

# **A Framework for Quality Assurance Strategy in Public Housing Project: In a Case of Addis Ababa**



Roman Besheda Jima

A Thesis Submitted to the department of Civil Engineering  
School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of  
Masters of Science in Construction Engineering and Management  
(Specialization in Construction Engineering and Management)

Office of Graduate Studies

Adama Science and Technology University

June, 2024  
Adama, Ethiopia

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Advisor: - Bahiru Bewket (Ph.D.)

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### **DECLARATION**

I declare that this thesis entitled “**A Framework for Quality Assurance Strategy in Public Housing Project: In a Case of Addis Ababa**” is my own work and has not been submitted to any university for similar purpose. The references used in this thesis are duly recognized by proper citations.

Roman Besheda

Name of Student

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\_\_\_\_\_  
Date

### **RECOMMENDATION**

I, the advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled “A Framework for Quality Assurance Strategy in Public Housing Project: In a Case of Addis Ababa” prepared under my guidance by Roman Besheda, submitted in partial fulfillment of the requirements for the degree of Master’s of Science in Construction Engineering and Management. Therefore, I recommend the submission of revised version of the thesis to the department following the applicable procedures.

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Major Advisor

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Signature

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### APPROVAL PAGE

I, the advisors of the thesis entitled “A Framework for Quality Assurance Strategy in Public Housing Project: In a Case of Addis Ababa” and developed by Roman Besheda, hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

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We, the undersigned, members of the Board of Examiners of the thesis by Roman Besheda have read and evaluated the thesis entitled “A Framework for Quality Assurance Strategy in Public Housing Project: In a Case of Addis Ababa” and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Construction Engineering Management.

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## **LIST OF ACRONYM**

|              |                                                                     |
|--------------|---------------------------------------------------------------------|
| AAHDPO ..... | Addis Ababa Housing Development Project Office                      |
| CAPA.....    | Corrective action and preventative action                           |
| GTZ .....    | German Technical Cooperation                                        |
| ISO .....    | International standard Organization                                 |
| ISOTC .....  | International Organization for Standardization Technical Committees |
| QMS .....    | Quality Management System                                           |
| SMEs .....   | Small and Micro Enterprises                                         |
| SWOT .....   | Strengths, Weaknesses, Opportunities, and Threats                   |
| TQMS .....   | Total Quality Management System                                     |
| TVET .....   | Technical and Vocational Education and Training                     |
| RII .....    | Relative important index                                            |
| SPSS .....   | Statistical Package for the Social Sciences                         |

## ABSTRACT

*The demand for suitable and sustainable public housing solutions in Addis Ababa, Ethiopia, emphasizes the importance of a strong quality assurance framework to support project development and implementation. The study aims to develop a framework for ensuring the quality of public housing projects in Addis Ababa, Ethiopia. To achieve the objective, the study used a mixed-approaches research design that combines quantitative and qualitative research methods. Data were acquired by using a questionnaire and interview. The research design was used a combination of descriptive and exploratory research design; a purposive and snowball sampling technique was used. The data analysis methods would use descriptive analysis techniques and exploratory analysis techniques using mean scores and relative important index method. The study findings addresses to improving the quality of construction materials, involving stakeholders effectively, enhancing documentation and implementation of quality assurance measures, ensuring robustness and durability, and implementing rigorous quality control measures are key areas for improvement to align with global benchmarks for quality assurance in public housing projects. Addressing the challenges through the development of a comprehensive framework for quality assurance in public housing projects in Addis Ababa is essential for improving the overall quality, sustainability, and effectiveness of housing developments in the city. By enhancing communication with stakeholders, strengthening enforcement of regulations, ensuring accurate cost estimates, promoting financial transparency, and simplifying regulatory processes, stakeholders can work towards achieving higher standards of quality assurance in public housing projects. Addressing the impact of poor quality assurance on public housing construction projects issues requires a comprehensive approach that focuses on improving construction materials, enhancing workforce skills, and ensuring regulatory compliance throughout the project lifecycle. By prioritizing quality assurance in public housing construction, authorities can mitigate risks, deliver high-quality housing units, and safeguard the well-being of residents. Addressing the quality assurance including establish clear quality standards, implement a comprehensive quality management plan, conduct regular inspections, engage independent inspectors, establish a dedicated quality assurance team, train and empower project teams, establish a quality control process, implement a corrective action system, monitor and evaluate quality performance and continuous improvement. By implementing this framework, public housing authorities in Addis Ababa can address the quality assurance and deliver high-quality housing projects that meet the needs of residents and contribute to the overall well-being of the community.*

**Key words:** Quality, Quality Assurance, Public Housing, and Public Housing Project

## **CHAPER ONE**

### **INTRODUCTION**

#### **1.1. Background of Study**

Over the last few decades, a variety of quality management approaches have been created and implemented in the construction sector. The word "quality" derives from the Latin word "quail," which means "what kind of." Defining quality is difficult or impossible because it has multiple meanings and consequences, hence the term "slippery concept" (Hamid et al., 2019). The American Society of Quality defines quality as the features of a product or service that demonstrate its capacity to meet declared or implicit requirements. Project stakeholders' quality requirements are subjective and influenced by their lifestyles, preferences, customs, social structures, and education (Titman, 2003).

Quality management in construction ensures that all stages of construction meet the requirements agreed upon by project stakeholders. This stresses the definition of quality policies, which are carried out through planning, assurance, and quality improvement. Quality is also defined as "conformance to recognized necessities," and quality management as "the worries optimization of the quality actions complicated in manufacturing a product, process, or service, with avoidance and evaluation actions" (Oyebisi et al., 2019).

According to Wentzel (2010), notes that quality assurance is widely regarded as a larger, practically all-encompassing phrase for the use of standards and procedures to verify that a product or facility meets or exceeds intended performance criteria. Furthermore, quality in house construction requires both functional soundness and subjective acceptability in order to be a commercial product. According to Oseghale et al., (2015), quality assurance in the construction industry is now challenging. Because each construction project is unique and transient, it is difficult to maintain and establish a methodology across projects.

For nearly half a century, international development debates have focused on substandard housing in developing countries. The world has become urbanized, and this process is irreversible. This has put immense strain on the formal housing delivery sector around the world (Gideon, 2016).

The rapid urbanization and population growth in Addis Ababa, Ethiopia, has increased the demand for housing. However, the lack of a comprehensive quality assurance framework has resulted in issues such as substandard construction, safety concerns, and inadequate living conditions for residents. This has highlighted the need for a systematic approach to ensure the quality of public housing projects in the city (Dube, 2019; Mezgebo, 2021).

In addition, the special challenge faces in Addis Ababa a comprehensive framework for quality assurance in housing projects. Urban planning, infrastructure, and socioeconomic conditions can all have an impact on the quality of housing projects in the city (Birhanu & Debalke, 2020; World Bank, 2021).

Furthermore, the current state of quality assurance practices in housing projects in Addis Ababa, emphasizing the lack of alignment with international standards and the need for improvement. It should also highlight the key factors that impact the quality of housing projects, such as construction materials, workforce skills, and regulatory compliance, and how these factors contribute to the challenges faced in ensuring quality housing in the city (Ekpenyong, 2016; Solomon et al., 2019).

The poor quality of public housing in Addis Ababa has led to numerous negative consequences. Safety hazards such as unstable structures and inadequate fire safety measures pose a risk to residents. Additionally, substandard construction materials and lack of proper maintenance contribute to health problems such as mold, dampness, and poor indoor air quality, leading to respiratory issues and other illnesses. Residents are often dissatisfied with the living conditions, which can lead to social unrest and decreased community well-being.

There is a significant knowledge gap regarding existing quality assurance practices in Addis Ababa. Research in this area can address this gap by identifying the specific shortcomings in current quality assurance measures and proposing solutions for improvement. This could involve examining building codes, construction standards, and inspection protocols to ensure that public housing meets minimum safety and quality requirements.

