.
d) Distinguish elements in ways that can be explained (i.e., make it easy to give instructions or directions).
e) Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Principle 5: Tolerance for Error

The design reduces dangers and the negative repercussions of accidental or accidental activities. (S. Manley, 2016)

Guidelines:

a) Arrange elements to reduce dangers and errors: most frequently used elements should be closest to the user; dangerous elements should be removed, isolated, or protected.
b) Provide dangers and error warnings.
c) Provide features that are fail-safe.
d) In tasks that need vigilance, discourage unconscious action.

Principle 6: Low Physical Effort

The design allows for efficient, comfortable, and fatigue-free operation. (S. Manley, 2016)

Guidelines:

a) Allow the user to keep their body in a neutral position.
b) Make use of manageable operational forces.
c) Reduce the number of times you do the same thing.
d) Reduce long-term physical exertion.

Principle 7: Size and Space for Approach and Use

Regardless of the user's body size, posture, or mobility, adequate size and space is provided for approach, reach, manipulation, and use. (S. Manley, 2016)

Guidelines:

a) Allow each seated or standing user a clear line of sight to critical features.
b) Make it easy for any seated or standing user to reach all components.
c) Allow for differences in hand and grip size.
d) Allow enough space for assistive devices or personal help to be used.

2.3.9 Design for all

Human variety, societal inclusion, and equality are all emphasized in design for all. All planners, designers, entrepreneurs, administrators, and political leaders face a creative and ethical challenge as a result of this holistic and inventive approach. Design for all attempts to give everyone an equal

chance to participate in all aspects of society. The practice of design for all involves deliberate use of human needs and aspirations analysis, and it necessitates end-user involvement at every stage of the design process. (S. Manley, 2016),

2.3.10 Adaptable Design:

Adaptable features are those that can be adjusted or readily added or removed to match a user's specific demands or preferences. An adaptable structure contains all of the necessary accessible elements, but it also allows for some items to be left out or hidden until they are needed. The adaptation might be done without affecting the structure or the completed product. Knee spaces under sinks, counters, and grab bars in restrooms are examples of accessible features that might assist visualize what an accessible building would look like. These qualities, on the other hand, would not necessarily benefit individuals who do not require them. (S. Manley, 2016),

Wide doors, no steps, knee spaces, clear control and switch locations, grab bar reinforcement, and other access elements are all commonplace in an adaptable structure. However, grab bars can be placed and deleted as needed. The bars may be simply placed when needed without causing damage to the existing walls because the fundamental criteria have already been met. Knee space can be hidden by using a removable base cabinet that can be unscrewed from surrounding cabinets and pulled out when needed, or by using self-storing cabinet doors that fold and slide back Countertops and closet rods can be mounted on adjustable supports instead of being fixed at lower heights, as some wheelchair user’s demand. (S. Manley, 2016),

2.4 Common types of disability

According to the World Health Organization, disability is a broad word that encompasses impairments, activity limitations, and participation restrictions. An impairment is an issue with a person's physical function or structure; an activity limitation is a problem with a person's ability to do a task or action; and a participation restriction is a problem with a person's ability to participate in life events. Physical, cognitive, sensory, emotional, and developmental disabilities, as well as combinations of these, are all possible. As a result, before and after the construction of a building that serves society, designers must address all types of disabilities. Table 2.1 shows the many sorts of disabilities that are taken into account when designing and installing mobility solutions.

Non-Ambulatory:

Disabilities that, regardless of their cause or appearance, compel people to use wheelchairs for all practical purposes. (M. E. Baris and A. Uslu, 2009)

Person who is unable to walk or depart to safety without the assistance of another person. (M. E. Baris and A. Uslu, 2009)

Semi-Ambulatory:

Individuals having impairments that cause them to walk with difficulty or insecurity. Semi-ambulatory individuals include those who use braces or crutches, amputees, arthritis, spastics, women in advanced pregnancy, and those with pulmonary and cardiac illnesses. (M. E. Baris and A. Uslu, 2009)

Sight:

Blind person, person with vision impairments. Total blindness or partial blindness impacting vision to the point where the individual's ability to function in public places is jeopardized. (M. E. Baris and A. Uslu, 2009)

Hearing:

Deaf person, person with hearing impairments. Deafness or other hearing impairments that make a person feel unsafe in public since he can't speak or hear warning signs. In addition to the categories listed above, designers must consider a building user with a handicap that affects mental functioning, senses, internal body regulation, and motor impairment, inability to feel warmth or pressure, and inability to talk. (M. E. Baris and A. Uslu, 2009)

2.5 Challenges on disability and application of accessible buildings

2.5.1 Challenges faced by people with disability

The difficulties that PWDs experience have led them to remain in a confined setting and refrain from exercising their basic rights. Even though the notion of accessibility has already been acknowledged in Ethiopia, it is still not being implemented as intended. People with disabilities encounter numerous barriers in their physical environment that prohibit them from completely expressing their rights and participating equally in social, cultural, and professional life. This includes the right to an education and health care, as well as the ability to work and participate in family, community, and political life. The key to social inclusion for people with disabilities is a

barrier-free environment (Australian Government,2013). Accessibility benefits society as a whole as well. People with disabilities are generally disregarded in development policies and initiatives, according to the International Disability and Development Consortium's declaration on CRPD Article 9 accessibility.

The following aspects can be considered tough areas of accessibility in the built environment when considering disability and accessibility issues (K.M. Abir and M.S. Hoque ,2011):

- **Inside building:** Entrances, doors, elevators, stairwells, corridors or pedestrian paths, inside parking, and so on...
- **Outside building:** parking place, Sidewalk or footpath, transportation vehicles, Road crossing, Roundabout, Grade separated facilities e.g., underpass over pass, Bus stop and Railway station etc.…

Table 2.1: The problems and answers listed below are based on the type of injury:

Type of impairment	**Examples of difficulty faced**	**Accessibility Required**	**Possible Action**
Visual: Person with sight impairments, blind person	-Spatial awareness and orientation - Seeing obstructions within the path of travel - Finding Handrails - Recognizing emergency situations - Reading small writing or complicated texts - Maneuvering in elevators etc.…	- Improvement of visual perception - Mobilization of the other senses	- Installation of pedotactile strips on the ground as a guide and warning device, - Adapted signposting - Obstacle-free routes - Availability of audio or Braille formats
Auditory: Person with Hearing impairments, Deaf person	- Hearing audio information - Absences of sign for direction - Absence of building map at the entrance get - accessing rest room identified by a sign etc…	- Transfer of information from audio to visual formats	- Signposting, - Quality of lighting and acoustics

Physical: Person with difficulties in mobility, Person using walking aids and wheelchairs	- Moving around on loose, slippery or uneven ground - Passing obstacles or differences in level (steps, slopes) - Maneuvering in rest rooms - Passing narrow passages - Reaching certain heights - Grasping, using objects - Seeing at certain heights - Covering long distances with no rest etc…	- Removal of all obstacles on outdoor (roads and pavements) and indoor (entrance, exit, mobility inside buildings, facilities) routes and create the best possible conditions for using walking aids	- Different types of surfaces, access ramps and stairs, obstacle - Free routes, adaptation of facilities and commands
Mental / intellectual	- Learning difficulties and problems with orientation - Understanding signs - Memorizing an itinerary - Spatial awareness etc..	- Any modifications or adaptations which improve understanding	- Signposting using images - Simple plans - Simples commands Clearly visible entrances to buildings

(Adopted from M. E. Baris and A. Uslu, 2009)

2.5.2 Challenges with implementation of accessible buildings

Despite extensive attempts in terms of law and the adoption of national building rules, many countries' physical environments remain inaccessible (C. J. Nathan, 2015.). Universal design and construction must take into account regulatory, structural, human behavior, and operational standards in order to be successful. All of these factors are crucial in the planning and execution of a project. According to the World Report on Disability, the following issues are to blame for the inability to construct accessible buildings:

2.5.2.1 Weaknesses in the provisions of law/policy:

According to (Australian Government,2013), Universal design principles must be implemented through local policy, law, and enforcement rules. Lack of appropriate regulation, enforcement and maintenance can change built areas from being accessible, secure and safe area to being areas of danger and concern. In many nations, according to Imrie, national and legislative rules governing the development of barrier-free structures are weak or non-existent. Building codes that guide designers and developers in constructing accessible buildings and structures for the disabled were found to be inadequate and useless in industrialized countries, such as the United Kingdom (C. J. Nathan, 2015). Moreover, the provisions apply to only new Accessing the built environment is a

challenge. Accessing the built environment is a challenge. As a result, the pursuit of an all-inclusive constructed environment is a mirage as long as the legislation remains unchanged.

2.5.2.2 Inadequate policies and standards

Similar to the issue outlined above, national policies frequently overlook the needs of the disabled. Even when policies take into account PWDs, the policies or standards are rarely followed (C. J. Nathan, 2015). In Ethiopia's example, the accessibility policy is in place to provide legal support for assuring PWDs' access to the built environment; nonetheless, its enforcement and appropriateness is a source of concern (Ethiopian Building codes).

This policy phase entails extensive research, analysis, and consultation. The goal is to establish a clear path for implementing appropriate policies and standards. When it comes to universal design, it's critical to (Australian Government,2013):

- As a starting point, identify and comprehend the legislative frameworks of an associate country.
- Some developing countries have disability-inclusive legislative frameworks and policies.
- Identify local Disabled People's Organizations and other sources of assistance.
- Document the lessons learnt from all disability-related country projects.

2.5.2.3 Complexity and high cost of designs which incorporate the needs of PWDs

According to Imrie and Hall, the built environment cannot be designed to be entirely all-inclusive for the following reasons (P. Imrie, R. and Hall, 2001):

i. The disabled have few needs that demand the creation of an accessible constructed environment for them.
ii. The cost of creating an entirely accessible environment is significant, thus additional fixtures and devices add to the complexity of projects that fully reflect the demands of the disabled. As a result, the more complicated the design, the higher the cost.

According to Vandebelt, the statement of Imrie and Hall, 2001, can be refuted by considering the following: To begin with, the fact that PWDs use a facility in lesser numbers than able-bodied people is insufficient justification to deny them their right to use it. They should not be barred from using facilities if they are eligible to such benefits. Furthermore, because a person's ability to function can deteriorate at any time, designers should not base their conclusions solely on existing

facts. Second, on the cost issue, Vandebelt admitted that designing for all may cost more than traditional designs, but that by incorporating universal design principles, one can still construct an all-inclusive structure that is financially beneficial (K. E. Y. Ashigbi, A. K. Danso, E. P. Tudzi, and E. L. Torgbenu, 2017).

2.5.2.4 Ignorance

Architectural incapacity was related to the designers' ignorance, inflexibility, and beliefs, according to Wijk's study (C. J. Nathan, 2015). According to J.P.S. Salmen's 2001, research, engineers, architects, planners, and other built-environment specialists rarely pay attention to the predicted changes that society requires. As a result, they are unable to produce design solutions that are inclusive. It is suggested that designers' ignorance be addressed by public education and the introduction of creative examples. Furthermore, professional training programs can help them shift their beliefs. In addition, the existing training method should be updated (J. P. S. Salmen, 2001).

2.5.2.5 Ineffectiveness of Disability Groups

PWDs' suffering, according to Ojok, 2006 is partly due to the ineffectiveness of disability groups. He said that it is the responsibility of the disability community to defend the cause of disabled exclusion. They are in charge of advocating for the passage and implementation of disability legislation and policy. As a result, the crippled suffer when this body is silent or useless.

2.5.2.6 Negative attitudes towards PWDs

Education, employment, health care, and social involvement can all be hampered by traditional and cultural views. When it comes to incorporating the needs of PWDs into the built environment, some designers' negative perceptions about the disabled can impact their judgments (Ojok, 2006).

2.5.2.7 Lack of budget allocation for implementation

In affluent countries, for example, it is estimated that 20 percent to 40 percent of the disabled do not have access to assistive technology. Furthermore, most emerging economies' governments are unable to provide adequate assistance for the disabled. The money allocation to promote an inclusive atmosphere is one of the factors. Money set aside for infrastructure building is frequently discovered to be insufficient in terms of financing the project, despite the fact that all needs for PWD access have been adequately incorporated (Ojok, 2006).

2.5.2.8 Lack of consultation and involvement in decision making

Even on matters that directly affect them and have a direct influence on their lives, the majority of disabled people are excluded from decision-making processes. This is a major issue that most countries are dealing with (Ojok, 2006). In every country, disability organizations serve as the voice of people with disabilities. They air a variety of grievances, such as the problems they have in using a specific facility.

As a result, it is deemed critical that disability organizations or the disabled themselves be invited and their opinions sought on the obstacles they confront in navigating the built environment on a regular basis. It was provided crucial information to designers and policymakers in order to plan and build an all-inclusive environment that meets the needs of users. Designers, on the other hand, typically sit in offices, consult books, and generate designs that, at the end of the day, are sometimes unable to match the needs of consumers, according to Ojok, 2006.

2.5.2.9 Lack of coordination between departments

One of the biggest obstacles associated with the execution of the Disability Requirement, according to Ojok's analysis, is the difficulty in coordinating the activities of other ministries, lower government organizations, and commercial companies responsible for the implementation of the law/policy. As a result, in order to improve our country's current situation, early coordination between government representatives, infrastructure designers, and Disabled People's Organizations is required (Ojok, 2006).

2.5.3 Tips for promoting universal design (According to Australian Government,2013)

- Identify and comprehend the legislative structure, as well as the building norms and codes, of a neighboring country.
- Early collaboration between government representatives, infrastructure designers, and Disabled People's Organizations should be established.
- Throughout the project cycle and after the project is completed, consult with a diverse variety of disability groups as equal participants to assess the design's success and collect lessons learned.
- Learn how local persons with disabilities and their families make their homes more accessible by modifying their surroundings.

- People with disabilities should be included on general planning committees to ensure a greater awareness of the challenges they encounter.
- Include inclusive design expenditures in the overall building price rather than referring to it as an add-on.
- Ensure that contractors and consultants think about hiring disabled individuals in design, construction, and administration.
- Use the Accessibility Design Guide as a reference tool to discuss the value of universal design with other development partners.
- Advocate for the incorporation of universal design principles into local laws and regulations.
- Ensure that the lessons learned are incorporated into the planning of future aid funding.

2.6 Sustainable Public Buildings

Due to poor design and performance, many public buildings are clearly inaccessible to the elderly, the very young, and those with impairments. According to the World Bank and the World Health Organization's World Report 2011 on Disability, Ethiopia has an estimated 15 million disabled children, adults, and elderly people, accounting for 17.6% of the population (A. Molla, 2012). As a result, there is a pressing need for a well-thought-out strategy for dealing with the problem of disabled people's accessibility in public facilities.

Planning can aid in the removal of unwanted physical obstacles and exclusions produced by bad building and place design. Because of their lengthy history of developing accessible building standards and laws, certain countries have attained a greater degree of technical specifications. Building users, architects, engineers, designers, builders, building owners and managers, manufacturers, policymakers, and legislators are all given standards and recommendations in order to produce a sustainable and accessible built environment. The purpose of this International Standard is to define how the built environment should be designed, constructed, and managed to allow people to travel toward, enter, utilize, exit, and evacuate a facility without assistance, in the most equitable and dignified manner feasible. Good design may aid in the creation of buildings and spaces that are welcoming to everybody. In order to recognize variety and uniqueness, a sustainable building must have inclusive design, which is more likely to be realized if it is considered at every stage of the development process, from conception to completion. It is,

however, sometimes misunderstood as a Building Regulations issue that must be resolved after planning approval has been given, rather than during the planning application process. Many of the difficulties that some users can be avoided by thinking about how the finished building were appear and be managed early in the design process (ISO Int. Organ. Stand., vol. 2011, 2011).

2.6.1 Standard features of accessibility design

The following are some of the common accessible design features that have been studied and adapted from: (Australian Government,2013) and (B. Kyei-dompim, 2010)

2.6.1.1 Parking spaces

The term "parking" refers to both parking spots and drop-off zones. People with disabilities experience parking issues such as a lack of or insufficient parking places, spaces that are not wide enough, and/or spaces that are too far from a main building entrance. No designated zones or zones that are poorly positioned are examples of drop-off zone issues. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- Identify disabled parking places within 50 meters of a main building entrance.
- Parallel parking spot with the outside limits lined with the outside border of the regular size parking space next to it.
- Design parking spaces with a minimum width of 3.2 m (ideally 3.6 m) for people with disabilities, as well as an adjacent minimum 2.4 m wide shared area for wheelchair transfers.

2.6.1.2 Entrances

Accessible, easy-to-find entrance spaces should be well-lit and accompanied by clear, consistent signage. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- Ensure that at least one entrance, ideally the main one, is wheelchair accessible.
- Accessible entrances, as well as alternate sites for accessible entrances, should be prominently designated using the international symbol of accessibility.
- Identifiable and personalized doors with accents
- a short route to the entrance that is covered or protected, with any ramps or steps that are meticulously described, and the avoidance of any level changes as much as possible

2.6.1.3 Stairs case

For all users, stairwells should allow secure access into buildings and between levels inside buildings. This is especially crucial for people who have low eyesight or blindness, as well as those who have mobility issues. Poor stair design is a prevalent problem in many buildings in developing nations, and the problem is even worse in Ethiopia, where it can lead to injuries. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- All steps in a single flight should be the same.
- Steps should be between 150 and 180 mm high and at least 280 mm wide.
- The use of open risers is not advised.
- The landing should be at least 1.20 m long and extend the entire width of the steps.
- Stairways should have a clear width of at least 1 m, preferably 1.5 m, to allow for easy two-way circulation.
- Treads should not have sharp edges or overhanging nosing.
- Nosing is favored over angled risers, although if it is used, it should be flush or rounded and not protrudes more than 40 mm.
- Slip-resistant, tightly fastened, and easy-to-maintain stair coverings are ideal.

2.6.1.4 Disable Ramps

Ramps can be used to allow barrier-free entry into buildings as well as access between floors. Lifts to the upper floors should only be considered if there is sufficient maintenance funds and technical capability. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- When stairs hinder pedestrians and individuals with disabilities from moving freely, ramps should be installed.
- Ensure that a public building has at least one accessible entrance, preferably the main entrance.
- Immediately near to doors, lobbies, and stairs, place ramps.
- Calculate the amount of space needed for ramps and landings to give an adequate slope, as well as rest and passing places.
- The landing should have a minimum length of 1.20 m and a breadth that is equivalent to the ramp's width.
- Ramps shall have a minimum width of 0.90 meters and a maximum slope of 1:20.

- Provide reasonable access to all ground floor services and amenities for existing buildings where re-design or refurbishment is contemplated.
- Access to all services and facilities should be addressed and included into any design for new single and multi-level buildings, which could include upper floor access through a disable ramp.

2.6.1.5 Railings and Handrails

Handrails and railings must be correctly configured and installed at a height that is easily accessible. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- For safety, help, and rest opportunities, place handrails around all accessible balconies, galleries, dangerous places, platforms, ramps, roofs, and steps.
- Handrails should be installed at a height of 80 to 100 cm.
- Verify that the installation is compliant with all safety and accessibility regulations.
- A safety guardrail measuring at least 0.40 m in height must be installed throughout the whole length of the ramp.
- A handrail is required on a ramp with a drop off that has a vertical change in elevation of 2 inches or more or a slope of more than 2 in 12.

2.6.1.6 Edge Treatment and Thresholds

- Thresholds should be as close to the ground as possible, with a maximum overall height of 15mm and a tapering excellent section.
- Edge treatment is not required for changes in level of one-quarter inch or less.
- A ramped surface with a maximum slope of 1:12 is required for changes in level more than half an inch. (Australian Government,2013) and (B. Kyei-dompim, 2010)

2.6.1.7 Doors and Doorways

Accessible doors are those that can be opened and closed with a single motion with minimal effort. They must not: (Australian Government,2013) and (B. Kyei-dompim, 2010)

- Be excessively small, hinged incorrectly, heavy and difficult to operate, and swing in the wrong way.
- Passable entrances with a clear opening of at least 32 inches.

- Accessible doors that require a minimum amount of effort to close or open and a maximum opening pressure of 30N.
- In restricted or hazardous places, however, toggle, knurled, roughened, or carborundum-epoxy coated circular door knobs are permissible.
- When a glass door is open, the edges of the door should be visible.
- A second handle or pulling device has been added.

2.6.1.8 Windows

- Window sills should be 18" (46cm) to 36" (91cm) above the floor to allow a seated person to easily open and close the handle.
- Windows that can be used as fire exits must be at least 30" (76cm) wide to allow a person to pass through in the event of a fire. (Australian Government,2013) and (B. Kyei-dompim, 2010)

2.6.1.9 Light and Gadget Controls

- Light switches, thermostats, electrical receptacles, faucets, and other controls should be situated between 9 inches and 48 to 54 inches above the floor and useable with one hand (depending on the direction of approach).
- The use of lever or push-button faucets by people who have limited use of their hands and arms. (Australian Government,2013) and (B. Kyei-dompim, 2010)

2.6.1.10 Elevator

An accessible standard lift is the ideal option to enable those with limited mobility with access to upper floors in a multi-story building. Lifts, on the other hand, are costly, necessitate a constant and somewhat high-cost electrical source, and might be a safety threat when electricity is available. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- Ensure that the lift's dimensions allow a wheelchair user easy access.
- Install a handrail on at least two sides of the staircase.
- Place the control panel in a convenient location that is both accessible and visible.
- Install audio-visual signals, door re-opening activators, and floor audio announcements.
- Put down a non-slip floor.

- Choose a color for the door that contrasts with the walls, floor, and landing area in front of the lift doors.
- A minimum lift floor space of 1.4 m x 1.6 m is required.
- Provide controls ranging in height from 850 mm to 1.2 m.
- At the proper height, install Braille and tactile signage.

2.6.1.11 Restroom

Bathrooms and toilets can be found in any type of lodging, workplace, or public facility. (Australian Government,2013) and (B. Kyei-dompim, 2010)

- Slip-resistant flooring, flush detailing of drainage and junctions between surfaces and spaces, conveniently approachable positions of controls and fittings, and appropriate moving space should all be present in the restroom.
- a 3 × 3-foot shower with a bench for transfer, or a roll-in shower that can accommodate a wheelchair user
- On each floor, provide an accessible bathroom and/or toilet.
- In school ablution blocks, provide at least one toilet cubicle with accessible access.
- Allow enough room for persons who need wheelchairs or other assistance devices.
- Install doors with a minimum clear width of 850 mm and that open out or slide.

2.6.1.12 Floor Finishes

- The use of solid hardwood, ceramic tiles, vinyl, linoleum, brick, and stone as flooring materials.
- In the areas where wheelchairs were be utilized, carpets should be avoided.
- Non-slippery flooring surfaces. (Australian Government,2013) and (B. Kyei-dompim, 2010)

2.6.2 What makes a good client?

Commissioning and managing the construction of a public-sector project is a demanding process. CABE 2006 has outlined ten distinct principles that customers must follow if they wish to obtain the best results in public construction projects, based on its expertise and experience working with both government and built environment specialists.