Anecdotal evidence from residents living in substandard housing can illustrate the human impact of poor quality housing. For example, stories of families struggling with health issues due to

inadequate living conditions can highlight the urgent need for improved quality assurance. Conversely, statistics showing the potential benefits of improved housing quality, such as reduced healthcare costs and improved overall well-being, can underscore the importance of addressing this issue.

Finally, emphasize the importance of developing an appropriate framework for quality assurance implementation system for public housing projects in Addis Ababa, which would serve as a guide for developers, policymakers, and other stakeholders to ensure that housing projects meet established quality standards and contribute to sustainable urban development. It should also highlight the potential impact of such a framework on improving living conditions and overall urban development in Addis Ababa.

## **1.2.Statement of the Problems**

The rapid urbanization of Addis Ababa, Ethiopia, has highlighted the need for a comprehensive quality assurance framework to address substandard construction, safety problems, and poor living condition in public housing projects. The current status of quality assurance processes in housing projects issues such as building materials, personnel skills, and regulatory compliance add to the difficulty of assuring quality housing in the city. As a result, there is an urgent need to develop a systematic strategy to ensure the quality of housing developments in Addis Ababa, which would serve as a guide for developers, politicians, and other stakeholders to enhance living conditions and contribute to sustainable urban growth ( Mezgebo, 2021).

The existing level of quality assurance processes in public housing projects in Addis Ababa lacks a comprehensive understanding, which could lead to inefficiencies, inconsistencies, and varied standards for maintaining the quality of building and living areas. Understanding the critical elements determining the quality of public housing projects in Addis Ababa is significant, as the underlying determinants of quality may effect construction outcomes, community well-being, and long-term project viability (Erkiyhun, 2022; Gebrewold, 2015; Mathema, 2005).

The lack of a defined and context-specific quality assurance framework tailored to the unique problems Addis Ababa impedes effective and consistent quality management procedures in public housing projects, potentially leading to inferior project outcomes. While conceptualizing quality assurance frameworks is critical, the adoption and operationalization of such frameworks

within public housing projects in Addis Ababa lacks clear and practical rules, potentially leading to limited impact and effectiveness of proposed quality measures (Ansah, 2015; Eslit, 2023; Lewis, 2000).

Each problem statement would be accompanied by a justification emphasizing the importance of addressing these challenges in the context of Addis Ababa's public housing developments. This may include emphasizing the implications for community welfare, effective resource allocation, long-term urban development, and citizens' overall well-being. By phrasing the problem statement in this manner, the study can provide a clear, systematic, and focused approach to analyzing and improving quality assurance methods in Addis Ababa's public housing projects.

### **1.3. Research Questions**

In relation to the research questions, this study seeks to answer the following questions:

- What are the existing quality assurance practices in public housing projects in Addis Ababa?
- What are the unique challenges faced by public housing projects in Addis Ababa that impact quality assurance?
- What are the consequences of poor quality assurance for the health, safety, and well-being of public housing tenants?
- How can an appropriate framework for quality assurance implementation be developed for public housing projects in Addis Ababa?

### **1.4. Objective of the study**

#### **1.4.1. General objective of the study**

The general objective of the study is to develop a framework for ensuring the quality on Construction public housing projects in Addis Ababa, Ethiopia, with the aim of improving resident satisfaction.

#### **1.4.2. Specific objectives of the study**

The specific objectives of the study are as follows;

- To assess the current quality assurance practices in public housing projects in Addis Ababa.
- To analyze the specific challenges faced in Addis Ababa public housing projects for quality assurance.

- To identify the impacts of poor quality assurance on public housing projects in Addis Ababa, including but not limited to, construction materials, workforce skills, and regulatory compliance.
- To develop a framework for ensuring quality in public housing projects in Addis Ababa,

### **1.5.Scope of the study**

This study focuses on construction public housing projects in Addis Ababa, Ethiopia. It would evaluate current quality assurance processes in public housing construction projects. The study examined the specific challenges in Addis Ababa that are pertinent to the creation of a framework for quality assurance in public housing projects. It was also possible to identify significant elements that contribute to poor quality assurance in public housing projects, such as construction materials, personnel skills, and regulatory compliance. Finally, the study will create a suitable framework for implementing a quality assurance system for public housing projects in Addis Ababa. The study did not look into quality assurance in other sorts of construction projects, cities, or regions of Ethiopia.

### **1.6.Significances of the study**

The significance of this study may stem from its ability to help enhance the quality of public housing in Addis Ababa, ultimately contributing to better living conditions for people. This study's assessment of existing quality assurance processes and identification of major factors influencing public housing quality assurance could give valuable insights for stakeholders to make educated decisions and implement successful quality improvement strategies. The creation of a framework for quality assurance implementation could serve as a practical guide for policymakers and developers in ensuring that public housing developments adhere to international standards and best practices. The study's goal was to create an adequate framework for implementing a quality assurance system for public housing projects in Addis Ababa, which would eventually benefit the entire community. In other words, the findings of this study could serve as an empirical foundation for academics and researchers to conduct future research on relevant themes.

### **1.7.Limitations of the Study**

Some potential limitations of the study on developing a framework for ensuring quality in construction public housing projects in Addis Ababa may include data limitations which is the

study may rely on limited data sources, such as interviews, or surveys, which could introduce biases or limitations in the generalizability of the findings. Stakeholder engagement which is the study may face challenges in engaging relevant stakeholders, such as government agencies, construction companies, and residents, which could impact the development and acceptance of the proposed framework. Long-term impact assessment which is the study may not be able to fully assess the long-term impact of the proposed framework on resident satisfaction and building defects due to the time constraints of the research. Addressing these limitations through careful consideration of research methodology, data collection, stakeholder engagement, and acknowledging the contextual constraints can help strengthen the study's findings and recommendations.

### **1.8.Operational Definition**

Project: is a distinct series of coordinated operations with identifiable beginning and ending points that an individual or organization undertakes to achieve specific goals within a predetermined schedule, cost, and performance limits.

Public housing: is low-cost housing supported by government agencies, such as the Provincial Housing Board, to provide home for low-income families.

Quality: is a condition in which a collection of intrinsic features constantly meets the ever-changing needs of the organization's consumers and other stakeholders.

Quality Assurance: Meeting a predetermined standard inherent in a product.

### **1.9.Organization of the Thesis**

This thesis would be organized with the following pages: cover page, title page, approval sheet, acknowledgment, and table of content, list of tables, list of figures, acronyms, and abstract. The main body section is divided into five chapters, each with a different but connected subtopic. The first chapter contains an introductory section that includes background information, a problem description, research questions, objectives, significance, scope, and operational definition, limitations, and study organization. The second chapter consisted of a literature review. The third chapter discusses research methodology, including the study area, research approach, research design, population and sampling frame, sampling techniques, sample size determination, data

gathering method, data analysis method, validity and reliability, and ethical considerations. The fourth chapter is the study's results and discussion section, which focuses on data presentation and comments. This recorded the examination of primary and secondary data using a mixed research approach. The final chapter presented the study's results and recommendations.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1.Introduction**

This chapter describes the research related literature review that could use in the research study. These include the research theory, concepts and ideology that exist with regard to the theoretical and empirical issue of the quality assurance strategy in public housing project. It covers review of literature from different scholars and authors that have been reviewed in the area of public housing project with special focus on public housing project quality assurance. It deals with theoretical, empirical, and conceptual findings of various researchers concepts related to housing projects, concept of quality and quality assurance in housing projects, international quality assurance practices in housing projects, quality assurance practices for housing projects in Ethiopia, the importance and benefits of implementing quality assurance in housing projects, standards and best practices for quality assurance in housing projects, benchmarks and criteria used to assess and ensure the quality of housing projects, factors that affect the quality of housing projects, challenges of housing projects on quality assurance, the role of stakeholders in ensuring quality in housing projects, empirical literature review, gaps in the literature review and conceptual framework of the study.