- Understand the function of design - there is significant evidence that good design may improve quality of life while also lowering negative environmental impacts.
- Recognize design roadblocks - by understanding the most prevalent roadblocks, you can work to eliminate them and ensure that the necessary procedures are in place to get a better outcome.
- From the brief to on-site construction, insist on the importance of design – a commitment to design must be present from the start.
- Consider the long-term worth of your design — smart design can help you save money by increasing efficiency and lowering operating expenses.
- Examine the nominated entries for the Better Public Building Award and determine whether the design you're contemplating is a viable rival.
- Consult your design champion - Leverage their experience and connections to assist you with your project.
- Obtain design advice - clients should always seek out professionals with relevant experience.
- Use the design quality indicator.
- Consider civic value: effective design should make people feel good.
- View samples - they may serve as benchmarks for determining how well you are doing with your own project.

2.6.3 Achieving excellence in construction

Importantly, the primary goal of achieving excellence in construction is to ensure delivery of the best value for money, not in the sense of the lowest cost, but in the sense of the optimum balance of quality and whole-life cost to suit user needs. This is the attitude that public bodies must take, according to the National Audit Office (HM Government, 2006).

2.6.4 Specify materials and finishes

Users' quality of life is influenced by interior materials and finishes, which contribute to their health, safety, psychological, and well-being. Interior materials and finishes are one of the most common causes of building interior accidents, which primarily impact those with physical limitations and the elderly (C. Stephanidis, 2000).

Floor coverings, wall finishes, ceiling finishes, and textiles are four crucial factors to consider when it comes to interior finishing. Slipping and tripping are common problems with flooring. Tripping refers to rapid changes in floor surface heights between rooms, while slipping pertains to surfaces exposed to dampness. A minor difference in height can result in an accident. People with weak vision may be at risk from some floor coverings. To benefit everyone, floor coverings should be slip-, trip-, and fall-resistant and thick carpeting should be avoided. Painting or using a long-lasting wall covering is two options for finishing walls. Wall coverings come in a variety of designs and colors, making interior spaces more human (C. Stephanidis, 2000). The sound quality of interior spaces is enhanced by ceiling coatings. The easiest technique to control noise is to use an acoustical ceiling, which absorbs sound reverberation ((B. Kyei-dompim, 2010). It's crucial to think about fire safety requirements, mold and bacteria prevention, and moisture absorption while choosing ceiling finishes. Ceilings should always be white to maximize reflectivity. Low maintenance, up-to-date materials, flammability requirements, breathability, moisture barrier, abrasive level, and infection control are all significant factors to consider when choosing fabrics (C. Stephanidis, 2000).

Overall, there are numerous options for floor coverings, wall treatments, ceiling finishes, and textiles. However, they are chosen based on aesthetics, rather than addressing the functional demands of individuals of various ages and abilities, which is the most important factor to consider when developing inclusive workplaces (C. Stephanidis, 2000).

2.7 Approaches and design concepts

Meeting the demands of users has become an essential priority on the political agenda these days, and there is a growing acknowledgment of elderly people and persons with disabilities through paying attention to their needs in society. The growing awareness of these groups and their requirements has piqued the interest of developers and designers who want to help them gain greater independence in terms of societal assistance and support for regular tasks. Even if there was always a desire to design for persons who have some type of handicap, the shift in underlying values in society is critical. The following is a brief overview of some of the design approaches or groups of design thinking that have influenced and inspired many in the field of accessible design (H. Persson, H. Ahman, A. A. Yngling, and J. Gulliksen, 2014).

2.7.1 Barrier-free design

In the United States, the changing process of public policies and design practices began in 1950. The US President's Committee on Employment of the Handicapped, the Veterans Administration, and others worked on national standards for "barrier-free" buildings, aimed at making buildings accessible to handicapped soldiers and others with similar conditions, in response to a number of people returning to the US with injuries after the Vietnam War. As an alternative to institutionalized health care, the goal was to provide education and employment opportunities. Barrier-free design is primarily a disability-centered movement that employs building codes, regulations, and guidelines to create designs and features that are accessible to people with disabilities.

2.7.2 Accessibility

The phrase "accessible design" comes from the ADA (American Disability Act) accessibility guideline. "No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of any place of public accommodation by any private entity who owns, leases (or leases to), or operates a place of public accommodation," it states in general (P. L. a W. May, 2008)." In other words, accessibility refers to the ease with which an individual can use a program, activity, meeting, hearing, or other event or procedure, regardless of his or her limitations. When applied to a building or facility, it signifies that a facility can be accessed, entered, and utilized by everyone, regardless of their skills. Accessible design is defined as "design centered on concepts of extending standard design to persons with some type of performance constraint to maximize the number of prospective customers who can easily utilize a product, building, or service, which may be achieved by (C. E. Rapley, 2013):

- Designing products, services, and settings that are simple to use for the majority of users,
    - Placing signs in public places or towns
    - Deaf people's sign language
    - Braille documents
- Adapting products or services to diverse users (user interface adaptation) and
- Having standardized interfaces to make special items for people with disabilities compatible."

One of the most prominent global developments of the twenty-first century is urbanization. Urbanization has the potential to be a great engineer in achieving equitable and sustainable development for all. By 2050, approximately 6.25 billion people, 15% of whom are disabled, are expected to live in urban areas. Depending on how urban settings, infrastructures, facilities, and services are planned and created, they can obstruct or empower members of society's access, participation, and inclusion (P. D. United Nations, 2014).

There are six aspects to measure accessibility in the Universal Design Index, including connectivity (15%), accessibility (25%), usability (20%), safety (20%), integrated design (10%), and operation and maintenance (10%), with a passing score of 65 percent. According to Ethiopia's construction declaration, public buildings must be made accessible to people with disabilities in accordance with international standards. "Any public building shall offer a means of access adequate for use by physically challenged persons, including those who are confined to wheelchairs and those who are able to walk but unable to climb steps," the law states. The Council of Ministers and the Ministry of Urban Development and Constructing both published regulations and directives in response to the proclamation. According to article 28 (2) of the building code, the design of category "C" buildings must have sufficient access to stairwells, parking lots, and restrooms for individuals with disabilities. Lifts must also be suitable for all users, including PWDs, according to Article 33 (3) of the code. Article 34 of the same rule outlines the fundamental services that a public building shall provide for people with disabilities (B. Y. F. Kenea, 2018).

2.7.3 Usability

Usability refers to the number of additional adaptations, in addition to accessibility adjustments, that an architectural space must have - assistive technology, permanent staffing, or random aid from other individuals in the space – in order for it to be useable for someone with a disability (Hong-Li Wong, 2014).

2.8 Policy Frameworks

2.8.1 International policy frameworks

The existing international policy framework for disability-inclusive urban development is mostly based on a variety of disability-related instruments. Accessibility is a critical component of the World Program of Action Concerning Disabled Persons (1982) (A/RES/37/52 aims)'s of "full

participation" and "equality." The Standard Rules on the Equalization of Opportunity for Persons with Disabilities (A/RES/48/96) designate "accessibility" of the physical environment as well as "accessibility" of information and communication as two "target areas" for ensuring equal opportunity. The International Convention on the Rights of Persons with Disabilities strengthened the international normative framework for the advancement of persons with disabilities' rights and socioeconomic development. The Convention defines accessibility as a cross-cutting issue that allows people with disabilities to live independently and fully participate in all aspects of life. Article 9 of the Convention, as well as several other provisions, such as articles 19 (living independently and being included in the community), 20 (personal mobility), and 21 (freedom of expression and access to information), provide detailed guidance on measures that States must take to advance accessibility (M. Dufour, R. O 'Reilly, M. Charbonneau, and G. A. Chaimowitz, 2020).

The United Nations High-Level Meeting on Disability and Development in 2013 and its action-oriented Outcome Document88 emphasized the importance of ensuring accessibility and inclusion of people with disabilities in all aspects of development, as well as giving all people with disabilities due consideration in the 2030 Agenda for Sustainable Development. The Outcome Document also called for actions to ensure accessibility, using the universal design approach, by removing barriers to the physical environment, transportation, employment, education, health, services, information, and assistive devices, such as ICTs, throughout the life cycle of people with disabilities, including in remote or rural areas, so that they can achieve their full potential. The international community's commitment to improving accessibility and mainstreaming disability in development has been reaffirmed, as evidenced by the recently adopted 2030 Agenda for Sustainable Development. Disability is referenced 11 times in the 2030 Agenda's target areas, and it is stated particularly in the aim relating to accessible and inclusive habitat and human settlements (United Nations, 2015).

2.8.2 Laws and Policies adopted in Ethiopia

The Federal Democratic Republic of Ethiopia (hereafter FDRE) Constitution of 1995 guarantees all Ethiopians their fundamental rights to social fairness, economic development, enjoyment of rights and opportunities, and access to clean and safe water, among other things. Despite the legislative recognition of the right to an accessible public building, millions of Ethiopians, particularly People with Disabilities (hereafter PWDs), live in an inhospitable environment. Many

persons with disabilities lack equal access to health care, education, and career prospects, as well as the disability-related services they require, and are excluded from daily activities. After the United Nations Convention on the Rights of Persons with Disabilities (CRPD) went into effect, disability became more widely recognized as a human rights issue. Despite the scale of the problem, there is a shortage of both awareness and scientific information about handicap issues. People with disabilities are isolated from jobs, housing, health care, and education as a result of the CRPD's promise of equal opportunity in accessible public facilities. Despite the fact that persons with disabilities exist in every community, accessibility policies have harmed them. The Ethiopian government has passed and implemented a variety of laws, regulations, and standards affecting people with disabilities, including their right to productive and decent labor. The most important are (A. Molla, 2012):

- Article 9 of Ethiopia's Federal Democratic Republic Constitution.
- Ethiopia's Federal Democratic Republic Constitution, adopted in 1995. The State is responsible for providing required rehabilitation and support services for people with disabilities, according to Article 41(5) of the Constitution.
- Building Proclamation No. 624/2009 mandates accessibility in the design and construction of all structures to guarantee that they are suitable for physically disabled people.
- Proclamation No. 515/2007 of the Federal Civil Servant.
- Proclamation No. 691/2010 on the Defined Powers and Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia
- Ethiopia issued Proclamation No. 676/2010 ratifying the "United Nations Convention on the Rights of Persons with Disabilities" (UN CRPD).
- Optional Protocol to the United Nations Convention on the Rights of Persons with Disabilities (2006). Status: ratified, 7 July 2010.
- Persons with Disabilities National Action Plan (2012-2021).
- Disability is established as a crosscutting sector of development in the Growth and Transformation Plan (GTP) 2010-2015, with a focus on avoiding disability and providing education and training, rehabilitation, and equitable access and opportunities to persons with disabilities.

The Ethiopian government is taking steps to address the needs of disabled people. The following are some of the proclamations aimed at protecting and securing the rights of individuals with disabilities: Proclamation No. 101, 1994, which focuses on the elimination of discrimination and protects the right of PWDs to compete for and obtain employment based on their qualifications, and proclamation No. 1, 1995, which enacts the Ethiopian Constitution on the democratic rights of all citizens, including PWDs, to be protected under articles 11,16,18,20, 25, 28, 31, and 33. The Ethiopian Government's Education and Training Policy (TGE 1994) and the Developmental Social Welfare Policy (FDRE, 1996) both emphasize the importance of education, development, and participation of PWDs in Ethiopia's political, economic, and social spheres.

The Imperial Order providing for the Establishment of a Rehabilitation Agency for the Disabled, No. 70/1971, and proclamation No. 101/1994 are the two sources of legal definitions linked to disability that Ethiopia has embraced. Both proclamations lacked an international standard definition of a disabled person.

The legal requirements discussed above are sufficient to address all issues of accessibility in public buildings at the Addis Ababa level. In this scenario, the federal building codes can be used to fill the gap, despite the fact that they do not address the issue completely. Furthermore, without directives or guidelines to guide designers, building officers, and professionals, it is difficult to ensure that their responsibilities are carried out in accordance with the standard for facility accessibility. Furthermore, there was be no effective way to check or monitor the implementation of accessibility standards in the current building industry (A. Sisay, 2012).

2.9. Problems of Disability in Ethiopia

According to the International Rehabilitation Review, over 10% of the world's population suffers from disability, with 80% of these people living in poor nations. Due to a lack of resources and other issues, the majority of those in developing countries do not have access to rehabilitation treatments (UNICEF) (1988) Because of a variety of pre- and post-natal debilitating factors (such as infectious infections, birth difficulties, under-nutrition, malnutrition, damaging cultural practices, lack of good infant care and management, etc.), the situation of disabled people in Ethiopia is even more terrible and serious Civil war, drought, and hunger on a regular basis) and the lack of early primary and secondary preventive actions.

The following are the most pressing issues in the field of disability:

- a lack of public awareness
- a scarcity of data on the number and severity of disabilities
- Basic needs, such as vocational training placement, health facilities, and so on, are in short supply.
- Inability to use assistive devices.

Some Ethiopians connect disability (handicap) with spiritual evil and refuse to allow crippled people to leave their homes. As a result, families hide impaired family members, resulting in erroneous disability information and statistics. The Ethiopian Federal Democratic Government established a Rehabilitation Department under the Ministry of Labor and Social Affairs to address disability issues (MOLSA). The department's key responsibilities include rehabilitation, capacity building, and raising awareness. The administration of the government has been decentralized from the national to the regional levels, with institutions stretching from the zones to the "Woreda" districts.

2.10. Summary of Research gaps

A lot of researchers have done on Challenges of accessibility of building infrastructure for PWD's and they have been reviewed in relation to problems of access for PWD's. But many of the researchers explains on the design of accessibility of buildings with limited study area of design by addressing only Consultant companies and PWD's. The researcher concludes about the problems of access for PWD's as a whole by considering limited Consulting office and disabled persons. But This study was tried to assess purposely selected different consulting offices, contractor firms, Government regulatory bodies (sub-city employees that employee in land administration, design and building construction permission) and PWD's. The above mentioned were in our country Ethiopia currently adopts the new project delivery systems of DB (Design-Build) and BOT (Build-Operate-Transfer), for delivering the projects for foreign construction companies. So, according to the above project delivery system the research addressed all parties done from Consultant, Contractor and Government offices, and PWD's.

CHAPTER – THREE

INTRODUCTION

This chapter discusses the methodological framework within which the study was started. It gives details on research design, research techniques and procedures that were used for the gathering of data. It also included general information about the places of field work and the methods adopted on data gathering.

3.1 Research Methodology

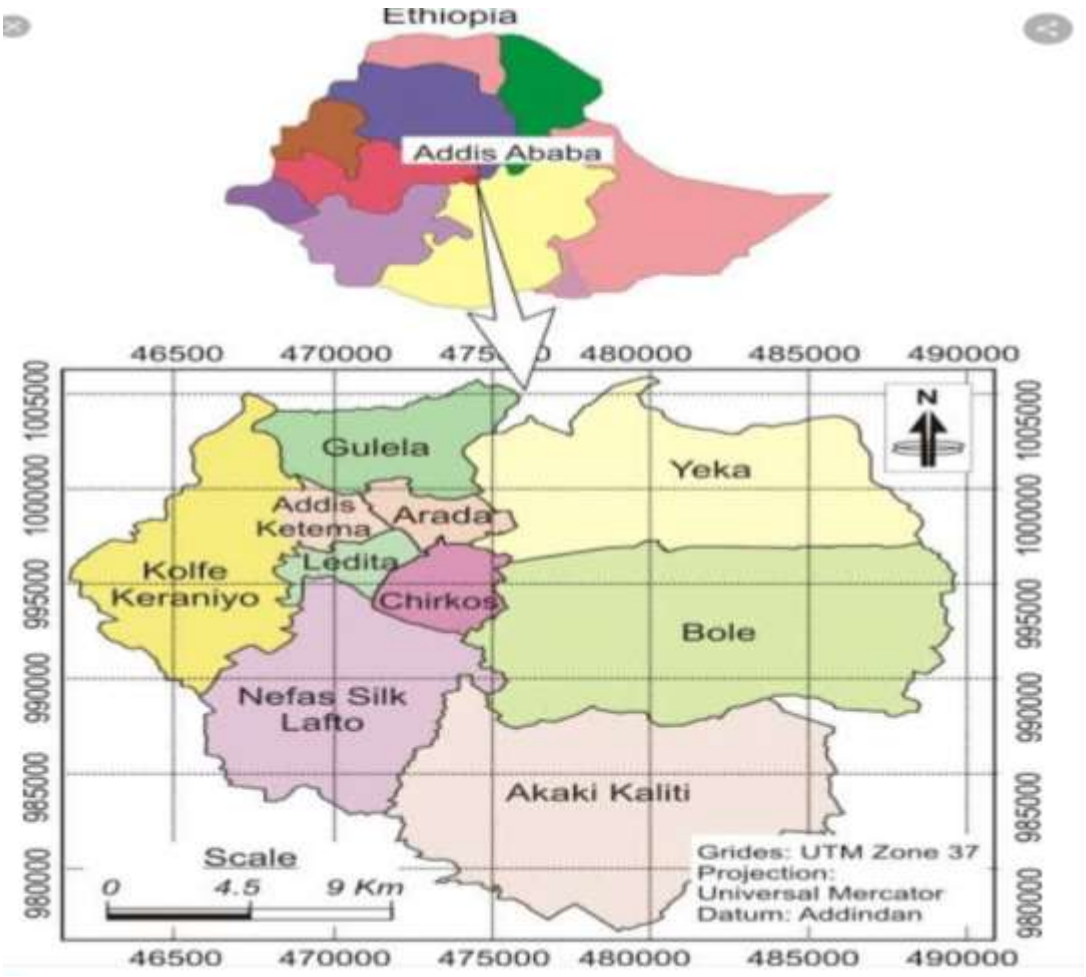
According to C.C. Miller, 2006, Research methodology is a way to systematically solve the research problem. It may be stated as a science of studying how research is done scientifically. As data and methodology are highly interdependent, the methodology to be used for a particular research problem must always take into consideration the nature of the data that were collected to resolve the research problem.

The goal of the research is to assess the efficiency and challenges of implementing accessible building facilities for persons with disabilities on public building of Addis Ababa city. It is anticipated, the study may create awareness on disability consideration in design, supervisions and construction, the challenging factors of designers on implementation of public buildings as per the standard, challenges that PWDs face, how inaccessibility and non-inclusiveness of building can adversely affects project and society, buildings efficiency, promote and facilitate inclusive development and initiate to review the existing practices, methods of work and management system to improve the usability of public buildings in Addis Ababa etc. This chapter explains the approach used and the instruments and strategies used to carry out the research.

3.2 Study area

This research is being carried out in Ethiopia's capital, Addis Ababa. It is situated in the country's geographic center and ranges in altitude from 2200 to 3200 meters above mean sea level. Its geography varies from gently rolling to hilly terrain with high grades. Hilltop with a flat top the municipality is 540 square kilometers in size, with 11 sub-cities and 118 Woredas the additional new sub city is Lemi Kura, but the lower half is less steep. It features 220 square kilometers of green space and an 80-square-kilometer vegetation cover (EPA, 2012). The study was conducted on public building projects. The following picture shows the study area of this research.

Figure 3.1 Map of Addis Ababa



Source: Google map of Addis Ababa

3.3 Study design

There are two types of researches i.e., qualitative and quantitative researches where the division bases on the way in which the research objectives can be questioned. A qualitative study is a "subjective" evaluation of an issue that takes the shape of an opinion, point of view, perception, or attitude toward objects (that are referred to as an attribute, variable, factor or question). Quantitative research, on the other hand, is an impartial assessment of an issue that uses statistical methods to analyze facts and discover links. This study is a mixed-methodologies study, which means it uses both qualitative and quantitative methods. The mixed methods approach attempts to integrate the advantages of both quantitative and qualitative research methodologies. It combines the two methodologies in order to acquire a better understanding of a social phenomenon. It is also

stated that the mixed methods approach is superior to either method alone because it gives not only more but also higher-quality data. For this study, a mixed methods strategy was used to maximize the benefits of both quantitative and qualitative approaches. (W. R. Dunn, S. Lyman, and R. Marx, 2003).

The quantitative structures in this study enabled the researcher to generate data from the sample size about different variables then to generalize the results to the population, whereas, the qualitative features were allowing the researcher to explore the current Efficiency and Challenges with Implementing Accessible Building Facilities for Persons with Disabilities on public building of the city. Mainly primary data were used in this study. More specifically, the researcher used structured questionnaire survey in the gathering of data. In addition, observation was used in order to substantiate results obtained from different data sources and types. Photos were taken during the site visit to support the data collection. The types of study design used in this research are mainly descriptive. Descriptive research tries to explore and explain a problem while providing additional information. It is regarded as a relevant and available study design for describing the aspects influencing the accessibility of building infrastructure disabled persons: the case of Addis Ababa, Ethiopia.

3.4 Data Sources

Data for research issues can be obtained in a variety of ways, including making references to documents, journals, magazines, interviewing, observation, and questioners. A qualitative and quantitative method was used in the research. The data for this study was gathered from both primary and secondary sources in order to address the research's main questions. Interviews, diaries, maps, graphs, statistics, charts, and other original documents are examples of primary sources. The most important thing to remember about primary sources is that they aren't explanations or analyses of a topic; instead, they're raw data, direct personal observations, or records. Writings regarding primary sources, or information taken from them, are referred to as secondary sources. The combination of primary and secondary information obtained from various groups of respondents, as well as topic-related documents, was thought to provide a clear picture of the current situation regarding the efficiency and challenges of implementing accessible building facilities for PWDs on public buildings in Addis Ababa. The study focused on persons

who had direct interaction with the subject to be studied in order to obtain firsthand and unique information from the primary sources.

3.5 Sampling Methods and Procedures

A sample is a portion of the overall respondents that represents the entire respondents. In this study, four separate target groups were chosen to fill out the questionnaires based on the study's goal. PWDs, contractors, government engineers (done sub-city), and consultants were among the groups targeted. The first questionnaires were distributed to full respondents of Consultants, Contractors and Government construction experts' office which means the first sample size is equal to 170. The second demographic was PWDs, and the sample size for the second questionnaire was determined by the use of purposive sampling technique. Five different companies were chosen that work with disability-related issues and have staffs who are PWDs, and six questionnaires delivered to each organization to address the target group, resulting in a second sample size of 30. The number of respondents was purposely selected techniques

In this study, observation was used in addition to the questionnaire method of data collecting. The observation focused on ten public buildings in Addis Ababa that were purposefully chosen for Bole roads from Meskel square to Bole bridge. Furthermore, government buildings, such as the old appartement buildings and office, was be required to observe and review literature, as well as the buildings' service and exposure to the physically challenged society on a regular basis. Researchers observed the facilities within and around the chosen buildings as part of the observation. Bibliography searches and a study of internet sources were also used to gather information. For the current study, many major works on people with disabilities and policy concerns focusing on Ethiopia were evaluated as understanding the infrastructures and problems of people with disabilities Systematic visitation and during the data collection methods, observation was employed as an extra mode of data collection that was considered in addition to the intimate engagement in the process of interviews. So, the number of respondents were limited due to time constraints, transport barriers and current political issues during questionnaire distributions and returned.

Table: 3.1: Summary on research questionnaire respondents

No	Category	Number Of Questionnaire Distributed	Number Of Questionnaire Returned
1	Construction Professional persons different organization workers (Consultants, Contractors and Government Regulatory office)	170	142
2	PWDs	30	24
	Total	200	166

Source: survey output, (2021)

3.6 Data Quality

Some procedures were completed to ensure the quality of the data and its appropriateness, such as pre-testing and questioner adjustment, strict supervision, and cross-checking of the replies acquired.

To establish reliability, quotes from interviews and statements from surveys were also used as references. When conducting personal interviews with respondents, the researcher used a checklist of questions to ensure data consistency and completeness. In addition, research assistants/enumerators were instructed on how to deliver the questionnaire, interview, and discussion guides, as well as how to capture any other helpful information found in the field. On a daily basis, field notes were generated and revised shortly following data collection.

The data scanning and scrutiny technique was also used to check and validate the survey instrument using accessible questionnaires from respondents in order to assure the clarity and quality of the data.

3.7 Data Collection

This study's data collection strategy incorporates both primary and secondary sources. The primary data for this study comes from questionnaires, interviews, and observations, while secondary data comes from reviewing related sources such as relevant journals, books, and internet sources on the current exercise of factors affecting accessible building infrastructure by disabled people. These many data gathering methods have been utilized in order for data gained from one source to be supplemented by data obtained from other sources, resulting in numerous evidences.

3.7.1 Questionnaire

Because it is focused on topics, a questionnaire provides instant information for the subject matter of a research. It also works as a survey to identify the primary concerns and attitudes of respondents toward the problems (W. R. Dunn, S. Lyman, and R. Marx, 2003).

The questionnaire survey was further modified to obtain respondents' opinions on the variables impacting accessibility of building infrastructure by persons with disabilities in Addis Ababa's public buildings. Consultants' office, Contractor companies and Government Construction experts (Sub-city engineers), to address the research questionnaires about PWDs. I use the purposely selective techniques because most of the public project was not interested to distribute the questionnaires and data collection. Those company were selected by using purposely selective techniques and the three parties are the most concerned area to achieve the objective of the research. The questionnaire consisted of a set of questions posed to individuals in order to acquire statistically useful information on a specific issue. When properly developed and conducted, questionnaires constitute a valuable tool for making statements about specific groups, individuals, or entire communities. This was done to aid in the selection of questions to ask and the manner in which they should be asked. Again, extremely short and concise questions were fielded, as long and wordy inquiries may confuse respondents. All of this was done to guarantee that the responses obtained were accurate. The above questionnaires were put detail in the appendix section one by one.

3.7.2 Interview

In this section eyesight persons are detailed discussed for the interview. A multistage sampling method was used in the investigation. To begin, the study population was purposively recruited from People with Disabilities (PWD) residing in Addis Ababa in rehabilitation centers and centers for disabilities, development, and working in various fields.

The interviews focus on the issues of physically challenged people being able to utilize building infrastructure in Addis Ababa (PWDs). The interview purposely focused eyesight disabled person challenged to read the questionnaires, because the questionnaire was not prepared in Braille. That is why the interview was conducted.

3.7.3 Observation

A check list was employed to observe purposively selected significant public buildings, which was used in this study to supplement responses discovered in the questionnaire. The check list was created using literature to gather information on the amenities and functional requirements for physically challenged individuals in essential public buildings. The check list includes such like ramps, elevators/lifts, restrooms, signage, entrances, staircases, and parking areas, among other things. The assessment also included the development of functional needs for the facilities. A total of 15 public buildings were observed at random. The study looked at important public structures like apartments, banks, and mixed-use buildings. The buildings are purposely selected group old building (The buildings were built during Derg Government), buildings (The building were built before 2000E.C. Millilumen) and recent buildings (The building were built started from 2000E.C. Millilumen and now) and according to table 3: 2.

Table: - 3:2. Number of Observation buildings.

No	Type of buildings	Number of buildings
1	Government old condominium	3
2	Mixed use Buildings	8
3	Government & Private Office	4
	Total	15

Source: survey output, (2021)

3.8 Data Processing and Analyzing

Using acquired data, data was evaluated statistically and qualitatively, and comparisons were done on outcome factors. The statistical method used to analyze the quantitative data was percentage, ranges and comparison of the data. The bulk data were collected through in-depth key informant questioners. Combining all the information that is gathered using the data collecting instruments reinforced the reliability of the research output. The data found by using questionnaires were examined using the Scientific Package for Social Science (SPSS). Tables and graphs are used to present the data. more elaborately in accordance with their importance. Therefore, information that were obtained through the data gathering tools were effective enough to address each research question.

3.8.1 Pilot study

To test question styles and sequencing, as well as survey techniques, the survey was pilot tested on a random sample of respondents. On the basis on information gathered during the pilot testing procedure, the original questionnaire was slightly modified.

Consultants (CAE), GRBs, and PWDs were among the experts who took part in this study. The questionnaire was piloted to see if it was intelligible, straightforward, and simple for respondents to understand and reply to. The questionnaire was tested in a pilot study using sample questionnaires.

The following is a summary of the key findings from the pilot study:

i. Some components and sentences should be changed or more fully represented.
ii. Some criteria were mentioned more than once and had the same meaning each time. As a result, it should be removed.
iii. Some components and sentences should be changed to provide clearer meaning and comprehension.
iv. Some sections of the questionnaire needed to be rewritten since they were unclear.
v. Some elements should be adjusted to provide a more appropriate and consistent meaning.
vi. There are a few questions that are neither practical nor realistic in the context of local building development projects. Such questions should be eliminated or amended to make them more realistic and applicable to real-life situations.

The questionnaire was then changed and rectified based on the feedback from the pilot study, and the final questionnaire was made clearer by replacing obscure words with simple and understandable ones.

3.8.2 Reliability and Validity of Data Collection Instrument

Sound measurement must pass reliability and validity testing. In fact, these are the two most important factors to consider when evaluating a measurement tool. In its broadest sense, reliability can be defined as the degree of clarity with which measurement results from random errors.

Many reliability coefficients have been offered for determining measurement tool dependability up till now. Cronbach's alpha coefficient is commonly used to determine reliability in terms of

internal consistency for a single test, particularly in combined measurements. Cronbach's alpha coefficients are another name for this coefficient.

When assessing the relevance of effect amounts in the study, Cohen et al., (2007) classification was employed. Influence quantities are classified as follows according to this classification:

1. Weak between 0.00 and ±0.10
2. Small between ± 0.10 and 0.30
3. Moderate between ± 0.30 and 0.50
4. Strong between ± 0.50 and 0.80
5. Very strong over ± 0.80

According to L. Cohen, L. Manion, K. Morrison, and R. Publishers, 2009 Cronbach's alpha coefficients was used to check the reliability of the data collection tool and the internal consistency was indicated according to Cohenet classification. The reliability of research was checked by using IBM SPSS version 26 software and the result shown in table 3.2.

Table: 3.3: - Cronbach Alpha Coefficient Test Result on efficiency and implementation challenges of accessible building for PWD

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.550	0.620	112

Source: survey data output

Validity means how fairly you can generalize your findings to other groups or other situations. Also, it can refer to the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure. But the question arises: how can one determine validity without direct confirming knowledge? The answer may be that we seek other relevant evidence that confirms the answers we have found with our measuring too (R. Pacheco and M. The, 2017).

In this study more trustworthy and exact, the researcher used the following validity strategies. The purpose of the first pilot study was to see if the questionnaire was intelligible, straightforward, and easy enough for respondents to grasp the topic and reply appropriately. The questionnaire was tested in a pilot study using sample questionnaires. The second task was to keep an eye on

important public structures. As a result, the researcher gains a thorough grasp of the aspects that affect building accessibility for people with disabilities. Data was obtained from several sources (i.e., questionnaire survey, interview, observation/site visit, and document analysis) for the third triangulation.

3.9 Ethical Consideration

To safeguard respondents from any potential harm that could occur from engaging in the study, the researcher examined the research values of voluntary participation, confidentiality, and anonymity. As a result, the researcher clearly stated the goal of the study as a partial fulfillment of a Masters Study program in Public Building Infrastructure Challenges of PWDs, and the respondents were asked to participate in the study on a voluntary basis, with refusal or abstention allowed. The respondents were also assured of the confidentiality of the information they provided, as well as protection from any potential harm resulting from the study, because the findings would only be used for the purposes intended. The survey respondents were have agreed to receive feedback on the study's findings.

CHAPTER – FOUR

4. ANALYSIS OF FINDINGS AND DISCUSSION

4.1 Introduction

This chapter examines the acquired data and gives a commentary based on the findings of the analysis on the primary concerns, as well as a literature review. The information was gathered via a questionnaire and observation. The questionnaire was sent out to the entire CAE population, and key public structures were closely examined.

This chapter comprises the study's findings and discussion, and it is divided into three sections, each of which deals with the perspectives of the various groups of respondents chosen for the study.

The first portion, which has four sections, covers the perspectives of designers (i.e., architects, engineers, and government regulating bodies or professional personnel). The first section of the report deals with the personal information of the sample respondents. The second segment discusses disability considerations in public building design and construction. The findings of the questions aimed at identifying the significant challenges or challenging factors in the implementation of accessible buildings are examined in the third section. The fourth section examines various improvement options that should be addressed in order for public facilities to be useable and accessible to people with disabilities, as well as the outcomes of the questions posed in this regard.

The second section includes disability groups' perspectives and discusses the issues faced by PWDs when accessing public buildings, as well as observations made of 10 carefully selected essential public buildings using a checklist.

4.2 Response Rate

Of the total fifty-five (55) questionnaires distributed for consulting office 48 questionnaires were collected and analyzed. And the rest 7 questionnaires were discarded, since they were not fully filled or returned. Thus, the response rate of the questionnaires was 48/55 (87.30%), out of sixty-two (62) questionnaires distributed contractor companies was 52 questionnaires were collected and analysis. And 10 questionnaires were discarded, because they were not fully filled or returned. Therefore, the response rate of the questionnaires was 52/62 (83.90%), out of fifty-three (53)

questionnaires distributed for governmental regulatory body or professional respondents was 42 questionnaires were collected and analysis. And 9 questionnaires were discarded, because they were not returned. Thus, the respondent rate of the questionnaires was 42/53 (79.50%),

And thirty (30) questionnaires are distributed but the returned questionnaires are 24 for disability groups for the challenges of public buildings thus, out of 24 were asked eight (8) eyesight, seven (7) for hearing cognitive filling the questionnaires, five (5) for wheelchair users, and the remaining four (4) for mobility were asked and analyzed. And the rest five questionnaires were discarded as well since they were not fully filled or retuned. So, the respondent rate of the questionnaires was 24/30 (80.00%).

Table 4.1: - An overview of the completed and returned questionnaires.

Category	Number of questionnaires Distributed		Number of questionnaire returned	
	Number	**In percentage**	**Number**	**In percentage**
Consultant	55	100%	48	87.30%
Contractor	62	100%	52	83.90%
Government regulatory body	53	100%	42	79.50%
PWD's	30	100%	24	80.00%
Total	200	100%	166	82.70%

Source: survey output, (2021)

The data gathered from the survey were then analyzed using EXCEL spread sheet. On the other hand, twelve critical public buildings which were engaged in giving service for the society their building facilities were observed in through check list and the findings from the observation is accompanied in the analysis of data found from questionnaire.

4.3 Personal Information of Respondents

In this subdivision personal information of respondents like: classification of organization, the position of respondents at the site, respondent gender, their educational background and work experience of respondents in the construction industry is discussed below.

Regarding respondents 'position office and site worked, 45(27.11%) were office engineers, followed by 37 (22.30%) Architects, 36 (21.69%) site supervising engineer, 28 (16.87%) resident engineer and 20 (12.10%) Project managers. Therefore, we can suppose most of the respondents were office engineers, Architects, and site supervisor engineers respectively.

The educational backdrop, 147 (88.55%) were degree holders, followed by 15 (9.04%) masters and 4 (2.41%) diploma holder. therefore; so, conclude that the majority of the respondents were degree holders.

With observe to the working experience of respondents, it was revealed that 86 (51.81%) had 1 to 5years 'experience, followed by 46 (27.71%) 6 to 10 years, 22 (13.25%) 11 to 15 years, 8 (4.82%) had >20 years and 4(2.41%) had 16 to 20 years of experience. therefore, conclude that the majority of the respondents had 1 to 5 years of experience.

Table 4.2: - Summery of Personal information of respondents

Profile / Professions		Respondents Rank	
		Frequency	Percent (%)
Position	Resident engineer	28	16.87
	Architect	37	22.30
	Site supervise Engineer	36	21.70
	Office Engineer	45	27.11
	Project manager	20	12.10
Educational background	Master's	15	9.04
	Degree	147	88.55
	Diploma	4	2.41
Years of experience	1-5 Years	86	51.81
	6-10 Years	46	27.71
	11-15 Years	22	13.25
	16-20 Years	4	2.41
	>20 Years	8	4.82

4.3.1 Position of respondent

Regarding respondents positions as shown in Fig 4.2, (27.11%) Office Engineers who formed the majority followed by Architects (22.30%), site supervising engineer or site engineers (21.70%), resident engineer (16.87%) and project managers (12.10). Thus, conclude that most of the respondents were engineers and Architects.

4.3.2 Work experience

Respondent's years of working experience as shown in Fig 4.4, 86 (51.81%) has got 1–5-year experience, 46 (27.71%) has got 6-10 years of experience, 22 (13.25%) has got 11-15 years of experience, 8 (4.82%) has got >20 years of experience and 4(2.41%) has got 16-20 years of experience. Thus, we can say most of the respondents (i.e., 50%) had at least 5 years of working experience. This put them in top position to provide in detail information about the problem the study arises. In line with the above, the credibility of the information is also assured.

4.4 Disability consideration in design and construction

An inclusive building is one in which all users, no matter what their disability are able to carry out their day-to-day activities conveniently, effectively and safely without being limited by the poor design, maintenance or management of the building. A solution outcome for inclusive design should therefore be to both improve environmental pressure and architectural disability, and also to achieve a greater measure of social equity and justice.

In terms of provision of facilities for disabled people the study went on to get the level of awareness of universal design, the type of disability and facility considerations while designing stage, making sure that projects under construction are being constructed by incorporating needs of the disable and the practice of the law which states about accessibility of buildings and also to recommend some of improvement solution for future projects.

4.4.1 Disability consideration in design

Regarding the presence of awareness on building facility for disabled person and extent of practice of the law in the design of facilities is shown in the figure 4.1 below. Even though 97.59% (n=162) respondents indicated that they have some level of knowledge about universal /inclusive design and 2.41% of respondents was unknown for universal/inclusive design.

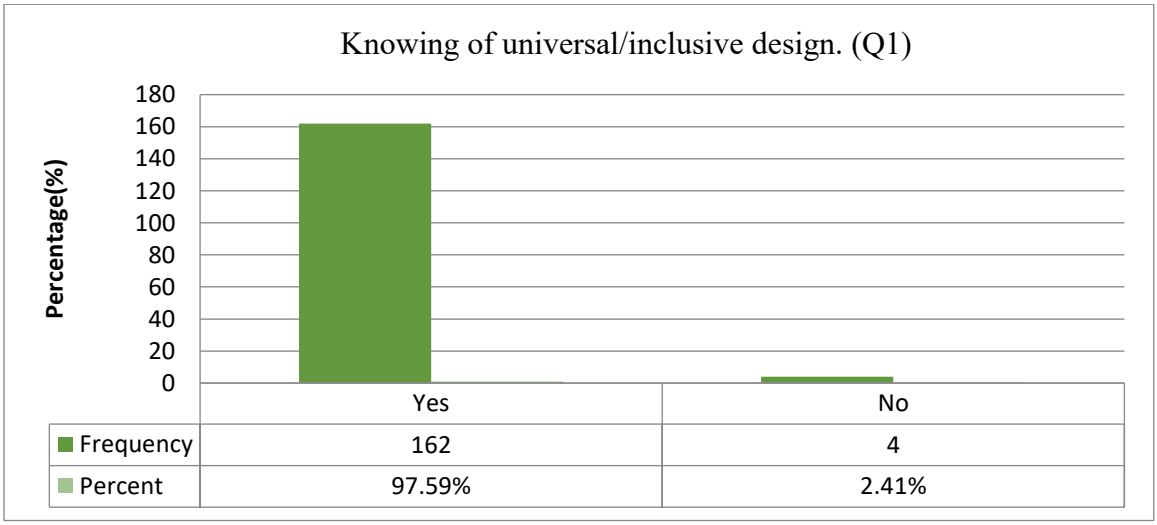


Figure 4.1: - Disability consideration in design for Q1 (Question 1)

It was 65.66% (n=109) that had fair knowledge, 26.50% (n=44) had high knowledge and 7.82% (n=13) had very high knowledge. The above findings raise an issue for great concern if above fifty

percent of the people who are responsible for taking decision on the design of our built environment have fair knowledge about the universality of building, how are they going to implement it. As shown below figure 4.2

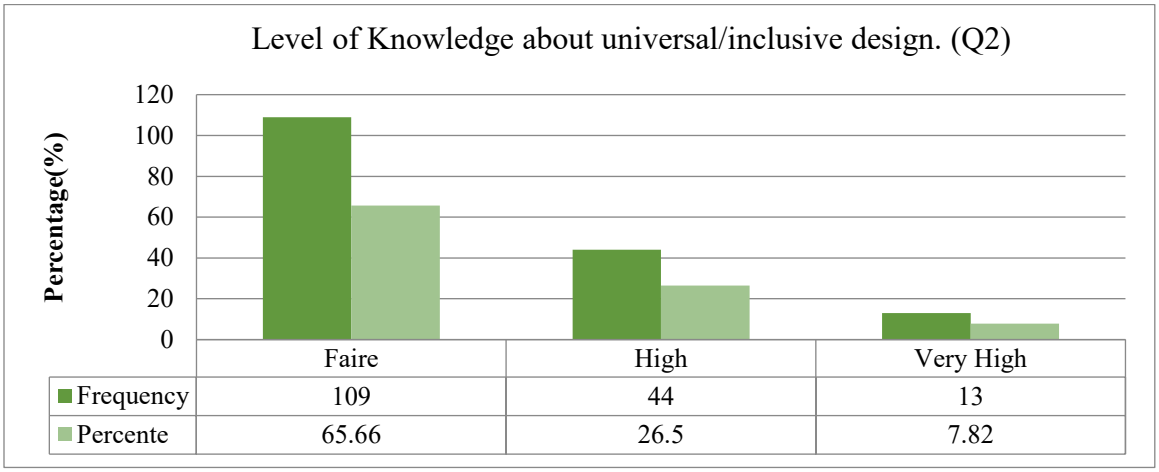


Figure 4.2: - Disability consideration in design for Q2 (Question 2)

Concerning the provision of inclusive design to clients, 68.67% (n=114) of the respondent indicated that they do not incorporate the needs PWD in their designs and 31.33% (n=52) of the respondents was respond that they provide inclusive design for their clients. Therefore, this indicates that most of the time universal/inclusive design was not being provided. As shown below Figure 4.3.

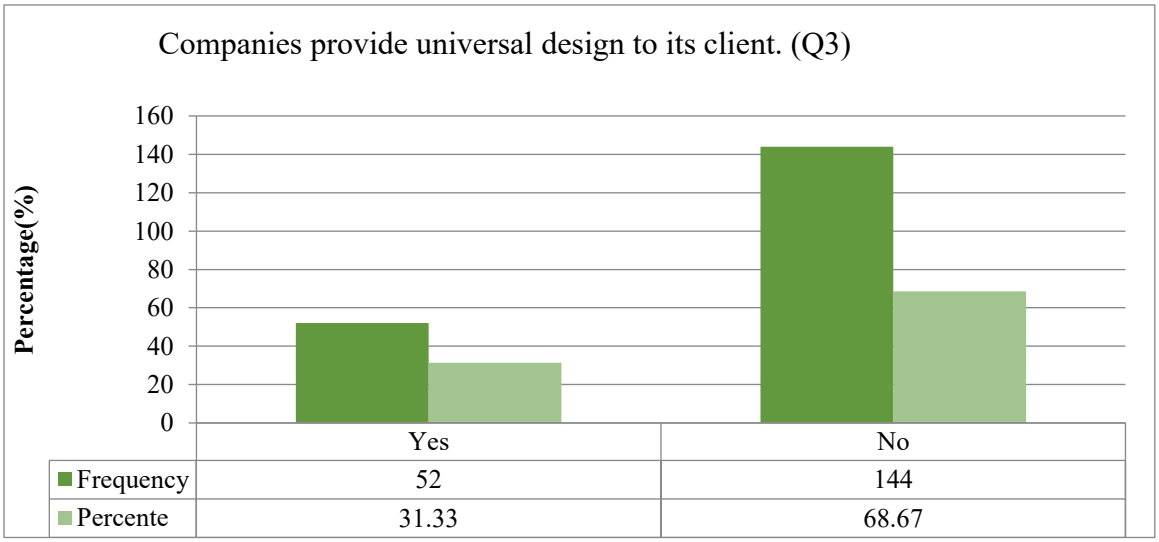
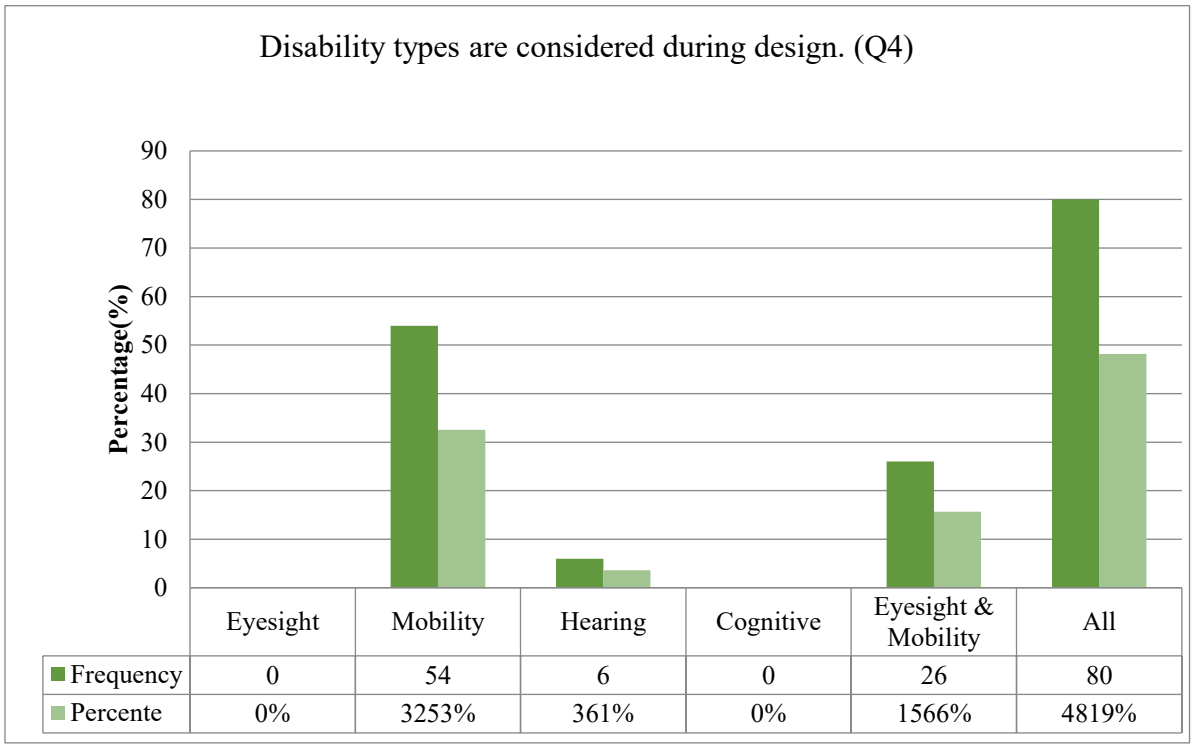


Figure 4.3: - Disability consideration in design for Q3 (Question 3)

About disability types that are considered during design, 48.19% (n=80) responded that all type of disability considered, 32.53% (n=54) replied that mobility type of disability considered, 15.66% (n=26) responded that both Eyesight and mobility type of disability considered, 3.62 % (n=6) responded that Hearing, and which are Eyesight, and Cognitive are considered. From this finding the disability which is frequently considered in design was all types of disability. During the interview of PWDs said that, "The Majorite of buildings are difficult access inter into the building as well as dumped construction materials are on the pedestrian road'' so, this is obstacle for sightless, wheelchair users and people with limited walking abilities. Therefore, the buildings are design purposely done all types of disabled person. As shown below.