It deals with the review of related literature gathered from different secondary sources such as published books, articles and related websites. In this regard, efforts will be exerted to include as much significantly related literatures as possible by reviewing available documents that exhibits points, targeting at the attainment of the research objectives.

#### **2.2.Housing Projects**

One of the three most basic human requirements is a place to live. "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, and medical care," states Article 25 (1) of the 1948 United Nations Universal Declaration of Human Rights. Mekonen (2008), This suggests that everyone has the right to live in a home that satisfies the minimal requirements, which include the need for the home to be accessible and to have access to utilities like power and safe drinking water. Nonetheless, the majority of homes in Ethiopia lack these amenities. According to Gerawork Jembere et al. (2020); Kidst (2014); Yewoineshet (2007), even in the capital city Addis Ababa,

where 80% of the total housing stock is found, most of the housing units are old, dilapidated, and substandard, overcrowded and have no kitchen, toilet, and bathing facilities. Hence, they are not fit for healthy life.

The Ethiopian low cost housing policy has two primary objectives; first, it aims to extend market for low-income households that are not covered by the private housing market through increased supply of affordable low-cost housing. In many developing countries, the great majority of lower income households cannot afford the lowest priced houses in the formal housing market. This is particularly problematic in developing economies where urban growth is predominantly driven by in-migration by rural households that often lack the financial wherewithal to participate in formal housing markets. In the present Ethiopian context, at prevailing housing price and financing mechanism, only households above the 95th percentile of the income distribution can afford to become home owners in the formal private housing market. In such economies, the only options available to those with the lowest incomes are to live in unregistered sectors that worsen the spread of slum regions, rent under unstable and unpredictable tenure terms, or build some sort of shelter. Because of this, lower-income households not only live in subpar housing but also have limited access to basic public services and financial resources. This is because they are frequently viewed as untrustworthy due to their employment, which is frequently in the unofficial sector, or because they do not have sufficient collateral for mortgage lending when it is available (Mosisa, 2018 and Alebel, et.al 2016).

Second by building more affordable housing units targeted at lower-income households and expanding the overall housing stock, the housing strategy seeks to stabilize the rental markets in Ethiopia's urban areas. Ethiopia is thought to have a million or so urban housing shortage at the moment, with only 30% of the country's existing housing stock in "fair" condition and the remaining 70% in need of complete replacement. In large urban regions like Addis Ababa, where the shortage of housing is expected to worsen along with the country's rapid population expansion, the situation is even worse. As a result, the demand for rental homes in urban areas has increased significantly, pushing up rental prices and making it difficult for working class people to afford them. The lack of rental housing options for renters is a major contributing factor to the problems with housing affordability in the private market. The supply of new

housing stock must rise to keep up with the fast increasing demand for urban dwelling in order to guarantee stable and affordable rental housing costs (Mosisa, 2018 and Alebel, et.al 2016).

One of the fundamental social factors that affect people and places' welfare and quality of life is the housing project. Given the long life span of dwellings as physical structures, these factors affect both the present and future generations. They also have a very real impact on people's daily lives, health, security, and well-being. These factors include where homes are located, how well they are designed and built, and how well they are integrated into the environmental, social, cultural, and economic fabric of communities. Thus, a housing project is essential to quality control (Badyina, 2012).

### **2.3. Concept of quality and quality assurance in housing projects**

The meaning of quality varies depending on who is defining it. Some consider it to be customer satisfaction, others see it as meeting contractual obligations, and still others see it as the achievement (performance) of standards or the value received for the money. For a construction company, quality is simply meeting clients' needs and desires while staying inside a predetermined budget (Eshetu, 2021).

According to Mosisa (2018), To fulfill customer satisfaction, quality is defined as the integration of all functions and processes to accomplish continual improvement of goods and services quality. Meeting the needs of all parties involved the owner, designer, contractor, and regulatory bodies define quality. The Total Quality Management System (TQMS) must be implemented in order to guarantee project quality. Every company in the sector participates in the TQMS initiative, which aims to increase performance by emphasizing process improvement, supplier and customer involvement, teamwork, education, and training to produce work that is defect-free and meets client expectations.

According to Dereje (2019), Characterized quality assurance as a collection of actions intended to show that a given entity satisfies all quality standards. The purpose of quality assurance initiatives is to instill trust in management and customers alike that all quality standards are being fulfilled. Furthermore, meeting a required quality level is the primary goal of quality assurance procedures in information processing (Dereje, 2019). Generally speaking, quality assurance is the process of confirming to donors, recipients, organization management, and other

stakeholders through evidence that the product satisfies needs, expectations, and other requirements. It guarantees the availability and efficacy of tools for processes and procedures, as well as the presence of safeguards to ensure that the required standards of quality will be met in order to generate high-quality results. As a result, quality assurance takes place during the project's implementation phase and involves routinely assessing the project's overall performance to give assurance that it will meet the quality criteria it has set International Quality assurance practices in housing projects

Quality Control is crucial to the home project. In order to make sure that quality standards are being met, quality assurance, in short, refers to a program for systematic monitoring and assessment of the many aspects, such as design processes and craftsmanship characteristics of a project (Rahmah Muthia, 2018). Although it cannot be guaranteed with 100% accuracy, quality assurance procedures increase the likelihood that high-quality items will be produced.

According to Wentzel (2010), The housing project is now using document control as one of its quality assurance methods to make sure personnel are following the right procedures and that they are being properly maintained; CAPA (corrective action and preventative action) is to correct flawed processes (i.e., quality procedures) when detected via audits and non-conformance tracking and to prevent defects from reoccurring; audits are used to ensure that quality procedures are being followed; non-conformance tracking is used to monitor and track quality issues and those defects are kept from customers; Management review, which examines performance data and quality metrics from quality systems to ascertain whether the system is functioning properly and, if not, what steps need to be taken to make improvements.

When looking at these quality assurance systems, it is evident that they are structured allowing for various aspects in the design processes as well as construction processes to be thoroughly tested and checked for any flaws.

#### **2.4.International Quality assurance practices in housing projects**

Quality assurance is very important in the home project. In summary, quality assurance is a program for systematic monitoring and evaluation of a project's different features, such as design processes and craftsmanship qualities, to verify that quality requirements are met (Rahmah

Muthia, 2018). Quality Assurance systems cannot guarantee with absolute certainty the production of quality products, but makes this more likely.

According to Wentzel (2010), the quality assurance systems now applied in the housing project are document control, which ensures that staff have the correct procedures and that the procedures are properly maintained. Audits are used to ensure that quality procedures are followed; non-conformance tracking is used to monitor and track quality issues and keep those defects hidden from customers; and CAPA (corrective action and preventative action) is used to correct flawed processes (i.e. quality procedures) discovered through audits and non-conformance tracking and to prevent defects from recurring. Management review entails analyzing quality system data (performance) (quality metrics) to assess whether the quality system is functioning properly and, if not, taking the necessary steps to enhance the system. When looking at these quality assurance systems, it is evident that they are structured allowing for various aspects in the design processes as well as construction processes to be thoroughly tested and checked for any flaws.

The current quality assurance practices in public housing projects have been widely used in the literature to evaluate its sustainability. A comprehensive review was carried out to assess the current quality assurance practices in public housing projects. The published literature and established quality assurance evaluation techniques were utilized to identify the quality assurance practices of housing projects as shown in table 2.1.