	Eyesight	Mobility	Hearing	Cognitive	Eyesight & Mobility	All
Frequency	0	54	6	0	26	80
Percente	0%	3253%	361%	0%	1566%	4819%

Figure 4.4: - Disability consideration in design for Q4 (Question 4)

For the question whether building facilities such as ramps and visually impaired like tangible warning markings, using contrasting colors, handrails and curbs. Features added to the design initially, 78.92% (n=131) replied that building facilities mentioned above are add initially to design and 21.08% (n=35) responded that building facilities like ramps and for visually impaired disabilities are not provided initially. Therefore, can be summaries as building facilities like ramps,

tactile, warning markings, using contrasting colors and handrails are was add initially in the design but in construction mostly not done.

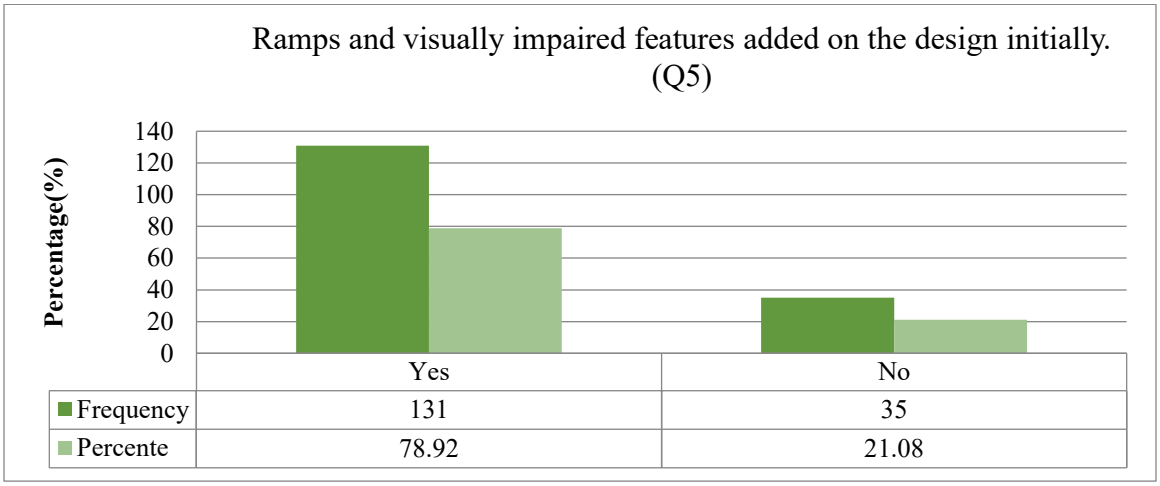


Figure 4.5: - Disability consideration in design for Q5 (Question 5)

4.4.2 Disability consideration in construction

Concerning in making sure buildings that are being constructed whether its usable or accessible for PWDs while supervising different sites shown in the figure 4.6 below, 69.88% (n=162) replied that they follow the accessibility of building while supervising their site, and 30.12% (n=50) responded that it's not being given much consideration while supervising site. Therefore, can be said even if the response shows that designer (engineers), and supervisors follow the usability of building while supervising their working site its accessibility to all including PWDs.

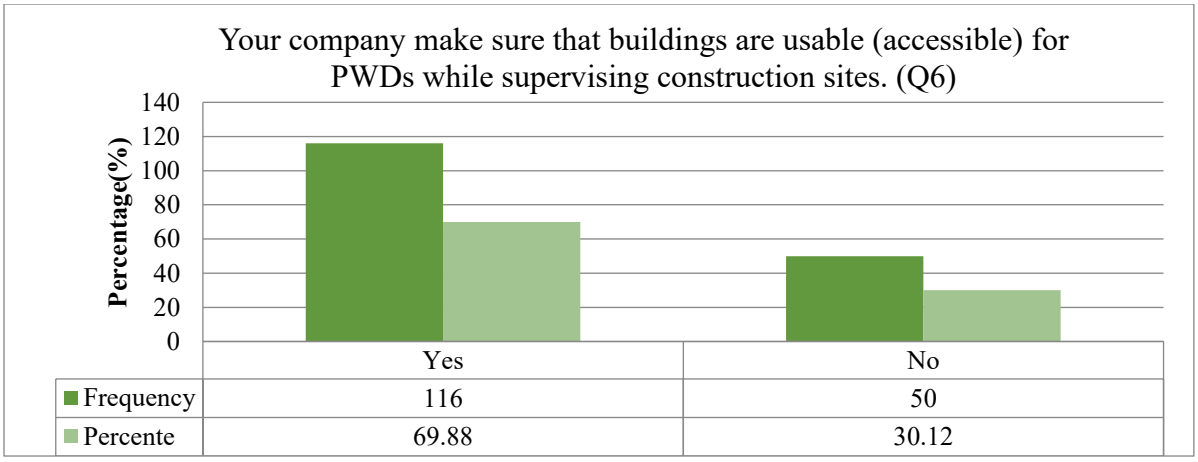


Figure 4.6: - Disability consideration in construction for Q6 (Question 6)

The difficulties while constructing accessible building facilities for PWDs, 51.81% (n=86) responded that it does not have any difficulties to construct accessible building and 48.19 % (n=80) responded that it has got difficulties to construct. From this finding accessible building facilities are somehow difficult to construct, almost 50% are it is no difficulty and 50% are it is difficult, because the above respondents answer was nearly the same value.

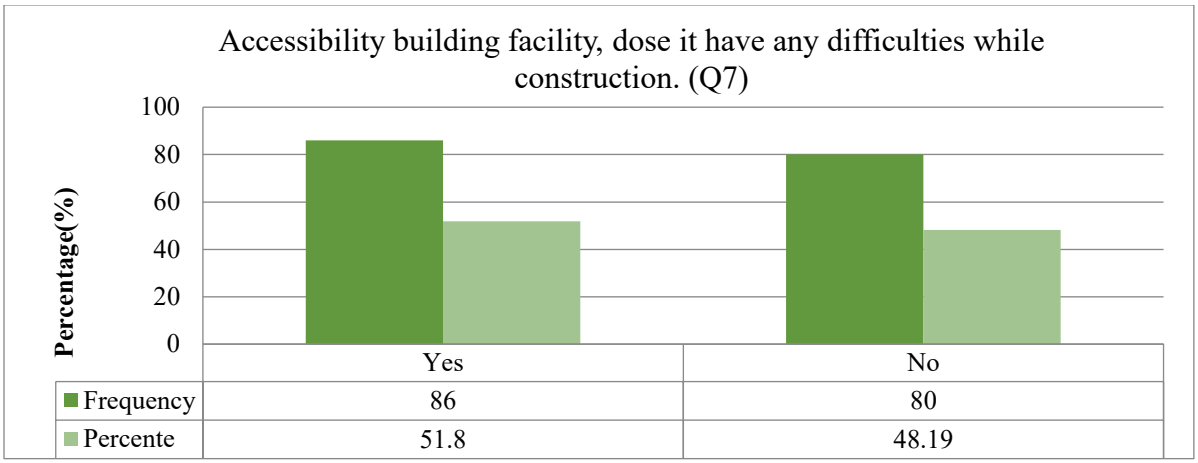


Figure 4.7: - Disability consideration in construction for Q7 (Question 7)

To determining that accessible of building facility whether its finishing work, structural member and both. So, 72.29% (n=120) replied that it is both structural and finishing work, 19.28% (n=32) replied that it is structural member and 8.43% (n-14) replied that it is finishing work. Therefore, from this finding disabilities are considered accessible building facilities are both structural member and finishing work as well.

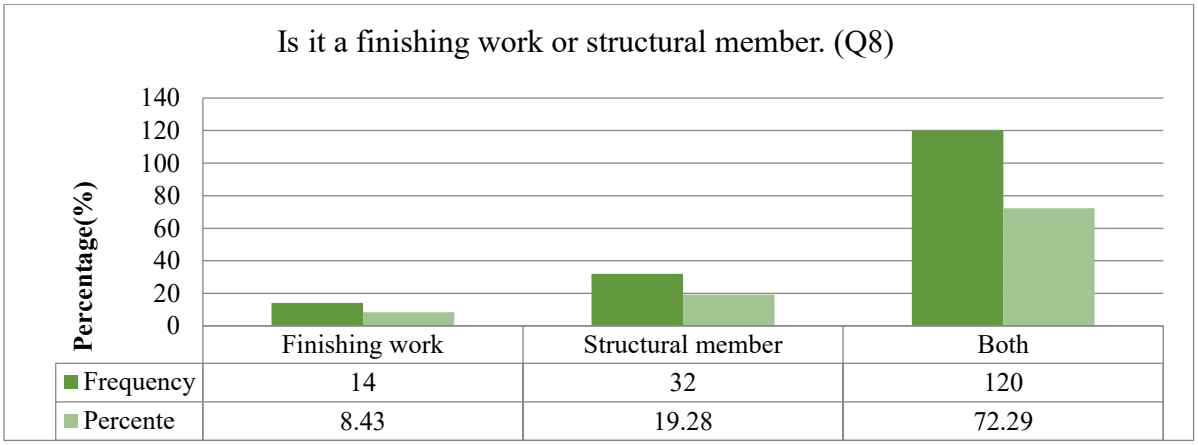


Figure 4.8: - Disability consideration in construction for Q8 (Question 8)

4.4.3 Awareness of Laws in accessible building facilities for PWDs

4.4.3.1 An enforcing and mandatory law.

About the enforcement of the law which directs for the inclusiveness of public building, 84.94% (n=141) respondents indicated that there is enforcing law which dictate for the inclusiveness of public buildings and 15.06% (n=25) responded that there is no enforcing law as shown in the table4.3 below. Therefore, this indicates that most of respondent have the awareness of the enforcing law which guides designers to follow to create inclusive environment.

4.4.3.2 Integrate the requirements of the code in design and construction.

Concerning integration of the provisions of the code in the design and construction of public buildings, 73.49% (n=122) of the respondent indicated that they do incorporation of the provisions of the code in their design and construction procedure and 26.51% (n=44) of the respondents responded that they don‘t. From this finding it can be summarized as majority of respondent‘s incorporation the provisions of the code which considers the accessibility for disabled in their design and construction procedure of public buildings.

4.4.3.3 The law on design permits stage of design.

For the question which states that the law on design permits stage of designs being universal/ inclusive is being practiced properly, 63.86% (n=106) responded that it‘s not being practice properly and 36.14% (n=60) replied that it‘s being practiced accordingly. Thus it is concluded that the majority of the respondents not agreed that there was a better follow up or enforcement of the law to make designs inclusive at design permit phase.

4.4.3.4 The law concerning accessibility of buildings on use permit after construction.

Regarding to the law which states about accessibility of building to permit for use after construction is being practiced properly, 80.11% (n=133) responded that it‘s not being practice properly and 19.89% (n=33) replied that it‘s being practiced properly. From these can be summarized that there is gap between design permit stage and building use permit stage. Thus, we can assume that the majority of respondents responded that the law is not being practiced accordingly in the stage of construction.

4.4.3.5 A controlling unit who monitors universality.

In addition, the controlling units who monitors universality of building is maintained, 59.04% (n=98) not agreed that there are controlling units who monitor universality of buildings and 40.96% (n=68) responded that there are monitoring units. According to this finding the majority of the respondents consider that there wasn't controlling units concerning to the universality of buildings is maintained.

Table 4.3: -Awareness of laws in accessible building facilities for PWDs.

No	Item	Respondents Answer	Frequency (n)	Percentage (%)
1.	Is there an enforcing law which dictates for the inclusiveness of building?	Yes	141	84.89
		No	25	15.06
2.	Do you incorporate the provisions of the code in the design and construction?	Yes	122	73.49
		No	44	26.51
3.	Do you think the law on design permit stage of designs being universal/ inclusive is being practiced properly?	Yes	60	34.14
		No	106	63.86
4.	Do you think the law concerning accessibility of buildings to use permit after construction is being practiced properly?	Yes	33	19.89
		No	133	80.11
5.	Is there a controlling unit who monitors universality of building maintained?	Yes	68	40.96
		No	98	59.04

4.4.3.6 Any change now a day in inclusiveness of public building.

Whether there is a change these days in inclusiveness of public buildings, 71.69% (n=119) replied that there is change and 28.31% (n=47) responded that there is no change on accessibility of public buildings. Therefore, it can be summarized as there are changes these days on the accessibility of public building of Addis Ababa city.

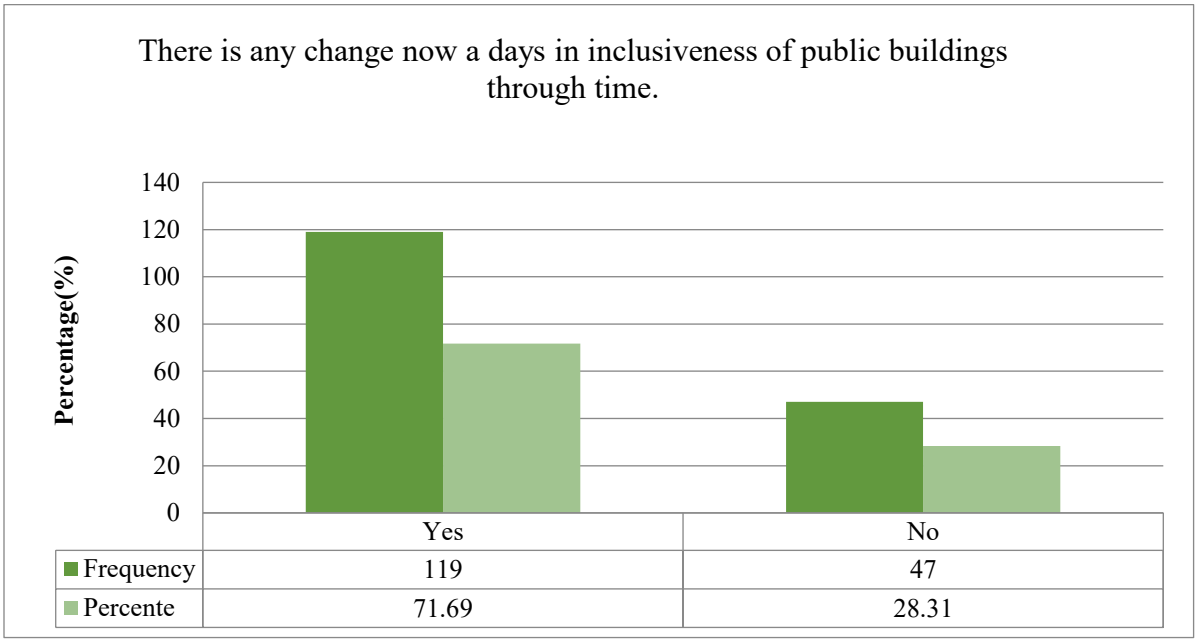


Figure 4.9: -Is there any change these days in inclusiveness of public building.

Challenged factors for construction accessible buildings.

4.5 Challenges with the implementation of accessible public buildings.

The purpose of the study was to gather information from respondents on why, despite provisions in the law and rules, the city is still failing to accommodate the needs of PWDs in the design and building phase of public facilities.

Some of the issues other nations experience with the implementation of inclusive or accessible buildings for PWDs were gathered from literature and presented to the responder to indicate how important each of the factors is in the failure to implement our disability considering law and standards.

The findings of the examination of the responses are provided in table 4:4. The findings revealed that all of the elements described in the literature help to explain the city's predicament in some way. The following is a list of the challenges:

4.5.1 Lack of commitment the ethics of professionalism.

The first factor that respondents picked as the most important challenge of professional ethics is not committed; respondents gave a mean score of 4.23 to this factor. As a result of this study's findings, more emphasis was placed on professional ethics and more exercises were conducted in inclusive/universal design and construction. This challenge was ranked first in its category.

4.5.2 Weakness in the provisions of the law/code

This aspect was evaluated as the second most significant problem in the current study, with a mean score of 4.01. From the literature, R. Imrie 2007 explained many countries' legislative and legal requirements governing the development of barrier-free structures are poor or non-existent. He pointed out that in the United Kingdom, for example, the building codes that guide designers and developers in providing accessible buildings and structures for the disabled are weak and ineffective, with developers only being required to make "reasonable provisions" in the design of their structures for the disabled. Furthermore, the provisions only apply to new construction and major renovations. As a result of this flaw in the code, the country's efforts to remove obstacles to PWDs accessing the built environment have been hampered. As a result, the constructed environment has not been effectively "pinned down" by the construction laws, according to developers, designers, and contractors.

4.5.3Lack of public awareness about the law

As mentioned before in the study, some of the designers and high management members who make decisions are unaware of the Accessibility of Building Facilities for People with Disabilities rules. Furthermore, some of the respondents stated that they are aware of the law/code governing building accessibility, but those that claim to be aware of it are hesitant to put it into practice. With a mean score of 3.90, respondents identified this element as the third most critical problem in this survey.

4.5.4 Lack of enforcement of the law to compel designers

With a mean score of 3.88, respondents ranked the absence of enforcement of the law as the most significant impediment to the implementation of inclusive building facilities for the disabled as the fourth factor. It is important to understand that the law and its execution (implementation) are not the same thing. Some of the respondents stated that they are required to observe the law primarily during the design permission stage, but that there is a gap in the enforcement of the law during the usage permit stage following construction.

The foregoing findings are consistent with Caesar Julius Nathan's (2015) analysis of the Disability Act's implementation in Ghana, in which lack of enforcement was identified as one of the most significant implementation issues. As a result of the current study's findings, there is a gap/weakness in the provisions and implementation of law in Addis Ababa that include

accessibility to public buildings. The law/code includes a clause about building accessibility, but it fails to require that all designs/drawings submitted for permit/approval be scrutinized and checked to ensure that all necessary requirements for accessibility of PWDs are incorporated before the permit is granted in both the design and construction stages.

4.5.5 Lack of technical persons /Governmental consultation and involvement for the stage of design up to construction, the case of accessibility of PWD's.

This was the sixth element that hampered the accessibility of PWDs for government regulatory bodies and consulting firms during the implementation design stage to construction. As a result, the above findings were ranked on a scale of 3.87, So that the government and private consulting companies are more closely aligned and committed to professionalism.

4.5.6 Lack of knowing law/policy of disabled associations/firms

The disabled or their supporters are practically never considered in the design of constructed settings. In fact, some of the respondents went on to say that they don't invite the disabled or their organizations to their board meetings, despite the fact that the topics being discussed were about PWDs. Some of them indicated that they do not invite the disabled to their meetings because they believe they lack understanding about the built environment and hence it is not necessary to invite them. This rationale may appear to be logical; yet, the perspectives of PWDs and their organizations are a crucial source for the development of an inclusive environment, and hence cannot be overlooked.

The legislation and policy are unknown, and there is no closer exercise in the construction sectors; as a result, the above findings of these problems are the respondents rated sixth, with a mean of 3.54.

4.5.7 Inadequate policies and standards

Developed countries like England, USA, and Canada etc. There is a unique standard/code for the accessibility of people with disabilities to build environment. The codes specify how the built environment should be designed and constructed in order to be barrier-free. However, there is no detail standard in our country. Even if there are several codes that refer to building accessibility, they are not detailed enough to be utilized as a guideline. There are no design guidelines in the Disability Act. As a result, only a select few designers who are familiar with international design

standards are able to consider and incorporate them into their work. According to the report, this component is insufficient to assure that the countries-built environment is barrier-free or all-inclusive. The factor was ranked 7th with mean score of 3.50.

4.5.8 Scarce of land / insignificant amount of built-up area.

These barriers are placed 7th, with a mean of 3.24; in our country, land management is inadequately used, and insufficient land permits are impeding PWDs' ability to develop environments. The land must be adequately managed and appropriate land for the creation of a barrier-free environment for PWDs, according to the aforementioned research.

4.5.9 Lack of budget allocation for implementation

In our country, the implementation and design stages are inexpensive. As a result, designers are less committed to design and prefer to work on projects that pay the least amount of money; in poor nations, the design fee is around 4% of the project budget, which is not the case in our country.

The respondents voted or ranked this element as the 9th most important factor, with a mean score of 3.22. As a result, the implementation phase was mostly completed with the help of professionals, and budgets were carefully allocated.

This step entails a thorough investigation of all aspects of the construction operations and facilities for PWDs in order to create a barrier-free environment. As a result of this stage's successful completion, the project's expenses were reduced by 50% in terms of unneeded demolitions and design changes.

4.5.10 Lack of capability of professional's status.

Another issue raised by respondents is a lack of professional skill, which is one of the issues facing Ethiopian construction industries. In Ethiopian construction industries, unprofessional persons are simply insert into the industry, and technical capability is a question mark. As a result, the government must appoint the appropriate individual to the appropriate position. The respondent rated 10th and the mean was 3.17 in the above study.

4.5.11 Complexity and High Cost of designs which incorporate the needs of the PWDs

There are four reasons, according to Imrie and Hall, why the built environment isn't all-inclusive. The high cost of constructing a completely accessible constructed environment is one of them.

Imrie and Hall 2007 appear to be in agreement with the responders. They all agreed that designs that take into account the demands of people with disabilities are more complicated and costly. "For example, in situations like entrances, you have to have ramps on the outside of the building together with steps," two of the respondents stated. The ramp's construction is an extra cost. Furthermore, restroom rooms must be large enough for wheelchair users to maneuver comfortably. Building fittings and fixtures must also be properly built to accommodate the disabled. All of these factors, as well as others, contribute to the construction cost." Thus, the fear of the increase in cost of construction put some of the designers and clients off especially when there are few disabled people who are use the facility. So, the above challenged factor is ranked 11thwith the mean score 3.13.

4.5.12 Ineffectiveness of disability groups

According to Tessema Eseta the ineffectiveness/no inclusiveness of disability group is somewhat to blame for the suffering of PWDs in Ethiopia. He explained that, Disability community is supposed to expose and defend the cause of challenges that PWDs are facing. They are also responsible to advocate for the passage and implementation of disability laws. Where the disability group is quiet or ineffective the disables suffer with different challenges on their daily basis. In the current study, the respondents articulated similar worry that the disabled societies are to a certain extent responsible for failure to implement disability laws. This challenging factor is ranked 12thand the mean score of 3.11 places according to respondents. If the associations are vibrant, the rights of the disabled to have equal access in the use of the public buildings as well all built environment was be respected.

4.5.13 Negative attitudes towards the disabled

According to the respondent ranked 13th and the mean score of 2.83. This is the last ranked and this factor is this much affected the disabled access of the environment. Thus, our culture was negative attitudes for disability.

Table 4.4: - Challenges with the implementation of disability law on accessibility disabled to public buildings (Views of designers or consultant) from Question 1 – 15

Item.	Challenges	Evaluation					Total	Mean	Rank
		1	2	3	4	5			
1	Lack of commitment the ethics of professionalism.	0	16	40	40	70	166	4.23	1st
2	Weakness in the provisions of the law/code.	4	16	20	60	66	166	4.01	2nd
3	Lack of coordination between departments.	10	7	25	64	60	166	3.95	3rd
4	Lack of public awareness about law/policy.	9	13	24	60	60	166	3.90	4th
5	Lack of enforcement of the law/policy to compel designers.	6	22	20	56	62	166	3.88	5th
6	Lack of technical persons / Government consultation and involvement of PWDs in decision making	3	19	26	66	52	166	3.87	6th
7	Lack of knowing law/policy of disabled association's firms.	11	29	24	66	36	166	3.54	7th
8	Inadequate policies and standards.	7	31	34	60	34	166	3.50	8th
9	Scarce of land / insignificant amount of built-up area.	26	30	34	30	46	166	3.24	9th
10	Lack of budget allocation for implementation.	16	42	38	30	40	166	3.22	10th
11	Lack of capability of professional's status.	20	30	12	50	24	166	3.17	11th
12	Complexity of designs which incorporate the requirements of PWDs.	10	46	46	40	24	166	3.13	12th
13	Ineffectiveness of disability groups.	23	23	65	26	29	166	3.11	13th
14	High Cost of designs which incorporate the needs of PWDs.	22	60	28	32	24	166	2.86	14th
15	Negative attitudes towards the disabled.	48	24	34	28	32	166	2.83	15th

4.5.16 Level of commitment of client in the provision of access for the disabled

As of the level of commitment of client in the provision of access for the disabled during requesting for design, 55.42% (n=92) responded that the interest of clients in provision of access for disabled is low, 34.94% (n=58) replied that its medium and 9.64% (n=16) of the respondents answered that

the level of commitment of clients in the provision of access for the disabled was high. Therefore, from this finding level of commitment of clients in provision of access to the disable is low.

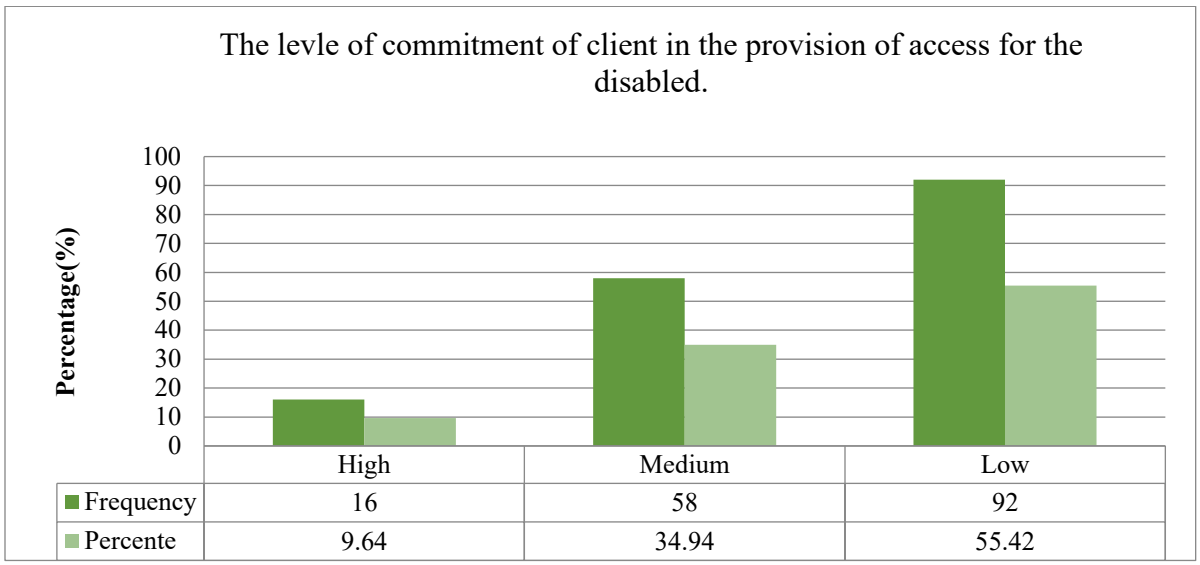


Figure 4.10: -Level of commitment of client in the provision of access for the disabled.

4.5.17 Inclusive design does it change in the overall cost of the projects.

Concerning Inclusive design whether it has got any change in the overall cost of projects, 69.25% (n=115) replied that it has not got a change in the overall cost of the project and 32.72% (n=51) responded that there is change in the overall cost of the project if one needs to use inclusive design. Therefore, can be summaries as inclusive design not changes the overall cost of the project.

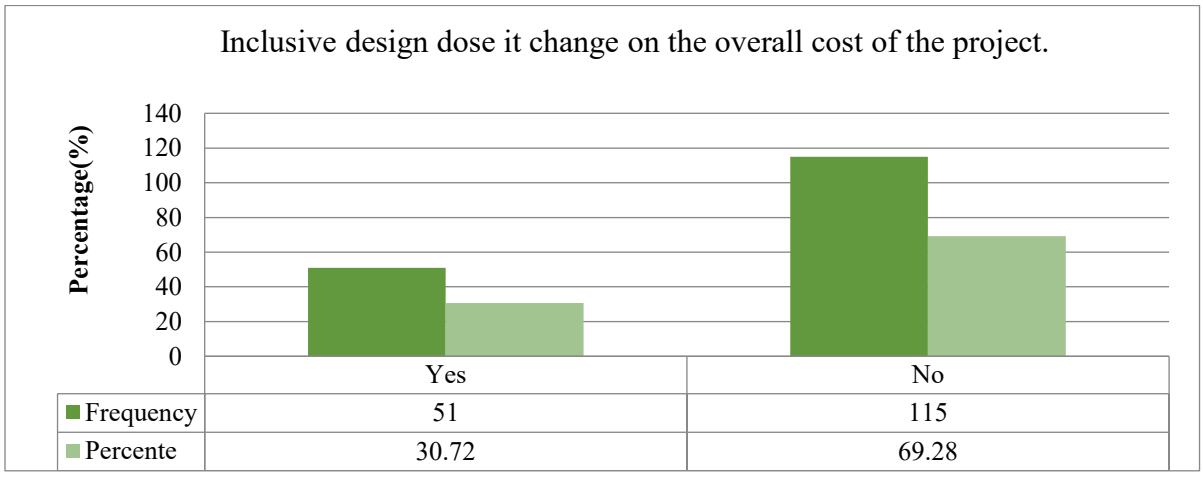


Figure 4.11: -Inclusive design does it change the overall cost of projects.

4.5.18 whom do you blame for the failure to incorporate the requirements of PWDs in the designs?

Regarding the blame for the failure to incorporate the requirements of PWDs in the designs of public buildings, there were five choices for the respondent where blame goes to like Government, Designers, Clients, Disability Groups and finally all and 73.50% (n=122) responded that all were to be blamed which are government 12.06%(n=20), designers 9.64%(n=9.64), clients and disability group are 2.4% (n=4) replied that the same ranked are to be blamed. Therefore, this finding lead to totally conclude for the failure to incorporate the requirement of PWDs in design of public building were the government, designers, clients, PWDs and all who are concerned with this issue.

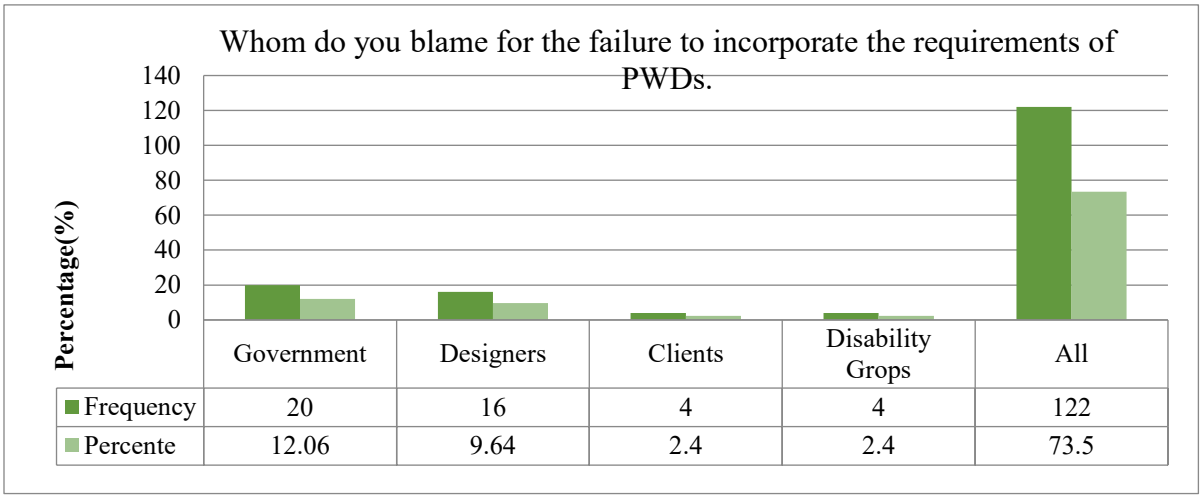


Figure 4.12: -Whom do you blame for the failure to incorporate the requirements of PWDs in the designs

Key buildings facilities that need improvement.

4.6 Building facility functionality improvements of PWDs.

Survey respondents were asked to give their opinion by ranking in level of agreement (1 "strongly disagree", 2 "Disagree", 3 "Neutral", 4 "Agree" and 5 "strongly agree") a series of statements regarding building facilities that they believe improves accessibility for persons with disabilities in their community. Tables 4.7 below show the overall building facilities that need to be addressed in public buildings of the city. And respondents responded their level of agreement/disagreement as it relates to their experiences in designing and construction which was most important; they believe to improve accessibility for persons with disabilities.

4.6.1 Parking

The table 4.5 below shows parking area facilities which need improvement for providing accessible parking to the society including PWDs from the views of designer's, among the key improvements that building facility need: Accessible parking on building area needs to be adequate was indicated as the first building facility functionality improvement with the mean score of 4.41, Sidewalks on building area need to be adequate was ranked as the second with mean score of 4.38, Building parking entrance with Natural Ground Level (NGL) is to be done moderate slope was ranked as the third with mean score of 4.35, Curb cuts should be located where they are needed was ranked as the fourth with mean score of 4.11,Curb cuts on building area need to be adequate was ranked as fifth with mean score of 4.05 and Indicating signs needs to be easy to read and understand as the sixth building facility improvement with the mean score of 3.47. The results obtained confirmed with the reviewed literatures.

Table 4.5: -Building facility functionality improvement rating for parking

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
1. Parking									
1	Accessible parking on building area needs to be adequate.	9	9	3	29	116	166	4.41	1st
2	Sidewalks on building area need to be adequate.	5	16	8	19	118	166	4.38	2nd
3	Building parking entrance with NGL is to be done moderate slope.	0	12	18	36	100	166	4.35	3rd
4	Curb cuts should be located where they are needed.	3	18	11	59	75	166	4.11	4th
5	Curb cuts on building area need to be adequate.	6	12	24	50	74	166	4.05	5th
6	Indicating signs needs to be easy to read and understand.	10	10	0	40	106	166	3.47	6th

4.6.2 Entrance

Short route to entrance and covered or protected with any ramps or steps carefully detailed, Avoidance of change in levels as possible. Accessible entrances should be clearly identified using the international symbol of accessibility including alternate locations of accessible entrances are some of key building accessibility guidelines for facility improvement. In the table 4.6 below

building facility which needs improvement for providing accessible entrance to the PWDs from the views of designer‘s, among the key functional requirements that building facility need: The primary entrances to buildings need to be accessible was indicated as the first entrance functionality improvement with the mean score of 4.478, Accessible building entrances needs to be easy to identify was ranked as the second with mean score of 4.39, Accessible building entrances should be adequate was ranked as the third with mean score of 4.38, The approach to the entrance free of stairs and steps was ranked as the fourth with mean score of 3.88. The results obtained confirmed with the reviewed literatures.

Table 4.6: - Building facility functionality improvement rating for entrance

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
2. Entrance									
1	The primary entrances to buildings need to be accessible.	10	4	4	28	20	166	4.47	1st
2	Accessible building entrances needs to be easy to identify.	3	8	8	49	48	166	4.39	2nd
3	Accessible building entrances should be adequate.	3	6	12	49	96	166	4.38	3rd
4	The approach to the entrance free of stairs and steps	3	23	33	39	68	166	3.88	4th

4.6.3 Signage

There are different codes and standards which guides how signage should be provide in built areas some of them reviewed in the literature (Australian Government,2013) and (B. Kyei-dompim, 2010), these are Signs must be clear, simple and easy to read, color of signs needs be clearly distinguishable, there should be directional signs indicating the location of accessible facilities and Maps, information panels and wall-mounted signs should be placed etc. The table 4.7 below shows accessibility facility which needs improvement for providing signage or indication to the users including PWDs from the views of designer‘s, among the key improvements that building facility need: directional signs indicating the location of accessible facilities as the first signage improvement with the mean score of 4.50, The color of signs needs be clearly distinguishable was ranked as the second with mean score of 4.49,There should be the color of signs needs be clearly distinguishable was ranked as the third with mean score of 4.30, Maps, information panels and

wall-mounted signs should be placed was ranked as the fourth with mean score of 4.28. The results obtained confirmed with the reviewed literatures.

Table 4.7: - Building facility functionality improvement rating for signage

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
3. Signing									
1	There should be directional signs indicating the location of accessible facilities	0	8	8	43	107	166	4.50	1st
2	Signs must be clear, simple and easy to read	0	8	8	44	106	166	4.49	2nd
3	The color of signs needs be clearly distinguishable	5	14	5	44	98	166	4.30	3rd
4	Maps, information panels and wall-mounted signs should be placed	0	7	20	58	81	166	4.28	4th

4.6.4 Pathway

From the table 4.8 below accessible building with its functional requirements of pathway that needs to providing for PWDs from the views of designer ‘s, among the key improvements that accessible building facility need: The pathway needs to be clear of obstructions was indicated as the first signage improvement with the mean score of 4.43, The path of travel needs to be free of steps or stairs was ranked as the second with mean score of 3.99. The results obtained complete with the reviewed literatures.

Table 4.8: - Building facility functionality improvement rating for pathway

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
4. Pathway									
1	The pathway needs to be clear of obstructions	0	10	15	34	107	166	4.43	1st
2	The path of travel needs to be free of steps or stairs	3	25	17	46	75	166	3.99	2nd

4.6.5 Ramps

According to (Australian Government,2013) and (B. Kyei-dompim, 2010) the reviewed literatures ramps functional requirements that needs to be provided are, minimum width should be 0.90 m and the maximum recommended slope of ramps is 1:20, a protective handrail must be placed along the full length of ramps, the ramp surface needs to be clear of obstructions and the surface of ramps

needs to be non-slip. In the table 4.9 below accessible building needs functional improvement on providing ramps to the PWDs from the views of designer‘s, among the key improvements that building facility need: There should be a complementary ramped route next to stairs or steps was indicated as the first ramps improvement with the mean score of 4.53, The location of the ramp must be clearly identifiable was ranked as the second with mean score of 4.50, The ramp surface needs to be clear of obstructions was ranked as the third with mean score of 4.48,The surface of ramps needs to be non-slip was ranked as the fourth with mean score of 4.40. The results obtained confirmed with the reviewed literatures.

Table 4.9: - Building facility functionality improvement rating for ramps

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
5. Ramps									
1	There should be a complementary ramped route next to stairs or steps	0	8	14	63	82	166	4.53	1st
2	The location of the ramp must be clearly identifiable	0	8	12	36	110	166	4.50	2nd
3	The ramp surface needs to be clear of obstructions	4	7	7	36	112	166	4.48	3rd
4	The surface of ramps needs to be non-slip	0	10	14	42	100	166	4.40	4th

4.6.6 Doors

From different functional requirement of doors in public buildings in the review literature, to have minimal effort to close or open and requiring 30N maximum of opening pressure, adding second handle or pulling device and door handles being in a shape that is easy to grasp with one hand are some of them. The table 4.10 below shows building facility that needs improvement for providing suitable door to PWDs from the views of designer‘s among the key improvements that accessible building facility need: Doors needs be opened without much effort was indicated as the first doors functionality improvement with the mean score of 4.25, Door handles needs to have a shape that is easy to grasp with one hand was ranked as the second with mean score of 4.24, There should be sufficient space beside the latch side of the door was ranked as the third with mean score of 4.11. The results obtained confirmed with the reviewed literatures.

Table 4.10: - Building facility functionality improvement rating for doors

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
6. Doors									
1	Doors needs be opened without much effort	5	8	11	62	81	166	4.25	1st
2	Door handles needs to have a shape that is easy to grasp with one hand	3	12	8	62	81	166	4.24	2nd
3	There should be sufficient space beside the latch side of the door	4	14	19	51	78	166	4.11	3rd

4.6.7 Elevators

The table 4.11 below summarizes accessible building facility which needs functional improvement for providing barrier free service to the society including PWDs from the views of designers, among the key functionality improvements that building facility needed: There should be an accessible path leading to the elevator was indicated as the first elevators functionality improvement with the mean score of 4.28,The elevator door easy to identify was ranked as the second with mean score of 4.23,The door opening/closing interval needs to be long enough was ranked as the third with mean score of 4.17 and, The elevator cab needs to provided handrails on three side was ranked as the fourth with mean score of 4.08, The results obtained confirmed with the reviewed literatures.

Table 4.11: - Building facility functionality improvement rating for elevators

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
7. Elevators									
1	There should be an accessible path leading to the elevator	8	8	8	47	95	166	4.28	1st
2	The elevator door easy to identify	8	4	12	58	84	166	4.23	2nd
3	The door opening/closing interval needs to be long enough	8	4	16	52	84	166	4.17	3rd
4	The elevator cab needs to provided handrails on three side	6	6	15	66	73	166	4.08	4th

4.6.8 Stairs

The table4.12 below summarizes building facility which needs improvement for providing accessible stair to the society including PWDs from the views of designers among the key improvements that building facility needed: Treads need to be with a non-slip surface was indicated as the first stair functionality improvement with the mean score of 4.32, The location of the stairs must be clearly identifiable was ranked as the second with mean score of 4.22, and width of

the stairs needs to be adequate was ranked as the third with mean score of 2.29. The results obtained confirmed with the reviewed literatures.

Table 4.12: - Building facility functionality improvement rating for stair

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
8. Stairs									
1	Treads need to be with a non-slip surface	3	14	10	39	100	166	4.32	1st
2	The location of the stairs must be clearly identifiable	8	8	8	57	85	166	4.29	2nd
3	width of the stairs needs to be adequate	3	6	10	45	103	166	2.29	3rd

4.6.9 Railings and Handrails

The table 4.13 below shows accessible building facility which needs to be provided for improving functionally of Railings and Handrails for safe movement while using stairs, ramps and elevators to society including PWDs from the views of designers, among the key improvements that public building facility needed: The handrails must be easy to hold was indicated as the first with the mean score of 4.44, The handrails must be easy to hold was ranked as the second with mean score of 4.43, Handrails must be easy to identify was ranked as the third with mean score of 4.38, The handrails must be continuous throughout the full length of ramps and stairs was ranked as the fourth with mean score of 4.33, and Low positioned windows at landings must be protected by railings as the fifth building facility improvement with the mean score of 4.23. The results obtained confirmed with the reviewed literatures.

Table 4.13: - Building facility functionality improvement rating for railing and handrails

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
9. Railings and Handrails									
1	The handrails must be easy to hold	0	7	13	46	100	166	4.44	1st
2	The railings must be securely attached	0	2	21	42	100	166	4.43	2nd
3	Handrails must be easy to identify	0	5	15	58	88	166	4.38	3rd
4	The handrails must be continuous throughout the full length of ramps and stairs	0	13	7	46	100	166	4.33	4th
5	Low positioned windows at landings must be protected by railings	3	9	23	42	89	166	4.23	5th

4.6.10 Toilet

According to the reviewed literatures toilet or rest room functional requirements are, Restroom should have non-slipper flooring; flush detailing of drainage and junctions between surfaces and spaces, there should be accessible rest room identified by sign easily reachable positions of controls and fittings as well as adequate space for maneuvering. The table 4.14 below shows accessible building facility which needs to be improved in restroom for providing safe movement and usage function while using toilet to PWDs from the views of designers, among the key improvements functionality that building facility needed: There should be sufficient space inside the rest room to maneuver a wheelchair was indicated as the first with the mean score of 4.54, There should be accessible rest room identified by a sign was ranked as the second with mean score of 4.39, The flushing mechanisms needs to be easy to operate was ranked as the third with mean score of 4.36, The flooring material needs to be skid-proof, well drained and waterproofed was ranked as the fourth with mean score of 4.30, and There should be helping side rails facilities at the toilets was ranked as the third with mean score of 4.22.The results obtained confirmed with the reviewed literatures.