Table 2. 1: The current quality assurance practices in public housing projects

| R. No | The current quality assurance practices in public housing projects                                                                                          | Reference            |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 1     | Quality assurance practices in public housing projects in Addis Ababa align with international quality standards.                                           | (Getachew, 2019)     |
| 2     | The documentation and implementation of quality assurance measures in public housing projects reflect a high level of adherence to international standards. | (Mane & Patil, 2015) |
| 3     | Routine inspections and compliance checks in public housing projects effectively uphold international quality standards.                                    | (Sadik, 2017)        |

|    |                                                                                                                                          |                                     |
|----|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 4  | There is consistency in the adherence to international quality standards across various stages of public housing project implementation. | (Al-rub & Shibhab, 2020)            |
| 5  | The quality of construction materials used in public housing projects meets or exceeds international standards.                          | (Aljarallah et al., 2023)           |
| 6  | Public housing projects demonstrate robustness and durability in line with globally accepted quality benchmarks.                         | (Matsumoto, T. and Crook, J., 2015) |
| 7  | The current quality assurance practices in public housing projects effectively meet internationally recognized quality standards.        | (Brkanić, 2017)                     |
| 8  | The project planning process is thorough and well-documented.                                                                            | (Sadik, 2017)                       |
| 9  | Materials used in the project are of high quality and durable.                                                                           | (Brkanić, 2017)                     |
| 10 | The project complies with all relevant building codes and regulations.                                                                   | (GBPN, 2014)                        |
| 11 | Stakeholders are actively involved in decision-making processes.                                                                         | (Shibayama et al., 2020)            |
| 12 | Implementing quality control measures to ensure compliance with construction standards and specifications.                               | (Brkanić, 2017)                     |
| 13 | Conducting material testing and quality checks at various stages of construction.                                                        | (Derdried, 2011)                    |
| 14 | Regularly monitoring workmanship and construction processes to identify and address quality issues promptly.                             | (Brkanić, 2017)                     |
| 15 | Conducting regular inspections by qualified inspectors to verify compliance with design plans and building codes.                        | (Brkanić, 2017)                     |
| 16 | Documenting inspection findings and ensuring timely resolution of identified issues.                                                     | (Mane & Patil, 2015)                |
| 17 | Involving relevant stakeholders in inspection processes to enhance transparency and accountability.                                      | (Heimstädt & Dobusch, 2020)         |
| 18 | Utilizing technology tools such as project management software for real-time monitoring and reporting.                                   | (Mabillard & Zumofen, 2017)         |
| 19 | Conducting regular reviews of building code requirements and updating project plans accordingly.                                         | (GBPN, 2014)                        |

|    |                                                                                                                                  |                        |
|----|----------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 20 | Providing training programs for project personnel on quality assurance practices, safety protocols, and construction techniques. | (Oyebisi et al., 2019) |
|----|----------------------------------------------------------------------------------------------------------------------------------|------------------------|

Source: Authors compiled through literature

## **2.5. Quality assurance practices for housing projects in Ethiopia**

Ethiopia is currently dealing with a number of issues, including housing. The quality of housing and the factors that contribute to it left a lot to be desired. This is to propose that by focusing on the quality of construction in condominium housing developments, skilled labor force and SMEs produce an effective quality output. When focusing on the word quality, it can be described as the level of excellence. However, quality assurance is widely regarded as a larger, more comprehensive phrase for the use of standards and procedures to guarantee that a product or facility meets or exceeds the required performance criteria. Quality in housing construction demands functional soundness and also demands subjective acceptability for it to be a marketable product (Mosisa, 2018).

In Ethiopia a government led program administered and managed by the Housing Development Office to supply mass housing stock and to create job opportunities for thousands of people especially the youths, hence quality of housing is not considered. Good quality management and full participant involvement are clearly regarded by many authors and researchers as two major success factors in quality of housing projects. The research has extracted and identified current housing quality defects, quality standard guidelines related to 20/80 condominium housing and effort to increase quality of housing. Based on this set of classifications a number of surveys from which to develop a framework for identifying quality challenge for better and more focused implementation of quality practices on housing projects, designed to encourage and utilize better participant integration within critical quality management procedures on housing projects (Mosisa, 2018).

Quality controlling system in housing construction project plays a great role in the low-cost housing sector. Quality controlling system, in short refers to a program for systematic monitoring and evaluation of the various aspects such as construction processes and input provide based on the characteristics of a project, to ensure that standards of quality are being met Quality Assurance (Mosisa, 2018).

According to Mosisa (2018), study indicated that the quality systems currently implemented in the low-cost housing sector are document control which is to ensure employees have the correct procedures and that the procedures are properly maintained. Audits which are to verify the quality procedures are being followed. Non-conformance tracking which is to monitor and track quality issues and that defect are kept from customers. CAPA (corrective action and preventative action) which is to correct flawed processes (i.e. quality procedures) when detected via audits and nonconformance tracking and to prevent defects from reoccurring. Management Review which is reviewing quality systems data quality metrics to determine if the quality system is working and if it is not, taking the appropriate action to improve the system.

## **2.6.The importance and benefits of implementing quality assurance in housing projects**

In the construction sector, quality assurance is critical for reducing risks, improving project performance, and increasing client satisfaction. Early detection and mitigation of potential flaws is critical to avoid rework and delays in building projects (Rahmah Muthia, 2018). Quality assurance techniques highlight safety precautions throughout the construction process. Adhering to high safety standards reduces accidents and injuries on the job site. Effective quality control ensures that all materials used fulfill the necessary safety standards (Plan, 2010; Shah et al., 2012).

Quality assurance helps firms manufacture and transport products that are defect-free and fulfill the demands and expectations of their customers. High-quality items lead to satisfied customers, who are more likely to be loyal, make repeat purchases, upsell, and advocate. Quality assurance, as previously said, is a tool used to examine and ensure that a product or service meets the required level and that an organization provides the type of product or service that will entice customers to return. Khwaja et al. (2020) argue that a proactive approach where defects are detected before a product or service goes into the public domain is necessary. The study advocates that QA is vital in ensuring the satisfaction of customers' housing quality needs (Mcclintock et al., 2016).

Effective quality assurance techniques in housing projects provide several advantages that contribute to overall project success. Let us take a closer look at some of these advantages (Rahmah Muthia, 2018; Vikas Patel, Parmanand N. Ojha, Brijesh Singh, 2021):

**Improved Client Satisfaction:** Implementing strong quality assurance measures guarantees that the completed construction project meets or exceeds the client's expectations. This not only promotes great client connections, but it also raises the possibility of future business and referrals.

**Minimized Risks:** Quality assurance helps detect and manage potential risks and issues before they grow, reducing the likelihood of costly rework, delays, and even litigation. Construction project managers can make their workplaces safer by ensuring compliance with regulatory requirements and safety standards.

**Improved Efficiency:** Quality assurance processes streamline project workflows, improve coordination, and reduce errors or defects. By implementing efficient quality control measures, construction project managers can optimize resource allocation, drive productivity, and ensure timely project completion.

**Cost Savings:** A proactive approach to quality assurance helps avoid rework, repairs, and project delays, resulting in cost savings. According to industry statistics, construction rework can account for around 5-12% of the project cost, highlighting the potential financial impact of poor quality control. Standards and best practices for quality assurance in housing projects

## **2.7. Standards and best practices for quality assurance in housing projects**

ISO was a consequence of the unification of two organizations, the United Nations Standards Coordinating Committee and the International Federation of National Standardizing Associations in 1947. ISO found its home in Geneva, Switzerland. In the early 1950s, the Technical Committee had developed “recommendations.” Then ISO was becoming the standard for production, trade, and an element in national and industrial policies on quality, safety, environment, and consumer protection. Also, in the late 1970s, quality management and assurance introduced the ISO 9000 series of standards, termed one of ISO’s most spectacular. Today, ISO has over 10,000 standards and they cover a broad array of fields (Gasim, 2021; Islam, 2017).

The first series of ISO 9000 developed by the International Organization for Standardization Technical Committees (ISO-TC 176) in 1987, was updated in 1994 and 2000, and again in 2008. The latest version of this standard was published in September 2015. The revision of ISO 9001

has the following aims: to improve the organization's ability to satisfy their client, to ensure the relevance of standards maintained, as business and industry has changed, to reflect the needs of all user groups and current operating environments/technology developments. This helps confirm they remain worthwhile tools for the marketplace. The challenges faced by the organizations today are unlike from a few decades ago and ISO 9001 has been up-to-date to take this new environment into account Moving from ISO 9001:2008 to ISO 9001:2015 as cited by (BSI, 2015).