Table 4.14: - Building facility functionality improvement rating for toilet

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
10. Toilet									
1	There should be sufficient space inside the rest room to maneuver a wheelchair	7	3	0	40	116	166	4.54	1st
2	There should be accessible rest room identified by a sign	5	15	0	36	110	166	4.39	2nd
3	The flushing mechanisms needs to be easy to operate	6	6	13	38	103	166	4.36	3rd
4	The flooring material needs to be skid-proof, well drained and waterproofed	4	15	4	48	95	166	4.30	4th
5	There should be helping side rails facilities at the toilets	3	9	21	48	85	166	4.22	5th

4.7 Challenges faced by Persons with Disability (views of PWDs)

The study cannot be complete without the inclusion of the persons with Disability who are at the center of the problem at offer. The study purposively selected 40 persons with various forms of

destruction in the study area and their views solicited. But out of thirty-three (33) planed interview for disabled hearing (unable to hear persons) 10 respondents, Eyesight problem persons 8 interview, Mobility (wheel chair users) 5 interview, armless persons are 4, and mobility and eyesight 6 all these persons were successfully interview. For the above hearing persons are 12 questioners was distributed 10 hearing respondents are collected and analyzed and the rest 2 questionnaires were discarded since they were not fully filled or retuned, and the other interviews are good for within the target numbers.

4.7.1 Personal Information of Respondents (PWDs)

In this section personal information of respondents like: respondents/interview gender, impairment type, cause of impairment, usage of assistive device, type of assistive device use and how much help do they to access public buildings

4.7.2 Type of disability

As can be seen from Fig 4.13 below, 30.30% (n=10) were hearing impaired, 24.3% (n=8) were with visual impairment,18.2% (n=6) were with physically and visual impaired, 15.2% (n=5) were with mobility (wheel chair users) impairment, and 12 %(n=4) were with hand impaired respondents / interviews. This shows that hearing impaired respondents took the higher place and from the remaining interviews were ranked disable with visual impairment was in the first.

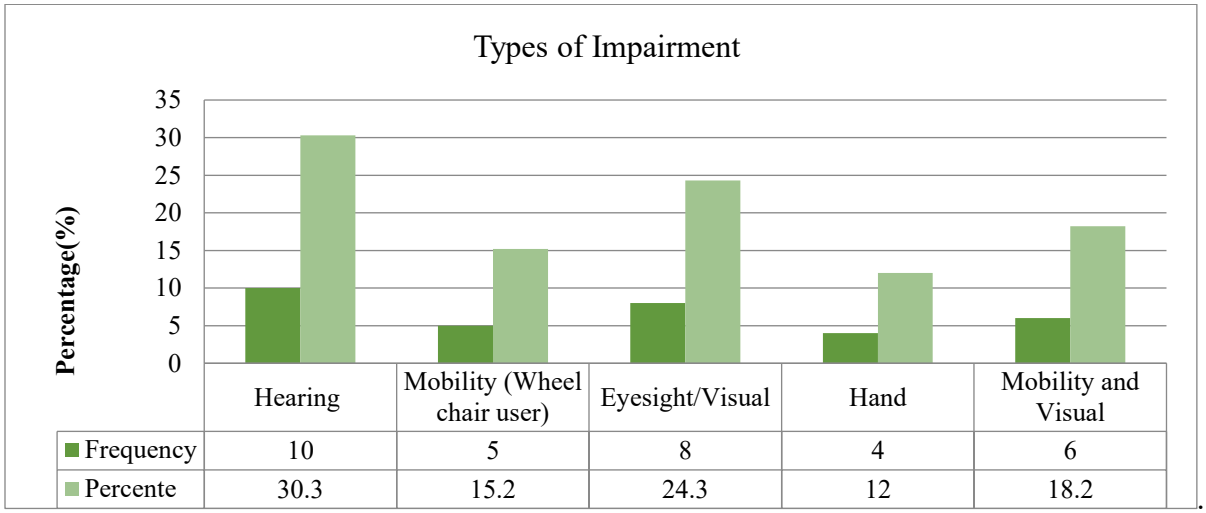


Figure 4.13: -Type of disability

4.7.3 Cause of disability

As can be seen from Fig 4.14 below, 78.8% (n=26) of the respondent/interview explained that they acquired their impairment later in life. Whereas the remaining 21.2% (n=7) had their impairment present at birth. Therefore, it can be said that most of the respondents got their impairment later in them through life because of accidents, sickness, war etc.

During the interview mobility and visual impairments were above 50% of the respondents (i.e., 4 respondents) of the interview disability comes from war.

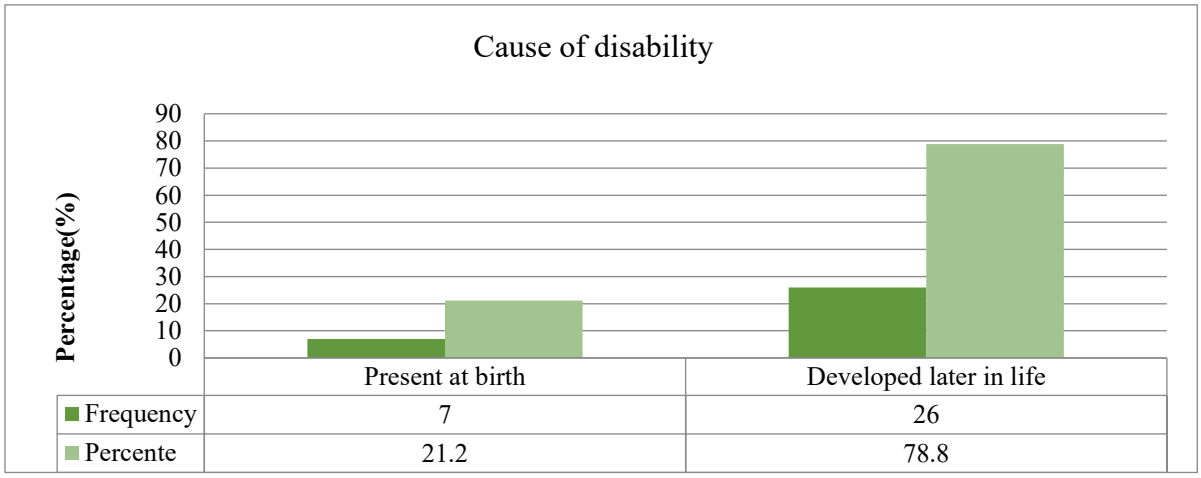


Figure 4.14: - Cause of disability

4.7.4 Usage of assistive device

The respondents also revealed that, due to the nature of their impairment and the environment, they have to use assistive devices to be able to move and access the built environments. As noted by The Office of Technology Assessment cited in Wisniewski and Sedlak, assistive-device technologies such as wheel chairs, calipers, crouches etc. improve the daily life of PWDs. They rehabilitate/restore the cause of the impairment; they facilitate normalcy and augment the skill of PWDs by providing a higher level of functioning.

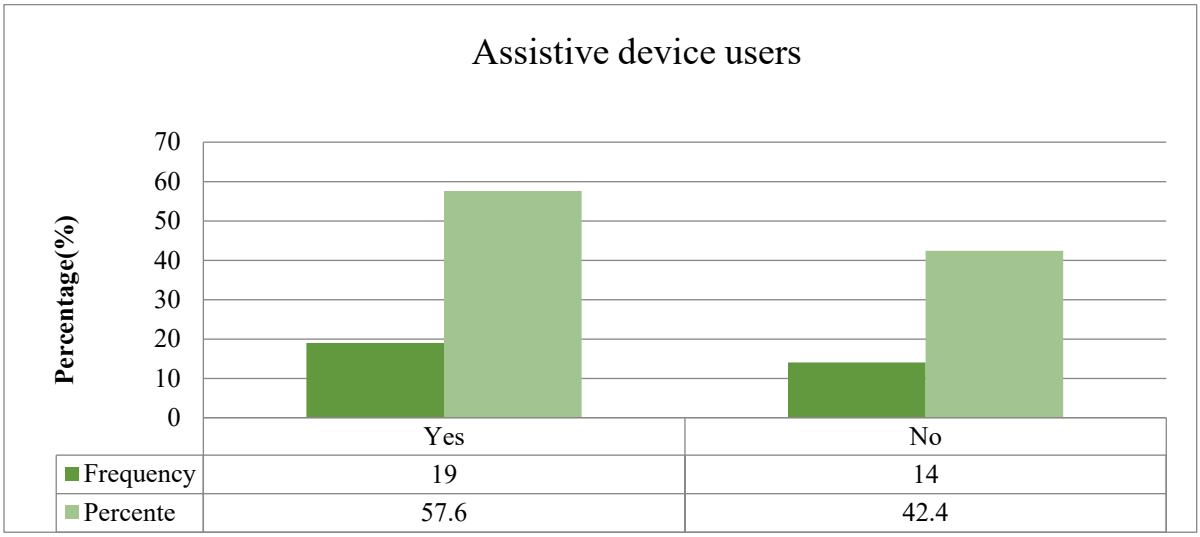


Figure 4.15: -Assistive device users

In the current study fig 4.16, 57.6% (n=19) of the interview / respondent representing said that they use assistive devices to access or to maneuver with in buildings and everywhere and the remaining 42.4% (n=14) responded that they don ‘t needs any assistive device. From these it can be said that most of the respondents use assistive device and respondents who don ‘t need assistive device are most of them with impairment on hands and hearing. Out of 57.6% (n=19) respondent who uses assistive device,9% (n=3) uses wheel chair, 24.3% (n=8) uses clutches, 24.3% (n=8) uses white cane, and the remaining 42.4% (n=9) uses none shown on fig4.13

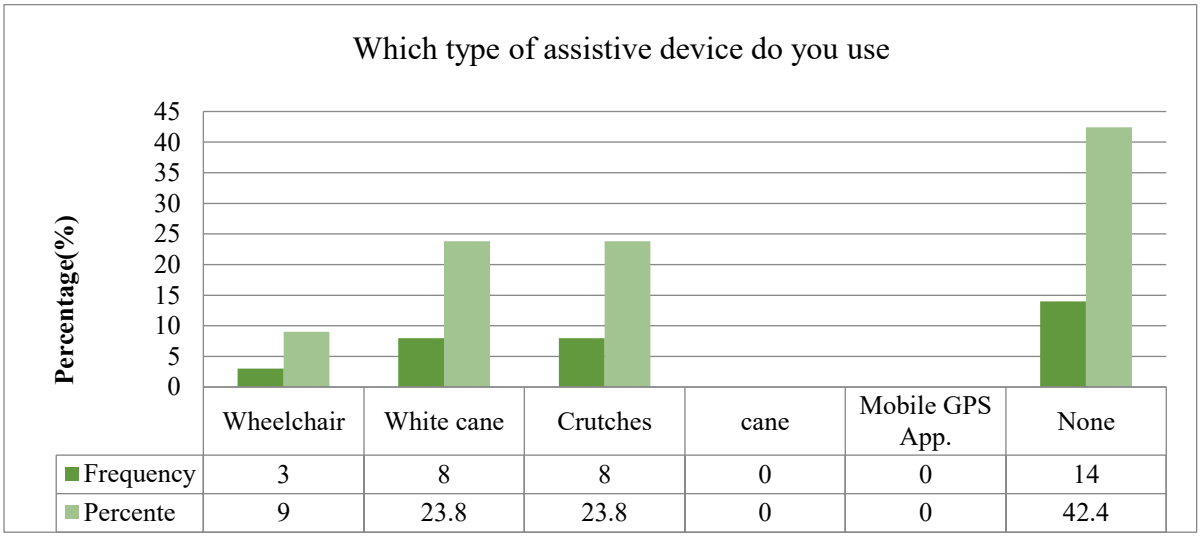


Figure 4.16: -Type of assistive devices used by PWDs

The study went on to asked if the respondents need any help to access or move around public buildings. The result (Fig 4.17) exposed that 48.5% (n=16) said that they needed some help, 24.2% (n=8) said they don ‘t need help, 21.20% (n=7) said they needed considerable amount of help; and 6.1% (n=2) said they needed continuous help. This shows that as high as 51.5% (above 50%) of the study respondents need varying degrees of help in order to use the public buildings, they use in their day-to-day activities.

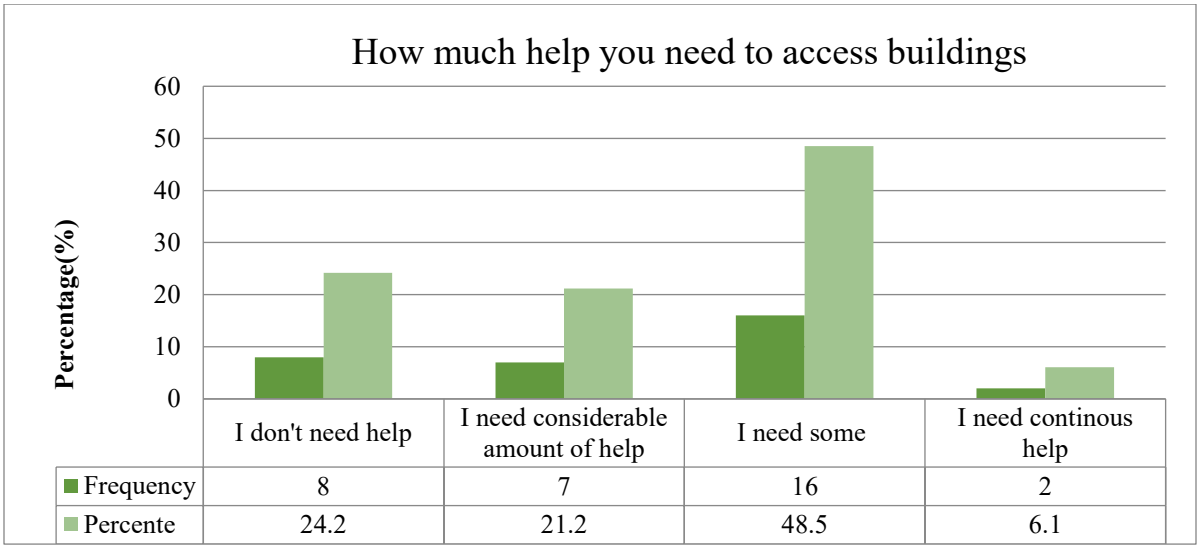


Figure 4.17: -Degree of help respondents need to access the public buildings

4.8 Key Challenges faced by PWDs

Many of PWDs lack an equal access to health care, education, job opportunities and other necessary services. One of these challenges that prevent their access to possible independence and their use of public spaces is lack of attention to their physical and mobility needs, resulting in their isolation and deprivation of their human rights. The issue of access to public buildings has received little attention in Ethiopia, leading to the deprivation of a large number of people from enjoying their legal rights on an equal footing with other members of the society. As a result, disability has caused many problems at family and societal levels, because PWDs have been deprived of accessing their human rights such as the rights to health and education and other human rights. The challenges that PWDs face while using these building differs as their disability type and assistive device they use. Below the researcher discussed the disability type and the challenges that are being obstacles for them to use without barrier.

4.8.1 Wheelchair users

In this section the researcher attempted to identify what are the key problems that wheelchair user face on public building and it was found that, the key problems on the functionality of building facility related with using barrier freely wheelchairs by disabled in the study area is indicated below in the table 4.15 according to their level of agreement. From the views of the wheelchair users; among the key problems: facing difficulties at Entrance was indicated as the first key problem with the mean score of 4.8, and ramp slop difficulties and maneuvering in tight spaces was ranked as the second with mean score of 4.60, Passing through narrow door openings and over high thresholds, passing through narrow door openings and over high thresholds and reaching high-mounted controls and objects. Ranked as the third with mean score of 4.4. The results obtained confirmed with the reviewed literatures.

Table 4.15: -Challenges of wheelchair user

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
1. Wheelchair users									
1	Face difficulties at Entrance	0	0	0	1	4	5	4.8	1st
2	Ramp slop difficulties and directional in tight spaces	0	0	0	2	3	5	4.6	2nd
3	Passing through narrow door openings and over high thresholds and directional in rest rooms.	0	0	0	3	2	5	4.4	3rd

4.8.3 People with limited walking abilities

As indicated in table 4.16 below, the mean of the opinion of the respondent in item Overcoming differences in level and Climbing stairs and ramps were 4.89 with respect to the others challenges that People with limited walking abilities face while using public building in Overcoming differences in level and Climbing stairs and ramps got the highest mean and took the 1st place on the rank. Therefore, it can be said that overcoming differences in levels and Climbing stairs and ramps of buildings area are the first key problem that People with limited walking abilities struggle with. The mean of the opinion of the respondent in item maneuvering in situations requiring speed was 4.50. The respondents agreed that maneuvering in situations requiring speed is a challenge that they face while using public building. Therefore, maneuvering in situations requiring speed is challenging factor for People with limited walking abilities to maneuver in situation which requires speed. So, these challenging factors took a place of 2nd in rank, maneuvering in rest rooms with

the mean of 4.13 and the rank of third the option of the respondents / interview, The mean of the opinion of the respondent in item slippery surfaces and passing through narrow door openings and over high thresholds were 3.63 and the rank at 4th place.

Table 4.16: - Challenges of people with limited walking abilities

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
2. People with limited walking abilities									
1	Overcoming differences in level	0	0	0	1	7	8	4.89	1st
2	Climbing stairs and ramps	0	0	0	1	7	8	4.89	1st
3	Maneuvering in situations requiring speed	0	0	0	4	4	8	4.50	2nd
4	Maneuvering in rest rooms	1	0	0	3	4	8	4.13	3rd
5	slippery surfaces	1	0	0	2	4	8	3.63	4th
6	Passing through narrow door openings and over high thresholds	1	1	0	4	2	8	3.63	4th

4.8.4 People with limited use of hands or arms

The table below summarizes the key challenges that People with limited hands use or arms facing while using public buildings facilities according to their level of agreement; and the result is shown in Table 4.17. From the views of the People with limited hands use or arms among the key problems of public building facility: Gripping door knobs was indicated as the first key problem with the mean score of 4.75, Opening heavy doors was ranked as the second with mean score of 3.50, Gripping faucets was ranked as the third with mean score of 3.25. The results obtained confirmed with the reviewed literatures.

Table 4.17: - Challenges of people with limited use of hands or arms

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
3. People with limited use of hands or arms									
1	Gripping door knobs	0	0	0	1	3	4	4.75	1st
2	Opening heavy doors	0	1	1	1	1	4	3.50	2nd
3	Gripping faucets	0	2	0	1	1	4	3.25	3rd

4.8.5 Sightless person

In this section the researcher attempted to identify what are the key problems that sightless person face on public building facilities and it was found that, the key problems of building facility related with challenges that sightless person may face in the study area is indicated according to their level of agreement; and the result is shown in Table 4.18. From the views of the sightless people among the key problems of building facility related with sightless person: Identifying obstructions within the path of travel and Locating exit doors and stairs were indicated as the first key problem with the mean score of 4.89,Lack of accessible path leading to the elevator was ranked as the second with mean score of 4.75, Orientation/direction was ranked as the third with mean score of 4.63, Maneuvering in elevators was ranked as the forth with mean score of 4.38, Lack of helping side rails facilities at the toilets was ranked as the fifth with mean score of 4.25, Recognizing emergency situations was ranked as the sixth with mean score of 3.75, and Finding Handrails was ranked as the last with the mean score of 3.5 .The results obtained confirmed with the reviewed literatures.

Table 4.18: - Challenges of people with sight problem

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
4. The sightless									
1	Identifying obstructions within the path of travel and Locating exit and stairs	0	0	0	1	7	8	4.89	1st
2	Lack of accessible path leading to the elevator	0	0	0	2	6	8	4.75	2nd
3	Orientation	0	0	0	3	5	8	4.63	3rd
4	Maneuvering in elevators	0	0	0	5	3	8	4.38	4th
5	Lack of helping side rails facilities at the toilets	0	0	0	6	2	8	4.25	5th
6	Recognizing emergency situations	1	0	0	1	5	8	3.75	6th
7	Finding Handrails	0	1	4	1	2	8	3.50	7th

4.8.6 Person with hearing impairment

In the table below the key challenges that person with hearing impairment face on public building while using them and it was found that, the key problems of building facilities that are related with disability of hearing-impaired person may face in the study area is indicated according to their level of agreement; and the result is shown in Table 4.19. From the views of the hearing impaired people among the key problems of building facility related with hearing impairment: Not hearing

door, elevator and emergency was the first rank with the mean score of 4.80, Absence of building map at the entrance get was indicated as the second key problem with the mean score of 4.70,Absences of sign for direction and Managing in situations involving the use of speech messages, verbal transmission and interaction were ranked as the third with mean score of 4.60,and Accessible rest room identified by a sign was ranked as the fourth with mean score of 3.20. The results obtained confirmed with the reviewed literatures.

Table 4.19: - Challenges of people with hearing impaired

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
5. The hearing impaired									
1	Not hearing door, elevator and emergency	0	0	0	2	8	10	4.80	1st
2	Absence of building map at the entrance get	0	0	0	3	7	10	4.70	2nd
3	Absences of sign for direction	0	0	0	4	6	10	4.60	3rd
4	Managing in situations involving the use of speech messages, verbal transmission and interaction	0	0	0	4	6	10	4.60	3rd
5	Accessible rest room identified by a sign	1	0	0	5	3	10	3.60	4th

4.8.7 Government is doing enough to improve the needs of PWDs

Figure 4.18 below shows concerning whether government is doing enough to improve the needs of PWDs in the built environment, 84.85% (n=28) responded/interviewed that the government is not doing enough to improve the needs of the disable and 15.15% (n=5) replied that it‘s doing enough. From these finding it can be said that the government is not performing in accessibility of public building issue as expected.

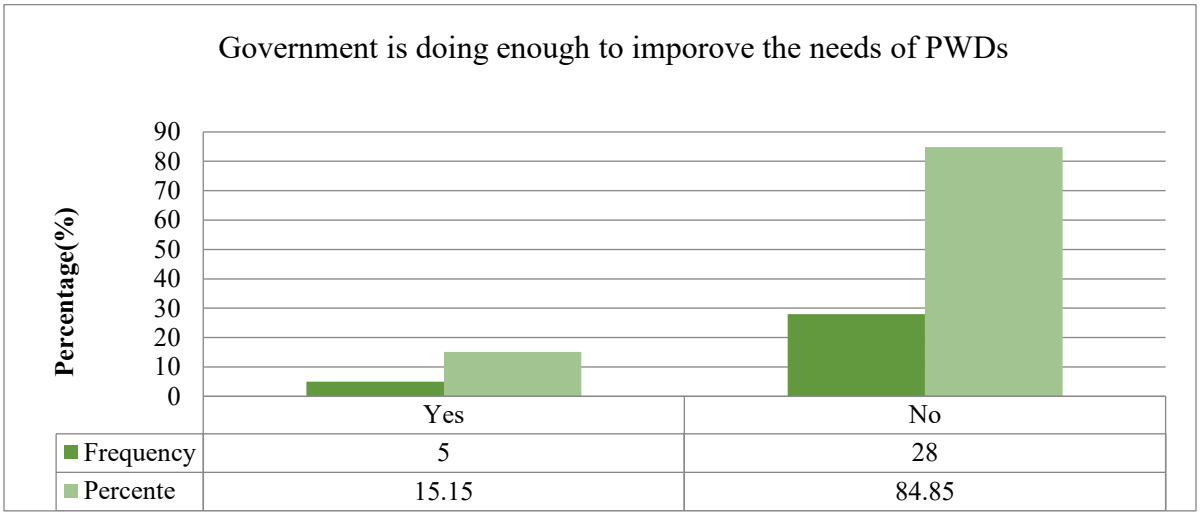
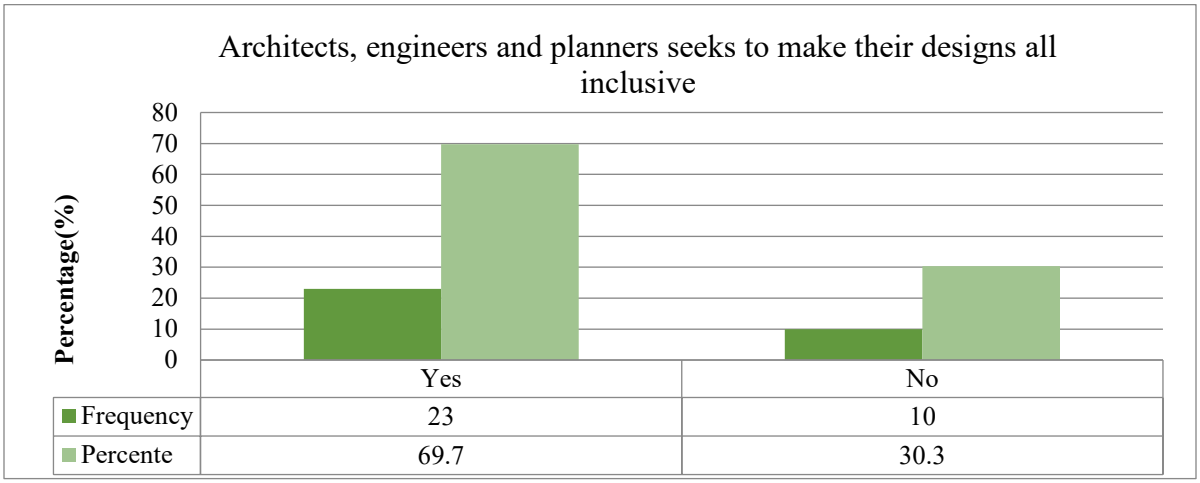


Figure 4.18: -Government level of contribution in the improvement of needs of PWDs

4.8.8 Designers performance for inclusive design

For the question which requests respondents opinion whether Architects, engineers and planners seeks to make their designs all inclusive, figure 4.19 below indicates 69.70% (n=23) replied that they think designers seeks to make inclusive designs and 30.30% (n=10) responded that don‘t think that designers seek to make inclusive design. Majority of respondents agreed that designers seek to make their design inclusive.

According to the interview disable persons were agreed designers, engineers and planners were making inclusive design, but the client and the government was not willingness especially the clients. Because of the client interest much number of rooms were getting and to calculate only the income disability not concerned. So, to conclude that government was be concerned and highly committed these challenges.

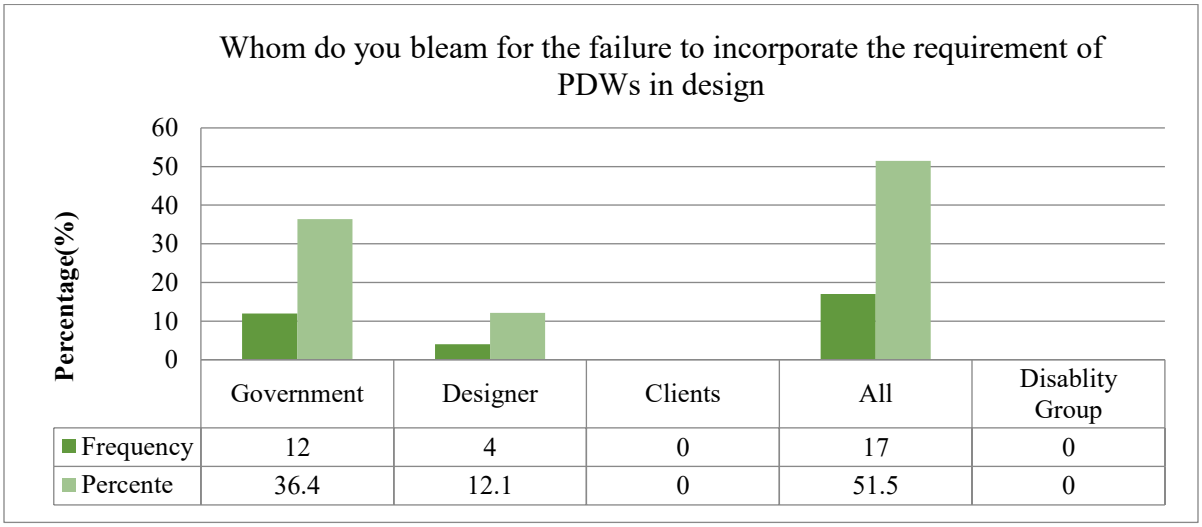


	Yes	No
Frequency	23	10
Percente	69.7	30.3

Figure 4.19: -Designers performance for inclusive design

4.8.9 The blame for the failure to incorporate the requirement of PWDs in design

Regarding the blame for the failure to incorporate the requirements of PWDs in the designs of public buildings, there were five choices for the respondent where the blame goes to Government, Designers, Clients, Disability Groups and finally all and figure 4.20 below shows51.5% (n=17) responded that all were to be blamed which were government, designers, clients, disability group, 36.4% (n=12) replied that government designers was to be blamed and 12.10% (n=0) replied that designers was to be blamed. Therefore, this finding lead to totally say for the failure to incorporate the requirement of PWDs in design of public building were the government, designers, clients, PWDs and all who are concerned with these issues.



	Government	Designer	Clients	All	Disablity Group
Frequency	12	4	0	17	0
Percente	36.4	12.1	0	51.5	0

Figure 4.20: -The blame for the failure to incorporate the requirement of PWDs in design

4.8.10 Changes these days in inclusiveness of public buildings

Concerning whether there is a change in the inclusiveness of public building these days, figure 4.21 below shows 60.6% (n=20) replied that there are change in the inclusiveness of public buildings now a day and 39.4% (n=13) responded that there is no change in the inclusiveness of public building in the city. Therefore, can be summaries as there are some changes in the inclusiveness of public buildings now a day.

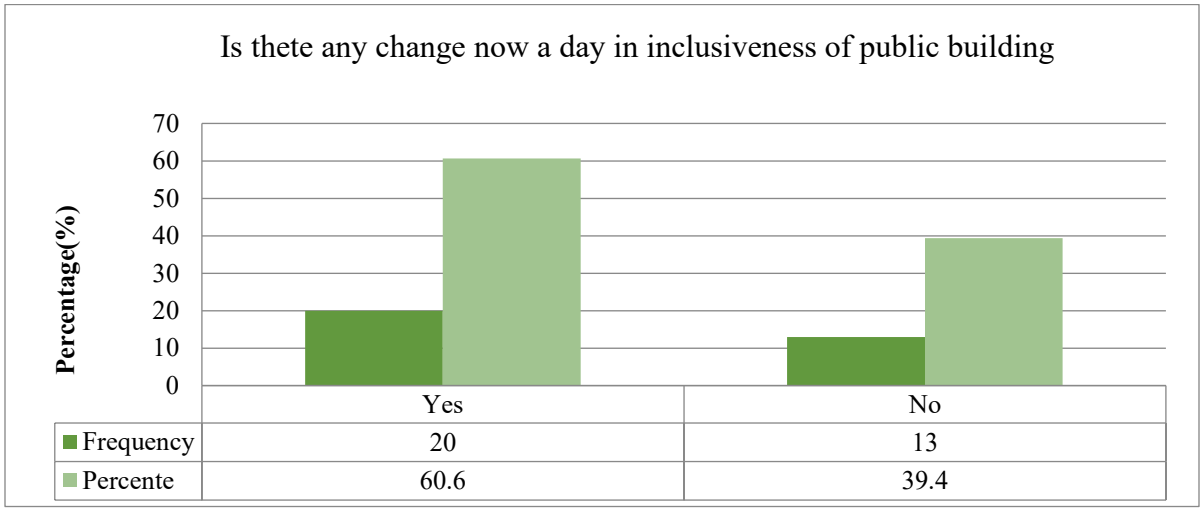


Figure 4.21: - Frequency and Percentage change in inclusiveness of public buildings

4.9 Site Observation

The presentation below shows all the result from the observation that has been done to all the ten purposively selected critical public buildings. Based on the list that has been provided, if the facilities follow all the requirements in the list it was marked with '/' and for the facilities that did not follow the list it was marked with "X", while those facilities were not provided at all was marked with 'NA'. During the technical visit, all the facilities have been strictly observed to ensure that all the results are valid. This process of information gathering afforded the researcher the opportunity to have first-hand information and actually see and experience what is on the actual efficiency and availability of public building facilities for PWDs.

4.9.1 Observations and Findings

The public buildings observed were grouped based on their use and service they provide for the society. All buildings observed were with three floors and above. The number of buildings was restricted by the barriers of time, client interest and covid 19 during observation of the buildings.

The summary of types and number of buildings studied are shown in Table 4.20 total of 15 public buildings were observed.

Table 4.20 1:-Summary of random selected public buildings observed

No.	Building Type	Number of buildings
1.	Mixed use buildings	12
2.	Apartment	2
3.	Office	1
	Total	**15**

4.9.2 Entrances

According to Ethiopian standard, the entrance of the building must be free from any obstacles and must be easily accessible by everybody especially disabled people. Based on the observation, all the 15 public building followed this requirement. Besides, the entrance also connected with the pathway that leads to the entrance. Also, none of the buildings provide the tactile floor for visually impaired people. The tactile floor is one of the requirements that buildings does not fulfill with. As there are differences in level between the road surface and pathway level at building entrances. As shown in table 4.21 below, nine (9) of the buildings (73.30%) are with ramps and steps for access to able and disabled people. The remaining 26.70% are with only steps to provide for able and disabled people. In the observed buildings 53.3% of entrance accessible with not pathways, 40% of the buildings were with entrance accessible, and the reaming 46.70%. Entrance is provided with tactile floor as well ramps for disable 80%, the remaining 20%was lack this functional requirement.

Table 4.21: - Functional requirements of entrance checked on critical public building

Facility	**Functional Requirements**	**Number of buildings that conform with the functional requirement**	**Number of buildings that do not conform with the functional requirement**	**Number of buildings that functional requirement not available**
Entrance	The entrance is free from any obstructions	9	6	0
	The entrance accessible with pathways	7	8	0
	The entrance is provided with tactile floor and ramps for disable	12	3	0

The figures 4.22 below shows some of the observed entrance of buildings and their provision of functional requirements (i) shows the provision of separate entrance which is free from any obstructions and anti-slip steps, (ii) shows entrance having steps without disable ramp being, (iii) entrance steps with obstacle for PWDs, and (iv) Shows an entrance step with disable ramp, it is not accessible for PWDs observed around the selected buildings.

i. Painful entrance for PWDs

ii. High gradient disable ramp

iii. Entrance barrier

iv. Car parking obstacle the main Entrance

Figure 4.22: - Sample image for entrance observed

According to literature reviewed Australian Government,2013 and B. Kyei-dompim, 2010 Entrance areas should be accessible, easy to find, well-lit and supported with clear and consistent signage. But the above images are not comfortable disabled persons are entered into the buildings.

4.9.3 Signage

Based on the literature reviewed, all signage on disabled facilities needs to be visible, clear, simple, and easy to read and understand by all people. These requirement features must be fulfilled according to the standard requested by Ethiopian Standard. Besides, the symbol used by all the signage needs to be a universal symbol. Also, needs to be located at the appropriate Passion and not hidden from the sight. As of this study, more than 80% of the buildings looks (observed) are not providing signage. The deficiencies in the signage available are as follows: lacks of directional signs, available signs are unclean, not readable at night, and the others are not available signage. Images are not captures during the observations of two buildings the owners are not interesting capture the buildings. The results were summarize seen in table 4.22 below.

Table 4.22: - Functional requirements of signage checked on critical public building

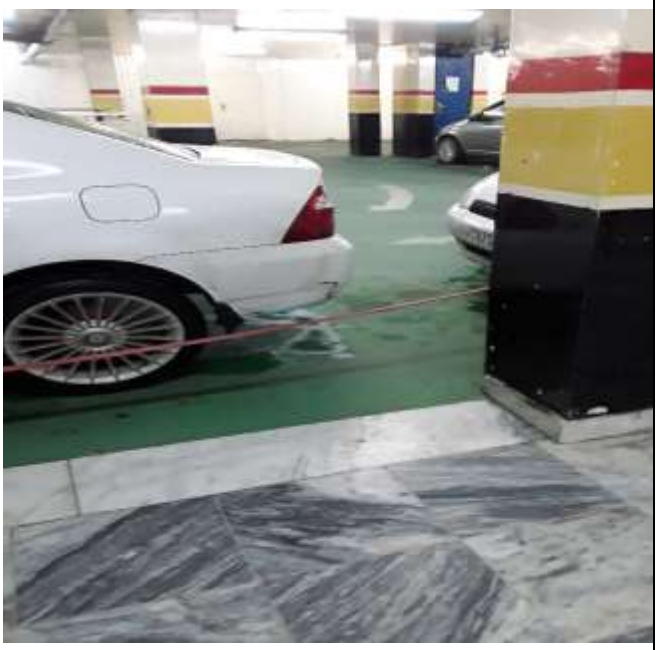
Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
Signage	The signage is clearly seen by all people	2	12	1
	The signage is marked with universal symbol	2	12	1

4.9.4 Parking

It is a requirement to provide parking space for disabled people as stated in the standard requirement that has been used worldwide. This requirement is important as disabled people must have a special privilege to access to the public building. According to Ethiopian standard, American with Disabilities Act 2010, Australian Standard and others, the minimum space for disabled parking should not be less that 3600mm width as space for wheelchair movement. Base on the observation, 73.33% of the parking area observed was free from any obstructions, 73.33% of the parking area is not marked with universal symbol, and 66.67% of the parking space is not located near to the entrance. As shown in table 4.23 below

Table 4.23: - Functional requirements of parking checked on critical public building

Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
Parking	The parking area is free from any obstructions	11	2	2
	The parking area is marked with universal symbol	2	11	2
	The parking space located near to the entrance	3	10	2



i. Parking with universal sign.

ii External parking

Figure: - 4.23 Sample image for internal and outside the building parking

The above pictures are to show that, the first image to indicate the parking area is marked with universal symbols from the literature reviewed and the second image to indicate that the parking is outside the building and the parking is obstruction to entrance, according to Australian

Government,2013 and B. Kyei-dompim, 2010 the parking area is free from obstructions. So, the second picture to indicate the parking is out of the standard.

4.9.5 Staircase

Staircase is one of the facilities that majorly used by the people in public buildings. Hence, the staircase needs to be barrier-free and constructed according to the requirements that provided in Ethiopian Building Code Standard (EBCS-G). Stairs are provided in all of the buildings observed (i.e., for buildings above one floor). The functional state of the stairs is summarized in Table 4.23, 53.33% (n=8) of the critical public building observed were providing handrail both side, 46.67% (n=7) of observed were not providing both side handrail. The second functional requirement Continuous handrails provision, of the public buildings observed 53.33% has provided both sides of staircase. Therefore, the major deficiencies observed are with Continuous Handrail being provided on the stair ranked at second and the non-availability of Braille inscription at the handrail at all.

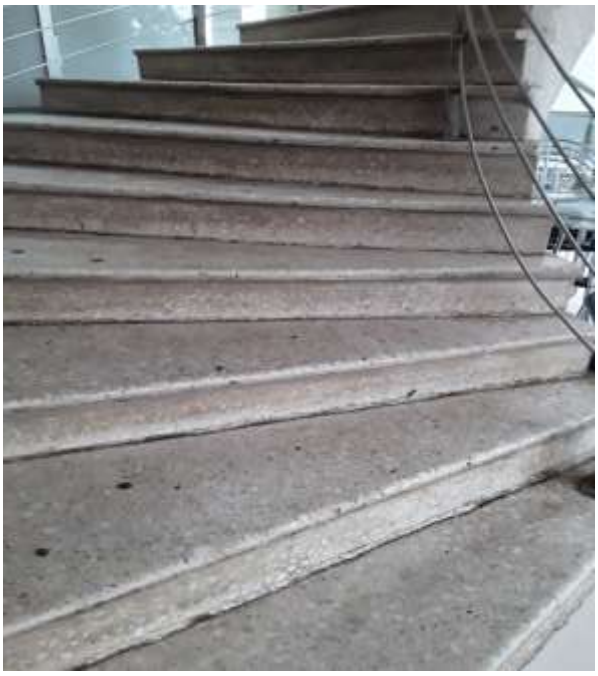
Table 4.24: - Functional requirements of staircase checked on public building

Facility	**Functional Requirements**	**Number of buildings that conform with the functional requirement**	**Number of buildings that do not conform with the functional requirement**	**Number of buildings that functional requirement not available**
STAIRCASE	Handrail provided both side of stair	8	7	0
	Continuous handrails provided	11	4	0
	Braille inscription at the handrail	0	0	10

The figures 4.24 below shows some of the stairs on the visited buildings and their provision of functional requirements (i) shows the provision of handrail both side of stair and handrail continuity was done, (ii) shows the provision of handrail provided only one side of the stair, (iii) shows circular staircase with two side of handrail which was continuous throughout the stair but there wasn't comfortable and (iv) shows old building with of one-sided continuous handrails.

i. Both side handrail & continues stair

ii. One side handrail



iii. A spiral stair with one side handrail

iv. Dark and one side handrail

Figure 4.24: - Observed Sample images of stair cases.

According to Australian Government,2013 and B. Kyei-dompim, 2010, the above pictures except number (i) handrail are not provided both sides, handrail continuous provide all pictures and there isn't Braille inspection at the handrail all the observed buildings.

4.9.6 Ramps

A ramp is another mode of access that is commonly utilized by disabled individuals. People who are physically or visually challenged the use of the ramp. It can help PWDs, particularly those in wheelchairs, move more easily. According to Ethiopian building proclamation it is required on all buildings above four floors to be provided with elevators.60% (n=9) of buildings observed provided entrance ramps but the majority of the buildings were not comfortable for PWDs. The table 4.25 shows the functional requirements of ramps that; 46.67% (n=7) of building observed were confirmed with the functional requirement which ramp needs to be full of obstructions, 53.33% (8) the ramp should within the given width standards, there is handrails provided on both sides doesn't conform with the functional requirement, and also ramp should have gentle gradient and the rest which is the same as the above 53.33% (n=8) were observed building which didn't meet the functional requirements.

Table 4.25: - Functional requirements of ramps checked on public building

Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
Ramps	The ramp is free from any obstructions and anti-slip	3	7	5
	The ramp should at least 1200mm wide	8	4	3
	There are handrails provided on both sides	7	8	2
	The ramp should have gentle gradient	5	8	2

The figures 4.25 below shows samples of the ramps observed on the visited buildings and their provision of functional requirements (i) and (ii) shows the provision of there wasn't handrail and

highly gradients/sloppy ramp, (iii) the picture to shows sheet metal ramp without any protection handrail and symbolic ramp. During the observation about 33.30% (n=3) buildings are to some extent within the standard, the reaming 66.70% (n=10) are almost no disable ramps. So, PWDs are not comfortable and do not meet the set standards.

i. Sloppy gradient and slipper floor finish

ii. Purposely slotted floor finish and sloppy gradient

v. None slipper floor finish and sloppy gradients

Figure 4.25: - Sample image for ramps observed

According to the literature reviewed Australian Government,2013 and B. Kyei-dompim, 2010, the above images are not full fill the standards. Because disable ramps are provide handrail both side and the ramp should have gentle gradients. So, almost all buildings are provided disable ramp but the ramps are not functional in the case of gradients, slipper floor finish uses and both sides handrail not provided.

4.9.7 Elevators

All the 11 buildings having more than 6 floors are provided with elevators. The other 2 building don ‘t has elevator and 2 buildings are having an elevator but the elevators are not functional. However, some of them did not fulfill the requirements that come with the elevator. The functional state of the elevators is shown in Table 4.26 Major deficiencies identified are even though there are elevators most of them are not giving function, five building the elevator which are giving service have button with Braille code but voice projection is not functional for visually impaired people, the space being accessible for wheelchair users about 60% of the buildings are within handrail but the others are not being provided in side of the elevator. However according to the standard all public buildings needs fulfills the requirements by providing elevators with expected functionality.

Table 4.26: - Functional requirements of elevators checked on public building

Facility	**Functional Requirements**	**Number of buildings that conform with the functional requirement**	**Number of buildings that do not conform with the functional requirement**	**Number of buildings that functional requirement not available**
Elevators	The button is accessible for wheelchair user	9	4	2
	Braille code and voice projection for visually impaired people	5	5	5
	The space is accessible for wheelchair user	7	4	4
	Handrails provided in the elevator	7	5	3

The figures 4.26 below shows some of the observed elevators which help to maneuver vertically and their provision of functional requirements (i.) show an elevator with accessible inside button, without handrail provided in all three sides, the space good accessible for wheelchair users and voice projection shows an elevator which is not giving service at all, (ii.) Shows panoramic elevator which has got both sides providing handrail and inside area accessible for wheelchair

users, (iii.) the elevator shows Braille code and voice projection for visually impaired people, and (iv.) shows an elevator within three sides are provide and sufficient access for wheelchair users.

i. There isn't Braille code and handrail

ii. Only provided a handrail

iii. Braille code Butten use.

iv. Three sides of handrail

Figure 4.26: -Sample images for elevators observed

According to the literature reviewed Australian Government,2013 and B. Kyei-dompim, 2010, the pictures show that don't include the given standards the images are not completed use the standards i.e., Braille code and voice protection, handrail provided at least two sides of the elevator and install a non-slipper floor.

4.9.8 Restrooms

Restrooms are available in all of the public buildings but most of them were locked and not giving service for the public. However, the researcher observed their functionality. There was only one building which got separate rest room for disable, 93% of the toilet door is accessible for wheelchair user,80% of the toilets floor were not slippery, 40% of the observe public buildings has got the area of the toilet which is enough to fit wheelchair. The deficiencies observed is the absence of indicating sign, handrails inside, the toilet not being on the same block, being lock in need of use, narrow corridors leading to the toilet, cleanness and not being comfortable for PWDs use. Also during the observation one building was not comfortable the case of floor label difference form corroder to toilet floor. As shown in table 4.27 below

Table 4.27: -Functional Requirements of Restrooms checked on critical public building

Facility	**Functional Requirements**	**Number of buildings that conform with the functional requirement**	**Number of buildings that do not conform with the functional requirement**	**Number of buildings that functional requirement not available**
Restrooms	The toilet is separated for PWDs	2	13	0
	The door is accessible for wheelchair user should not less than 900mm wide	14	1	0
	the area of the toilet is enough to fit the wheelchair	6	9	0
	The floor should not be slippery	12	3	

The figures 4.27 below shows some of the observed restrooms and their provision of functional requirements (i.) shows restroom which is better for PWDs to use and with not slippery floor (ii.) Shows restrooms which are not accessible for users with disability, have got challenges like not being enough to fit wheelchair.

i. Comfortable toilet

vi. Narrow door toilet

Figure 4.27: - Sample images for restrooms observed

For the other obstacles, the toilet seat and access are to some extent good for PWDs during the observation of the structures. However, in all types of buildings, signage for hearing impaired people, Braille coding, and voice projection for visually impaired persons are more improvements.