Recently, ISO 9000 and its related versions are quickly becoming a “license to compete” worldwide. Its standards are generic in the way that they can be applied to all functions and all industries in various areas of human endeavor regardless of the firm size. They have been defined as the one size fits all standards. ISO 9001 can be used successfully in construction companies and on their projects, even though every project is unique and involves different sub-contractors and suppliers. This because it specifically focuses on what organizations should do to achieve better quality management and continuous improvement (Awan & Bhatti, 2003).

Quality assurance systems must be based upon developing a design and construction process that assures quality in the design, in the materials and components used, in the site procedures used for communicating performance standards from design to the workplace, and in effective monitoring, control and feedback mechanisms. Effective quality assurance will lead to advantages, both for the design process and construction phase. Implementing formal quality assurance techniques can result in Better design, more effective planning, improved site management, increased project performance, efficient management of construction issues, improved quality fewer delays and inconveniences. Lower the cost of remedial and repeat works, and provide feedback for future projects. Improved reputation for quality design and construction (Afolarin, 2013).

Within the traditional form of building procurement, quality assurance relies upon the individual contribution to implementation from each party involved in public housing projects; from the client to the consultant to the contractor, to the supplier and sub-contractors and even to the end-users. Given that each professional party acts ostensibly in isolation, the aims and objectives of quality assurance are easily compromised and frequently lost. The adoption of non-traditional

procurement practices can however make a useful contribution to quality improvement (Afolarin, 2013).

Now a day's ISO Quality Management System (QMS) expanded in Ethiopia because of different reasons according to (Eshetu, 2021) based on a research of nine ISO certified contractors, the primary motivations for implementing ISO are to assure improved production, improve the firm's reputation, and use marketing. Due to GTZ's ISO 9001 training for construction companies, these companies have been motivated to implement QMS. Additionally, customer requirements have been met, primarily by the Ministry of Education and the University Capacity Building Program, which required certification or the process of obtaining certification in order to be eligible to participate in new university construction projects under the ministry of education. However, other clients did not specifically state that ISO 9001 certification was necessary

## **2.8.Benchmarks and criteria used to assess and ensure the quality of housing projects**

The idea of benchmarking has spread throughout many manufacturing sectors, but its possible benefits in the construction sector have received comparatively less attention up to this point. Finding the best practices to help a business perform better is known as benchmarking (Chan & Chan, 2003). Scholars studying construction management and professionals in the field have started to recognize how crucial it is to create benchmark measurements of best practices, such as construction quality performance, that customers, consultants, and contractors can utilize (Chan & Chan, 2003).

According to Mosisa (2018) Scholars and professionals in the building industry are still in agreement that the lack of appropriate quality performance measurements is a significant barrier to promoting sustainability and advancement in superior construction projects. Additionally, keep in mind that quality performance measures are necessary for continuous improvement in order to verify modifications and the outcomes of improvement actions, to check and monitor these quality performance, to comprehend process variability, and generally to make effective decisions. Any construction company needs to have readily available, objective information in order to make these kinds of decisions.

According to (Costa et al., 2006) shows that the necessity to continually propose modifications in housing quality is stronger because of the always rising demands and expectations of customers.

With the industry's competitiveness expanding at an exponential rate, construction companies throughout the world are fortifying their place in the market by improving their performance and setting new goals and benchmarks for the home market. Because of this dynamic mechanism and the well-known fierce national competition, most contractors are now more aware of benchmarking, or quality performance measurement. According to Mosisa (2018) Benchmarking is regarded as a relatively recent concept in the building sector. Mention further that there is essentially no information available now that explains the possibility for improved housing quality that benchmarking offers.

However, Kyrö (2003) claims that benchmarking has solidified its place as a strategy for raising the caliber of performance from contractors. Benchmarking, according to him, is the process of assessing and implementing best practices that offer opportunities to raise the caliber of output. Explains further that benchmarking is a notion that has evolved toward increasingly complex forms since the 1940s. He suggests that there have been five generations of it. Markovic et al. (2011) adds that many of the techniques directly associated with benchmarking may have their roots in the so-called quality movement of the 1980's, but the concepts which underpin them are a lot older.

## **2.9.Factors that affect the quality of housing projects**

The great majority of building failures are assumed to be the result of design flaws and construction errors. Such flaws, regardless of their nature, are caused by a lack of or a poor quality of management. These might range from trivial issues like snagging objects to latent faults that result in long-term lawsuits. These challenges spread owing to: historic separation of design and construction; poor communication of design needs; design is difficult to build; poor labor skills and supervision; complex contract documentation; and unrealistic schedule and cost assessments (Afolarin, 2013).

According to Bawane (2015); Oyeibisi et al. (2019), Contractual provisions, organizational structure, lack of technical expertise, slow pace of mechanization, lack of training and skills, and limited financial capabilities are some of the internal factors that impede the management of construction quality in developing countries. External factors include technological advancements in related industries and globalization.

Ethiopian construction companies today employ quality management techniques that are largely similar to those used by construction companies worldwide. The elements of both construction inputs and construction processing are the aspects influencing the process's quality. Therefore, the overall factors affecting quality were combined into the following categories in the following table 2.1 by combining the outcomes of the literature review with the outcomes of the nominal grouping (Eshetu, 2021 and Afolarin, 2013).

Table 2. 2: Factors affecting the quality of housing project by (Eshetu, 2021 and Afolarin, 2013)

| Category                 | Factors                                                   |
|--------------------------|-----------------------------------------------------------|
| Project related factors  | Scope of the project (type and nature)                    |
|                          | Location of the project                                   |
|                          | Site access                                               |
|                          | Period of the project                                     |
| Design related factors   | Completeness and consistency of design documents          |
|                          | Drawings are prepared in full details                     |
|                          | Conformance to codes and standards                        |
|                          | Experience and knowledge of designers                     |
|                          | Unclear owner's requirements for the design               |
| Contract related factors | Cooperation between parties involved in contract          |
|                          | Previous successful relations between parties             |
|                          | A written contract with clear conditions                  |
|                          | Using a standard contract                                 |
|                          | Types of the awarding system                              |
| Material related factors | Using a comprehensive material management system          |
|                          | Cooperation between the contractor and material suppliers |
|                          | Availability of good quality construction materials       |
|                          | Using storage and handling system                         |
| Labor related factors    | Labor management system                                   |
|                          | Using labor with high experience                          |
|                          | Using motivation system                                   |
|                          | Training courses for labor                                |

|                                  |                                                                |
|----------------------------------|----------------------------------------------------------------|
|                                  | Income level and wages of labor                                |
| Equipment related factors        | Availability of equipment                                      |
|                                  | Equipment management system                                    |
|                                  | Measurement of equipment productivity                          |
|                                  | Good utilization of equipment                                  |
|                                  | Equipment maintenance                                          |
| Subcontractor related factors    | Company's procedures of selecting subcontractors               |
|                                  | High cooperation between subcontractors and general Contractor |
|                                  | Using a system to evaluate subcontractors performance          |
|                                  | Good and fair subcontract conditions                           |
| Site layout related factors      | The site layout is large                                       |
|                                  | The site layout is organized well                              |
|                                  | The site layout has storage areas for materials                |
|                                  | The site layout is clean                                       |
| System related factors           | Software and computer applications                             |
|                                  | Implement quality control and assurance system                 |
|                                  | Using time schedule                                            |
|                                  | Using a cost control system                                    |
|                                  | Implementing a safety program                                  |
| Site staff related factors       | Cooperation between Supervision and Contractor's staff         |
|                                  | Understanding of contract administration by Supervision        |
|                                  | Skill and experience of Supervision staff                      |
|                                  | Skill and experience of Contractor's staff                     |
| Financial Issues related factors | Amount of contractor's cash flow                               |
|                                  | Non-delay of interim payments                                  |
| Owner related factors            | Nature of Owner's organization ( Public or Private)            |
|                                  | Owner's quick response (no delays in making decisions)         |
|                                  | Owner's contribution to the design                             |
|                                  | Owner's emphasis on quality                                    |
| Contractors related factors      | Lack of training course for personnel                          |

|  |                                                                        |
|--|------------------------------------------------------------------------|
|  | Improper personnel allocation to their tasks                           |
|  | Lack of complying with specification identified in contract conditions |
|  | lack of supervision of the sub-contractor                              |
|  | Low experience and competence of the contractor                        |
|  | Limitation of finance and budget                                       |

Source: (Eshetu, 2021 and Afolarin, 2013)

## 2.10. Challenges of housing projects on quality assurance

The challenges of housing projects on quality assurance have been widely used in the literature to evaluate its sustainability. A comprehensive review was carried out to determine challenges of housing projects on quality assurance. The published literature and established quality assurance evaluation techniques were utilized to identify the challenges of housing projects as shown in table 2.2.