CHAPTER - FIVE

5 Conclusions and Recommendations

The conclusions and recommendations generated as a result of the findings of the analysis of efficiency and implementation issues of accessible building amenities in public buildings in Addis Ababa are discussed in this chapter of the study.

5.1 Conclusions

According to the findings, the importance of barrier free infrastructure in built-environment on empowerment is strongly highlighted by these disabled persons and that is accepted by the facilitators and policy makers as well. These stake holder parties agree on the fact that currently barrier free access is not properly practiced in public buildings in Addis Ababa, hence unacceptable and it has affected the empowerment of disabled persons considerably. Despite the fact that people with disabilities account for 17.6% of the Ethiopian population, little has been done to ensure that people with disabilities have access to public facilities in Addis Ababa. The following are some of the conclusions reached:

1. In Addis Ababa, the consideration of disability in the design and construction of public buildings, research results show that over half of those in charge of making decisions about the built environment have a low level of understanding about inclusive, accessible, and universal design.
2. As a result, the majority of the designs given were universal or inclusive but currently not done. Even if impairments were provided for/considered in design, the most frequently considered one was all types of disabilities, which was mentioned by 48.19 percent of the respondents.
3. Building facilities such as ramps, tactile, signage, warning markings, employing contrasting colors, and railings are mostly added in the design by 78.92 percent of the respondents, according to the findings.
4. The results reveal that affordable building facilities are not difficult to construct during the construction stage, but the designers (engineers) who confirm the accessibility of buildings while supervising the construction site accounted for almost 70% of the respondents. This quantity is insufficient to make a significant difference in building ease of access. As a result, it is expected that departments such as architects and

engineers working in offices and on the job sites, as well as government representatives and regulatory bodies, work together to establish a barrier-free environment for all corporate activity.

5. When asked if there is an enforcing/mandatory law that mandates the inclusion of public facilities, 84.94 percent of respondents said yes. As a result, simply acknowledging international declarations and having documented legislation and rules is insufficient. According to our country's circumstances, the government must be carried out with competent local law enforcement.
6. Buildings that are easily accessible as a result of the outcomes of this study, greater focus was placed on professional ethics, and more exercises in inclusive/universal design and construction were done. As a result, parties such as the government, designers, building clients, and disability groups are all working to make buildings more accessible. Designers/engineers in particular, as well as government regulatory organizations.
7. When it came to assigning blame for the failure to incorporate PWDs' needs into public building designs, the respondent had five options, with the government, designers, clients, and disability groups all taking responsibility for the failure to incorporate PWDs' needs into the designs and construction.
8. The study examined the elements that contribute to the problems of implementing accessibility public building amenities for people with disabilities. The findings revealed that the installation of accessible building facilities is hampered by a number of challenging variables that have been identified. According to the respondents' rankings, the most important one is:
    - Lack of enforcement of the law
    - Lack of awareness for consulting and Contractors about the law
    - Lack of coordination between departments
    - High Cost and Time taken of designs which incorporate the needs of PWDs
    - Inadequate policies and standards
    - Lack of technical persons / Government supervisors and involvement of PWDs in decision making

- Complexity of designs which incorporate the requirements of PWDs
- Ineffectiveness of disability groups

9. PWDs responded that most public buildings are - closed to them and that lacks key facilities which greatly restrict their activities. It was clearly identified that; our public buildings lack the designing and the construction of buildings to the disabled as far as accessibility to our built-environment. Among the deficiencies identified with public buildings that are inaccessibility and non-compliance for PWDs are parking, entrance, signage, path ways, ramps, doors, elevator, stair, hand railings and toilets.
10. Most of the respondents accepted the fact that, there is a change these days in newly constructed buildings as well in the enforcement of the law to provided accessible building. But older and currently inaccessible buildings need improvements to upgrade them to the level which make them disable friendly. Therefore, designers need to come up with upgrading or improving solution for the existing inaccessible buildings and needs to work or provide and construct accessible public building according to the standards, codes and proclamation for future.
11. The observation results of this research indicate that all the fifteen buildings surveyed have serious deficiencies as far as accessibility to their built facility functionality is concerned. In terms of provision of facilities for disabled people.
12. Facilities for PWDs in and around the ten buildings, such as car parks, ramps, directional signs, and hand rails are not adequately provided and should be improved. The greatest levels of deficiency were observed in and around the two older buildings. These buildings are need major retrofitting to make them accessible to PWDs.

5.2 Recommendations

People with disabilities experience building infrastructure problems is not an end itself, so that could assist Consultants, government Supervisors, contractors, and people with disabilities in improving public building infrastructures. This would improve the lives of the Disabled persons as well as everyone else; ultimately, the study recommended based on the study's findings. some possible ways for the problems that are encountered by persons with disabilities as follows:

5.2.1 Designers (engineers)

- To reduce ignorance, designers must be addressed through public buildings and exposure to typical works. Furthermore, professional training programs might influence their mindset.
- Throughout the planning, design, and consulting stages of projects, universal accessibility standards must be followed.
- Different handicap kinds, such as wheelchair users, persons with walking issues, and those who are blind, deaf, or hard of hearing, should be considered in the design and building stages, with elements that support them.
- Ensure that all disabled facilities are addressed at the building stage, as this ensures that all facilities are provided in compliance with the specifications.
- Training with PWDs is required to assist the architect in identifying the issues that PWDs experience and known the factors affecting disability accordingly our country.
- Professionalism ethics are vital to technically skilled people since danger can occurrence at any moment. As a result, planners, designers, and government regulatory agencies adhere to the established standards, norms, and laws and to execute cooperatively.
- Increasingly obstacle - free facilities, particularly in all types of public buildings, are needed, in order to escape the limitations that disabled persons have been experiencing
- Building regulations bodies and rules in Addis Ababa / Ethiopia need to be revised so that they incorporate the required control that regulates the design criteria for this group of individuals.

5.2.2 Government

- Buildings for public services must be constructed in a way that is accessible to people with disabilities, according to Addis Ababa City Government construction rules no. 17/2004.

However, this legislation does not go into great detail when it comes to ease of access. However, a decision issued by the government's infrastructure development and civil works agency has left the details to be determined. Therefore, despite the fact that the expected directive no. 1 to address the access needs of PWDs in detail was released in 2005, the matter as a whole was ignored. As a result, both the rule and the directive should be modified to include all accessibility issues in order to better meet the needs of PWDs.

- Review the Addis Ababa City Government's building standards regarding accessibility of public buildings for people with disabilities so that they can be provided in detail as a
- Government consultants must ensure that all public buildings are accessible to disabled people and that the building facilities are accessible to handicapped people.
- Developed countries' knowledge and experience should be shared in the development of access legislation and enforcement practices.
- Before permission is issued, all designs or drawings must be thoroughly examined to ensure that they conform to the law's requirements, as well as stringent management.
- Punishing individuals who do not follow the rules and regulations in order to create a more accessible environment.
- Professional ethics are be upheld by government consultants and design approval personnel.
- The governance is accountable for checking and balancing the design/drawings in accordance with the rules and regulations. Because corruption is common in the construction industry.
- Obstacles are more difficult for disabled persons to overcome than for normal people, the government should encourage them to work.
- Government must be carried out by the right person at the right time in the right place. As a result, the local government is working harder to execute and engage with stockholders, particularly private consulting firms and PWDs.
- Finally, the codes, laws, and standards were recommended, and they virtually changed the context of our country.

5.2.3 PWDs

- Making representations of their barriers and challenges when using buildings in collaboration with the planning and construction team. to city councils and municipal governments
- Raising community understanding of the various conceptions of disability.
- PWDs must raise awareness about the obstacles they experience in the built environment, emphasizing that everyone is responsible for ensuring that all disabled facilities are in good working order and have never been mistreated.
- Increasing knowledge of PWDs' legal rights between professional bodies and judicial authorities.
- To execute for PWDs organizations are with the construction sector in the minister stages.

5.3 Recommendation for future study

- In the instance of Addis Ababa, Ethiopian buildings, assessing the problems of physically challenged folks walking way in to access.
- Assessing the challenges of PWD-friendly road infrastructure use in Addis Ababa city, Ethiopia.
- Assessing the environment comfortable for PWDs easily accessing the buildings free-from any obstacle in the case of Ethiopian Construction Industry.

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APPENDIXES

RESPONDENTS QUESTIONNAIRE

Dear respondent,

The aim of this questionnaire is to obtain necessary data for the partial fulfillment of an MSc thesis in Construction Technology and Management at Addis College. The objective of this thesis is to assess the "***Factors affecting accessibility of building infrastructure by physically challenged persons: the case of Addis Ababa city, Ethiopia***." Therefore, you are kindly requested to contribute to this research work by completing this questionnaire.

The identity of the respondent and that of the company you represent shall remain confidential and all data's found from the survey are only be used for an academic purpose. I would like to extend my gratitude for taking your precious time to respond to this questionnaire. If you have any investigation, please contact through the following addresses.

Tesfaye Solomon

Post Graduate Student at Addis College, school of Construction technology and management stream

Email: ts4444944@gmail.com

General Information

Please tick mark (√) in the appropriate box.

Section A: Background Information.

1. Classification of your organization ……

2. Your position

Resident Engineer ☐ Architect ☐ Site Supervising Engineer ☐
Office Engineer ☐ quantity surveyor ☐ Project Manager ☐

If other, please specify …….

3. Educational Background

Master's ☐ Degree ☐

Diploma ☐ If other, please specify …….

4. Years of experience in the construction industry

1 - 5 years ☐ 6 - 10 years ☐

11-15 years ☐ 16 - 20 years ☐ > 20 years ☐

Section B: Disability concern in design and construction

1. Do you know anything about inclusive/ universal design?

- Yes ☐
- No ☐

2. What is the level of knowledge about universal/inclusive design?

- Fair ☐
- High ☐
- Very high ☐

3. Does your company provide inclusive (universal) design to its customers (clients) sufficiently?

- Yes ☐
- No ☐

4. Which of the following Disability types are considered during designs?

Eyesight ☐ Mobility ☐ All ☐

Hearing Cognitive ☐ Mobility and eyesight ☐ Mobility and hearing ☐

- Can you list some of the design or construction solution for the disabilities that you provide?

A. Eyesight ----------

B. Hearing ----------

C. Mobility ----------

D. Others ----------

1. Do Ramps and Visually impaired features like tactile warning markings, using contrasting colors, handrails and curbs etc… have been added to the design initial?
   - Yes ☐
   - No ☐
2. Does your company make sure that buildings are usable (accessible) for PWDs while supervising construction sites?
   - Yes ☐
   - No ☐
3. Accessible building facility, does it have any difficulties while construction?
   - Yes ☐
   - No ☐
4. Is it a finishing work or structural member?
   - finishing work ☐
   - structural member ☐
   - Both ☐
5. Is there an enforcing and mandatory law which strictly dictates for the inclusiveness of buildings in Ethiopia?
   - Yes ☐
   - No ☐
6. Do you integrate the requirements of the code in the design and construction of public buildings?
   - Yes ☐
   - No ☐
7. Do you think the law on design permit stage of designs being universal/ inclusive is being practiced properly?
   - Yes ☐
   - No ☐
8. Do you think the law concerning accessibility of buildings on use permit after construction is being practiced properly?
   - Yes ☐
   - No ☐
9. Is there a controlling unit who monitors universality of the building is maintained?
   - Yes ☐
   - No ☐
10. Is there any change now a day in inclusiveness of public building designs through time?
    - Yes ☐
    - No ☐

Section C: Challenging factor for constructing accessible buildings.

Most newly construct public buildings remain disability unfavorable. The needs of the disabled are not considered in the design of these building facilities. This is due to different factors; some of them are listed below in the table. Therefore, one can show how significant the factors are by making a mark using the numbers.

On a scale of 1 – 5, please indicate your opinion of the challenges which weigh against the implementation of accessible building facility for person with disability (PWD) in public buildings.

1 = highly insignificant 2 = insignificant 3 = neutral 4 = significant 5 = highly significant

Item	***Descriptions of Challenges***	***Level of Significance***				
No	**Challenging factors**	**1**	**2**	**3**	**4**	**5**
1	Lack of public awareness about law/policy					
2	Complexity of designs which incorporate the requirements of PWDs					
3	High Cost of designs which incorporate the needs of PWDs					
4	Lack of enforcement of the law/policy to force designers					
5	Weakness in the provisions of the law/policy					
6	Inadequate policies and standards					
7	Ineffectiveness of Disability members					
8	Lack of Knowing law/policy of disabled associations firms					
9	Negative attitudes towards the disabled					
10	Lack of budget allocation for implementation					
11	Lack of technical persons / Governmental Consultation and involvement for the stage of design up to construction, the case of accessibility of PWD's.					
12	Lack of coordination between departments					
13	Scarce of land / insignificant amount of built up area.					
14	Lack of capability of professional's status.					
15	Lack commitment the ethics of professionalism					

16. What is the level of commitment of client in the provision of access for the disabled?

High ☐ Medium ☐ Low ☐

17. Inclusive design, does it have any change on the overall cost of the project?
    - Yes ☐
    - No ☐
18. Whom do you blame for the failure to incorporate the requirements of PWDs in the designs of public buildings?

(a) The Government (b) Designers (c) Clients (d) Disability Groups (e) All

(f) If others, please specify …….

Section D: key building facilities that needs improvement

Please read each statement and indicate your level of agreement/disagreement as it relates to your experiences in designing and construction. You are provided a space to describe any statements you strongly disagree with.

1=Strongly disagree 2 = Disagree 3= Neutral 4= Agree 5= Strongly agree

No	Building capability of enhancement:	1	2	3	4	5
	1. Parking					
1	Accessible parking on building area needs to be adequate.					
2	Sidewalks on building area needs to be are adequate.					
3	Indicating signs needs to be easy to read and understand.					
4	Curb cuts on building area need to be adequate.					
5	Curb cuts should be located where they are needed.					
6	Building Parking entrance with NGL (natural Ground level) is to be done moderate slope.					
Please, if any comment on question that you answered "strongly disagree" in space below ……. ……. …….						
	2. Entrances					
7	The primary entrances to buildings need to be accessible.					
8	The approach to the entrance free of stairs and steps.					
9	Accessible building entrances needs to be easy to identify.					
10	Accessible building entrances should be adequate.					
Please, if any comment on question that you answered "strongly disagree" in space below ……. ……. …….						
	3. Signage					
10	There should be directional signs indicating the location of accessible facilities					
11	Maps, information panels and wallmounted signs should be engaged.					
12	Signs must be clear, simple and easy to read.					
13	The color of signs needs be clearly distinguishable.					
	4. Pathway					
14	The pathway needs to be clear of obstructions.					
15	The path of travel needs to be free of steps or stairs.					
	5. Ramps					
16	There should be a corresponding ramped route adjacent to stairs or steps.					
17	The surface of ramps needs to be non-slip.					
18	The ramp surface needs to be clear of obstructions.					
19	The location of the ramp must be clearly identifiable.					
No	**Building capability of enhancement:**	**1**	**2**	**3**	**4**	**5**

	1. Doors					
20	Doors needs be opened without much effort.					
21	Door handles needs to have a shape that is easy to grasp with one hand.					
22	There should be sufficient space beside the latch side of the door.					
	2. Elevators					
23	There should be an accessible path leading to the elevator.					
24	The elevator cab needs to provide handrails on three sides.					
25	The elevator door easy to identify.					
26	The door opening/closing interval needs to be long enough.					
27	The elevator door easy to identify.					
	3. Stairs					
28	Width of the stairs needs to be adequate.					
29	Treads need to be with a non-slip surface					
30	The location of the stairs must be clearly identifiable.					
	4. Railings and Handrails					
31	The handrails must be easy to hold.					
32	The railings must be securely friendly.					
33	The handrails must be continuous throughout the full length of ramps and stairs.					
34	Low positioned windows at landings must be protected by railings.					
35	Handrails must be easy to identify.					
Please, if any comment on question that you answered “strongly disagree” in space below ……. ……. …….						
	5. Toilet					
36	There should be accessible rest room identified by a sign.					
37	There should be necessary space inside the rest room to operation a wheelchair.					
38	There should be helping side rails facilities at the toilets.					
39	The flooring material needs to be skidproof, well drained and waterproofed.					
40	The flushing mechanisms need to be easy to operate.					
Please, if any comment on question that you answered “strongly disagree” in space below ……. ……. …….						

QUESTIONNAIRE FOR PERSON WITH DISABILITIES

Dear respondent,

The aim of this questionnaire is to obtain necessary data for the partial fulfillment of an MSc thesis in Construction Technology and Management at Addis College. The objective of this thesis is to assess the "***Factors affecting accessibility of building infrastructure by physically challenged persons: the case of Addis Ababa city, Ethiopia.*** "Therefore, you are kindly requested to contribute to this research work by completing this questionnaire.

The identity of the respondent and that of the company you represent shall remain confidential and all data's found from the survey are only be used for an academic purpose. I would like to extend my gratitude for taking your precious time to respond to this questionnaire. If you have any inquiry, please contact through the following addresses.

Tesfaye Solomon

Post Graduate Student at Addis College, school of Construction technology and management stream.

Email: ts4444944@gmail.com

General Information

1. Group of special need/ impairment?
   [ ] Physical [ ] Hearing [ ] Speech [ ] Visual [ ] Mental [ ] Multiple others (specify)……
2. Cause of impairment?
   [ ] congenital (present at birth) [ ] acquired (developed later in life)
3. Do you use any assistive device?
   [ ] Yes [ ] No
4. If yes to Q4; which type of assistive device do you use?
   [ ] wheelchair [ ] white cane [ ] crutches [ ] cane [ ] calipers [ ] other (specify)…….. [ ] None
5. How much help to you need to access the built environment?

[ ] I don‘t need help [ ] I need considerable amount of help

[ ] I need some help [ ] I need continuous help

Section one: disability and problem faced

Please read each statement and indicate your level of agreement/disagreement as it relates to your experiences in different public building. You are provided a space to describe any statements you strongly disagree with. As a final step please provide mark (√) your level of agreement from your related disability.

No	Problems faced:	Strongly disagree	Disagree	Neutral	agree	Strongly agree
1. Wheelchair users						
1	Face difficulties at Entrance.					
2	Ramp slop difficulties.					
3	Passing through narrow door openings and over high thresholds.					
4	Directional in tight spaces.					
5	Maneuvering in rest rooms.					
6	Reaching high-mounted controls and objects.					

Please, if any comment on question that you answered "strongly disagree" in space below

…….

…….

2. People with limited walking abilities						
No	**Problems faced:**	**Strongly disagree**	**Disagree**	**Neutral**	**agree**	**Strongly agree**
7	Maneuvering in situations requiring speed.					
8	Climbing stairs and ramps.					
9	Slippery surfaces.					
10	Maneuvering in rest rooms.					
11	Passing through narrow door openings and over high thresholds.					
Please, if any comment on question that you answered "strongly disagree" in space below …… ……						
3. **People with limited use of hands or arms**						
12	Opening heavy doors.					
13	Gripping door knobs.					
14	Gripping faucets.					
Please, if any comment on question that you answered "strongly disagree" in space below …… ……						
4. The sightless						
15	Orientation					
16	Identifying obstructions within the path of travel.					
17	Finding Handrails					
18	Lack of helping side rails facilities at the toilet.					
19	Maneuvering in elevators					
20	Lack of accessible path leading to the elevator.					
21	Recognizing emergency situations.					
22	Locating exit doors and stairs.					
Please, if any comment on question that you answered "strongly disagree" in space below …… ……						
5. The hearing impaired						
23	Managing in situations involving the use of speech messages, verbal transmission and interaction.					
24	Not hearing door, elevator and emergency.					
25	Absences of sign for direction.					
26	Absence of building map at the entrance gets.					

27	accessible rest room identified by a sign					

Please, if any comment on question that you answered "strongly disagree" in space below

…….

…….

1. What other challenges have you been facing while using public buildings?
   I. ……
   II. ……
   III. ……

28 What are your impressions about the accessibility of the disabled to the built environment at public buildings?

(a) It is normal (b) It needs more improvement

29 How would you rank the level of accessibility and safety of using the public building in general?

(a) Highly inaccessible (b) Inaccessible (c) Accessible (d) High accessible

30 In your opinion do you think the government is doing enough to improve on the needs of the disabled persons especially regarding the access to public facilities?

[ ] Yes [ ] No

31 Do you also think designers (Architects, Engineers, and Planners etc.) seek to make their designs all inclusive?

[ ] Yes [ ] No

32 Whom do you blame for the failure to incorporate the requirements of PWDs in the designs of public buildings?

(a) The Government (b) Designers (c) Clients (d). All

33 Is there any change now a day in inclusiveness of public building designs through time?

- Yes ☐
- No ☐

If yes, can you explain? .....

Observation checklist

Provision of the disabled facilities in public buildings

If the facilities follow all the requirements in the list, it would be marked with '√'. Facilities that did not follow the list it was be marked with 'X ', while those facilities that not provided at all are be marked with 'NA'not available.

Table.1. Observation checklist regarding disabled facilities in selected public buildings

No.	Descriptions of factors	√	X	NA
ENTRANCE	1) The entrance is free from any obstructions			
	2) The entrance accessible with pathways			
	3) The entrance is provided with tactile floor and ramps for disable			
SIGNAGE	4) The signage is clearly seen by all people			
	5) The signage is marked with universal symbol			
PARKING	6) The parking area is free from any obstructions			
	7) The parking area is marked with universal symbol			
	8) The parking space located near to the entrance			
STAIRCASE	9) Handrail provided both side of stair			
	10) Continuous handrails provided			
	11) Braille inscription at the handrail			
RAMP	12) The ramp is free from any obstructions and anti-slip			
	13) The ramp should at least 1200mm wide			
	14) There is handrails provided on both sides			
	15) The ramp should be of gentle gradient			
ELEVATORS	16) The button is accessible for wheelchair user			
	17) Braille code and voice projection for visually impaired people			
	18) The space is accessible for wheelchair user			
	19) Handrails provided in the elevator			
Restrooms	20) The toilet is separated for PWDs			
	21) The door is accessible for wheelchair user should not less than 900mm wide			
	22) The area of the toilet is enough to fit the wheelchair			
	23) The floor should not be slippery			