Table 2. 3: The Challenges of housing construction projects on quality assurance

| R. No | Challenges of housing construction projects on quality assurance           | Reference                               |
|-------|----------------------------------------------------------------------------|-----------------------------------------|
| 1     | Inadequate quality control measures during construction.                   | (Getachew, 2019)<br>(Shah et al., 2012) |
| 2     | Deficiencies in materials used for public housing projects.                | (Erkiyhun, 2022)<br>(Hassen, 2021)      |
| 3     | Lack of skilled labor leading to quality compromises.                      | (Hussain et al., 2020)                  |
| 4     | Delays in project completion affecting housing availability.               | (Kifle, 2017)                           |
| 5     | Inefficient project scheduling and management.                             | (Sadeh et al., 2023)                    |
| 6     | External factors like weather conditions impacting construction timelines. | (Schuldt et al., 2021)                  |
| 7     | Budget overruns and lack of financial transparency.                        | (Gomero et al., 2020)                   |
| 8     | Inaccurate cost estimates leading to financial constraints.                | (Oke et al., 2017)                      |
| 9     | Limited access to funding sources for public housing projects.             | (Woldeeyesus, 2017)                     |
| 10    | Lack of community engagement in project planning.                          | (Derdried, 2011)                        |

|    |                                                                 |                        |
|----|-----------------------------------------------------------------|------------------------|
| 11 | Disregard for community needs and preferences.                  | (Luisi & Hämel, 2021)  |
| 12 | Limited communication and transparency with residents.          | (Gezihagne, 2018)      |
| 13 | Complex regulatory requirements and approval processes.         | (Eferences, 2004)      |
| 14 | Non-compliance with building codes and standards.               | (Fakunle et al., 2020) |
| 15 | Lack of Enforcement of regulations.                             | (UNEP, 2017)           |
| 16 | Limited adoption of eco-friendly construction practices.        | (Abera, 2024)          |
| 17 | Lack of emphasis on energy efficiency and environmental impact. | (Njenga & Phiri, 2017) |
| 18 | Insufficient focus on sustainable materials and designs.        | (Ayarkwa et al., 2022) |

Source: Authors compiled through literature

Since more affordable and moderately priced homes are being constructed, quality issues with recently finished buildings are becoming a major issue (Sellakutty & Rajendran, 2017). Construction defect according to (Sellakutty & Rajendran, 2017) is deficient and does not fulfill the necessary standards, which could become apparent during the construction of a building or after a particular task is finished. Any inadequacy in the design, planning, supervision, inspection, construction, or observation of any new house or building's construction is typically considered a defect. Typically, the flaws begin to show after two years of residence (Journal, 2014). Due to the potential risk and the associated direct and indirect costs of repairs, housing quality defects have an impact on society or end users. The following list of common construction flaws includes leaking windows and roofs, heaving and cracked concrete, gaps in walls and joints, broken plumbing, and incorrectly built electrical equipment. (Divya and Ramya, 2014), The primary issues with housing project quality are: surface appearance (surface etching & abrasion), corrosion, loose ceiling plastering, delaminating, cracking, Physical characteristics Water penetration, Dent age (deflection, warping, and buckling), Defects in sealants and staining (Gemeda & Umd, 2011).

The advantages of housing complexes for quality control: wealthy people may afford to make improvements to their homes when they need them. If they're not happy with what they have, they can also get something better for themselves. Most of the time, when we talk about housing quality improvement, we're talking about housing quality improvement for those who can't afford to build, buy, or rent nice, adequate dwellings that meet their fundamental needs.

Environmental factors are an exception to this rule. This need to be applicable to all housing kinds and price ranges. Regardless of cost, environmentally conscious building is advantageous to the neighborhood and its inhabitants. Enhancing the building's functionality, cutting down on waste, lowering energy, gas, and water use, and utilizing ecologically friendly materials for the building's finishes and architectural materials are a few strategies to raise the standard of living for residents as well as their general health and well-being (Average, 2019; Bieri, 2014).

According to Wentzel (2010), highlighted the following opportunities for housing projects' quality assurance: profitability via (increased opportunity, cost reduction, reduced wastage, reduced rework); new market via (differentiation, focus, niche); and new products and services via (segmentation, specialization). Competitive Advantage via (integration, flexibility, speed: improved cycle times, quality: reduction in defects, Cost reductions, customer focus: delivering client expectations, Improved image and reputation). The role of stakeholders in ensuring quality in housing projects

The position should support and advise the service's strategic planning, assisting in making sure the organization meets or surpasses its goals and objectives and that high-quality data is supplied to promote service enhancements (Guide, 2017).

During the construction phase, the Addis Ababa Housing Development Project Office (AAHDPO), contractors, small and micro enterprises (SMEs), and consultants are the primary participants. The general contractors in charge of the larger construction projects are the small contractors. The other significant role players are MSEs, who produce metal window and door frames, install electrical and sanitary systems, and create prefabricated building components (Mosisa, 2018).

#### **2.10.1. Contractors Roles**

Contractor performance has a direct impact on project quality. For example, bad contractor performance might result in poor project quality. According to the SWOT analysis conducted in the European construction industries, small contractors have lower productivity and less interest in education and training than other construction organizations (Ismail & Hussaini, 2017). Another element that has a negative impact on contractor performance is a lack of customer orientation and attention. Contractors can be graded in a variety of ways, including management,

claims orientation, site offices, safety, relations with site neighbors, plant and equipment condition, administration, worker skill, and quality (Mosisa, 2018).

#### **2.10.2. Small and Micro Enterprises (SMEs) Roles**

The criteria for defining SMEs varied among countries. For example, in India, the criteria for defining SME status are based on investment, whereas in South Africa, SME eligibility is based on employee count and turnover. Similarly, in Ethiopia, the working definition of a SME is based on capital and labor. However, there are three characteristics that are commonly accepted when defining SMEs in most countries: the number of employees, which is the most widely used criteria, the firm's level of capital investment or of assets, and the firm's amount of output or annual turnover (Mosisa, 2018).

#### **2.10.3. Addis Ababa Housing Development Project Office (AAHDPO) Roles**

AAHDPO's primary goal is to strengthen and develop the construction sector's capacity, as well as to improve the TVET system's capacity-building for SMEs. This component includes two primary activities. First, construction management, which includes activities such as the production of Capable Site Engineers and Foremen; SME entrepreneurs who will participate in various value chains of the housing project as manufacturers and subcontractors; and the development of the city's coordination and supervision capacity. The second step is to create capacity and meet facility requirements, which involves three core actions. First, training will be provided to ensure that the necessary facilities and equipment are in place, as well as rules and procedures to assist program implementation, including institutional and organizational arrangements. It will also strengthen and build the city's capabilities in construction material manufacturing, construction services, skilled labor, and institutional service delivery (Kifle, 2017; Mathema, 2005).

#### **2.10.4. Consultants Roles**

They are frequently called upon to offer technical assistance or specialized knowledge in crucial areas of projects with a high priority. To save time and money, they develop and manage procedures and systems to improve the efficiency of repetitive tasks. They also put other operational improvements into place (Mosisa, 2018).

According to Gemedu & Umd (2011), shown that many of the present quality issues or flaws that arise in building projects are typically attributed to the major stakeholders. Effective communication between the many stakeholders engaged in building projects is identified as one of the most significant variables that have an undeniable impact on project quality. It is also confirmed that the relationships between the stakeholders have a major impact on the quality of projects. It may be inferred that involving stakeholders in quality management planning and procedures will significantly aid in resolving a multitude of quality-related issues in construction projects. Thus, building strong relationships amongst stakeholders and include them in practice and planning is crucial to resolving problems with quality failure.

### **2.11. Empirical Literature Review**

In Addis Ababa, Ethiopia, the population is growing rapidly, yet there is no systematic structure for quality assurance, which has led to poor construction, safety issues, and unsuitable living conditions for the locals. The issues experienced in guaranteeing quality housing in the city are attributed to a number of reasons, including construction materials, worker skills, and regulatory compliance. The level of quality assurance methods in housing projects is now out of conformity with worldwide standards. In order to guarantee the quality of housing projects in Addis Ababa, implemental methodology must be developed. This will act as a guide for developers, legislators, and other stakeholders, enabling them to enhance living conditions and support sustainable urban development (Dube, 2019; Mezgebo, 2021; Moshinsky, 2015).

There is a lack of complete awareness regarding the state of quality assurance methods in Addis Ababa housing developments, which could result inefficiencies, inconsistent standards, and different approaches to guaranteeing the quality of construction and living areas. Since the underlying drivers of quality may have an impact on construction outcomes, community well-being, and long-term project sustainability, it is imperative to understand the key elements impacting the quality of housing projects in Addis Ababa (Erkiyhun, 2022; Gebrewold, 2015; Mathema, 2005).

Effective and consistent quality management techniques in housing projects are hampered by the lack of a defined and context-specific quality assurance framework made to meet the particular opportunities and difficulties of Addis Ababa. This could result in less than ideal project

outcomes. Although the development of quality assurance frameworks is essential, the implementation and adoption of these frameworks in Addis Ababa housing projects lacks explicit and practical guidance, which could restrict the impact and efficiency of suggested quality measures (Ansah, 2015; Eslit, 2023; Lewis, 2000).

According to Eshetu (2021), indicated that the building construction industry in Ethiopia is suffering from low-quality performance, and this study discovered that design-related, labor-related, and site staff-related are the most common among the twelve different factors examined in the study through the sub-factors, and are critical for the success of quality practice in construction companies. Furthermore, the suggested improvement factors include the appointment of experienced and skilled personnel, top management commitment and leadership, qualified and on-time supply of construction materials, adequate and suitable designs, good communication, the provision of training courses for employees at various levels of the company, and the implementation and proper application of a Quality Management System. Of experienced and skilled personnel, top management commitment and leadership, qualified and on-time supply of construction materials, having adequate and suitable designs, good communication, and provide training courses for employees at different levels of the company and implementing and properly applying a Quality Management System.

According to Afolarin (2013), The main rank factors affecting the quality of housing projects are poor communication of design requirements by clients, poor labor skills and supervision, lack of clarity in project design and build ability problems, availability of skilled labor, availability of materials, availability of construction equipment and machinery, contract award criteria, and unrealistic cost assessment.

According to Gemedu & Umd (2011), revealed that the primary issues of housing project quality are: cracking, loose plastering of ceilings, delamination, surface appearance (surface abrasion and etching), corrosion, Physical appearance: Dent age (deflection, warping, and buckling), water penetration, sealant problems, and staining.

According to Wentzel (2010), indicated that the opportunities of housing projects on quality assurance are competitive advantage via (Integration, Flexibility, Speed: improved cycle times, Quality: reduction in defects, Cost reductions, Customer focus: delivering client expectations,

Improved image and reputation); profitability via (Increased opportunity, Cost reduction, Reduced wastage, Reduced re-work); new market via (Differentiation, Focus, Niche); and new products and services via (Segmentation).

According to Abas et al. (2015); Getachew (2019); Jha & Iyer (2006), Trust with suppliers, effective communication, Continuous Improvement, Incentive Mechanism, Joint Working, ISO Certification, Shared Benefits, and Government Policies are all aspects that contribute to improved quality practice in construction. The most effective strategy to achieve continuous improvement is to propose the right person for the right position, train people, assign responsibilities properly, and share the pain and benefit with important stakeholders. At the end of the project, produce a questionnaire about the project's quality performance and ask your client to score it. This will assist the contractor improve the quality in future projects (Oke et al., 2017).

According to Afolarin (2013), revealed that clients' awareness and communication of their unique needs to the consultant/designer, who faithfully reproduces them on site, the contractor's faithful reproduction of the requirements on site, and, finally, the end-user's proper use of the building are all critical to guaranteeing quality in housing projects. If quality assurance practices are to be effective, they should not be restricted to a certain group of people. Rather, everyone should be concerned. Last but not least, a gap between the nation's level of awareness and the caliber of housing projects will persist unless government agencies, regulatory bodies, and clients demand comprehensive proof of contractors' credentials for quality assurance capability before compiling their tender lists.

## **2.12. Gaps in the Literature Review**

The gaps in research for this study could include:

There may be a scarcity of comprehensive studies concentrating on quality assurance techniques in public housing developments in Addis Ababa. Existing research may be limited to broad construction quality assurance or lack a thorough investigation of the local situation.

Inadequate investigation of local elements influencing public housing projects quality: While the literature may highlight aspects influencing quality in public housing projects, there may be a lack of specific research on the unique factors present in Addis Ababa. This could include

socioeconomic, political, and cultural issues that affect the implementation and efficacy of quality assurance techniques.

The literature may not provide adequate direction on building a complete framework for quality assurance in public housing projects. Existing frameworks may be focused on specific parts of quality assurance or may not cover all phases of the project lifecycle.

Limited study on the comparison of local procedures to international standards: There may be a scarcity of studies comparing current quality assurance practices in Addis Ababa to recognized international standards. This gap may impede the creation of a complete framework that is consistent with global best practices.

Inadequate consideration of stakeholder involvement: The literature may fail to effectively address stakeholders' roles in assuring quality in public housing projects. This may include the participation of homeowners, contractors, government agencies, and other interested parties. Understanding stakeholder engagement levels and their impact on quality assurance is critical for creating an effective framework.

Addressing these research gaps is critical to building a comprehensive framework for ensuring the quality of public housing developments in Addis Ababa. More study is needed to better understand the specific issues in the local environment and develop effective solutions for applying quality assurance practices.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1.Introduction**

This chapter covers the methodology utilized in the research investigation. These include the study area, research design, study population and sample frame, sample procedure, sample size determination, data collection method, data processing techniques, questionnaire reliability and validity testing, and ethical considerations. The acquired data was examined with Microsoft Excel and SPSS software. The research methodology was qualitative and quantitative, resulting in a hybrid research style that is suited for this topic.

#### **3.2.Study Area**

The study focuses on quality assurance system in public housing construction projects in Addis Ababa, Ethiopia. The primary goal of the study is to develop a comprehensive framework for ensuring the quality of public housing developments in the city. To fulfill the research purpose, the study would focus on the following specific objectives: examining current quality assurance procedures, identifying important variables influencing poor quality, analyzing challenges, and establishing a quality assurance framework. By addressing these specific objectives, the study hopes to contribute to the enhancement of public housing project quality in Addis Ababa, thereby helping people and parties involved in the city's housing development. Figure 3.1 depicts the spatial description of the study region graphically in the context of the Addis Ababa map.

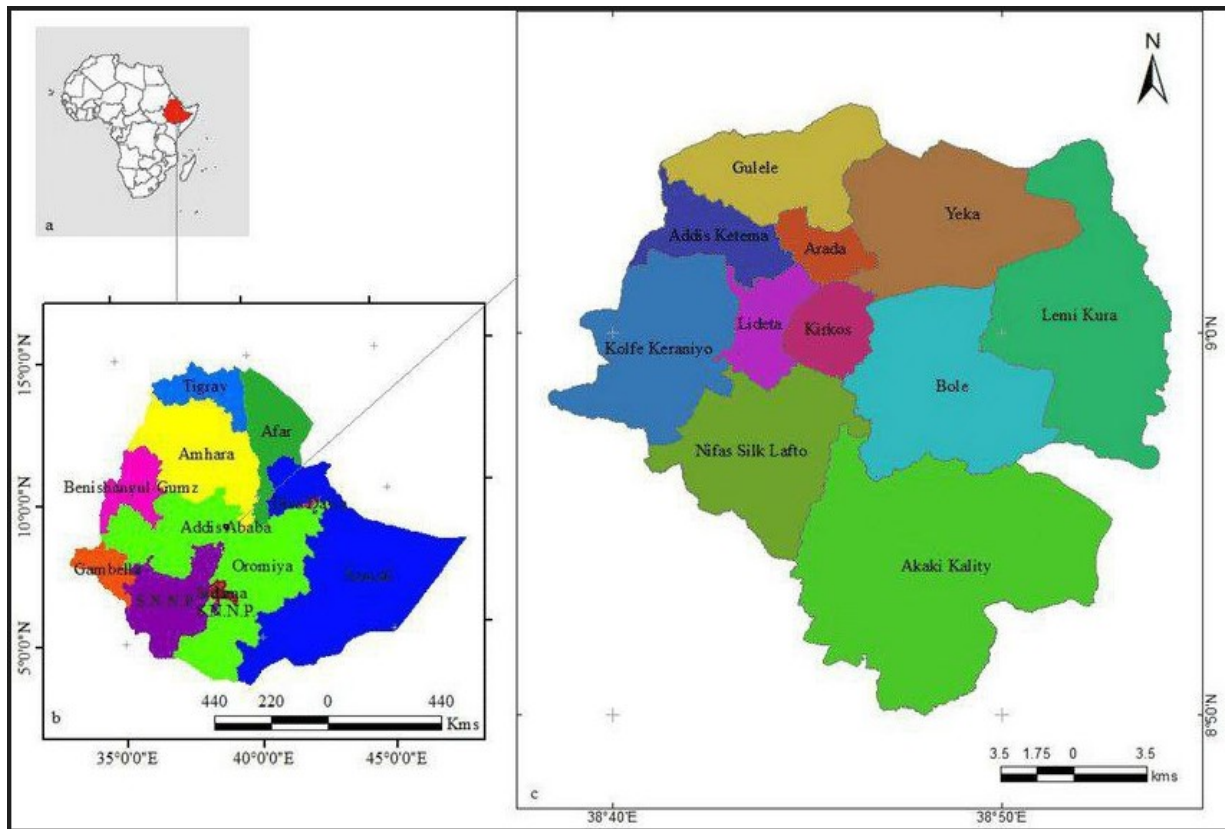


Figure 3. 1: Map of Addis Ababa

Source: Addis Ababa city Municipal

### 3.3. Research Design

This study used a mixed-methodologies strategy, which combines qualitative and quantitative methods. This method would allow for a comprehensive understanding of the current quality assurance practices, key impacts of poor quality assurance, and the specific challenges in Addis Ababa. Qualitative data collected through interviews and surveys provided insights into present practices as well as socioeconomic, political, and environmental aspects influencing the quality of public housing projects. Surveys and questionnaires were used to collect quantitative data from stakeholders on construction materials, workforce skills, and regulatory compliance, allowing for a more in-depth understanding of the factors influencing public housing project quality.

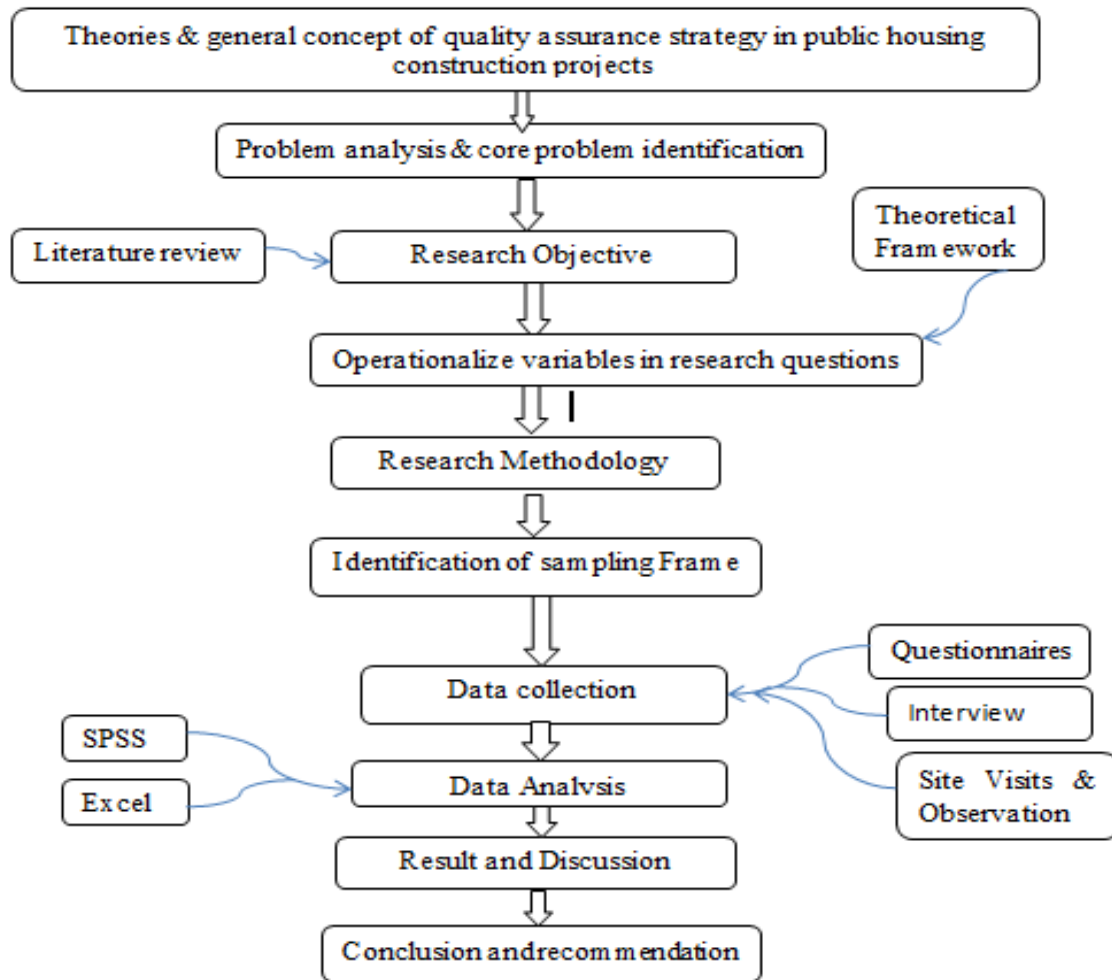
Research design entails selecting the suitable methodology, data gathering methods, and developing a plan (framework) for data analysis. The research plan would take a mixed-

methodologies approach, using qualitative and quantitative research methods to collect data from various sources. Based on the research aims, the researcher employed a descriptive and exploratory research design. The descriptive research approach was effective for acquiring extensive information on existing quality assurance practices in public housing developments. This would provide a full grasp of the current condition, which is required to establish a framework for reform. However, this approach may not reveal the fundamental variables impacting quality assurance.

The exploratory research design would be useful in acquiring insight into the key aspects influencing quality assurance in public housing projects. A researcher identified the specific issues associated with quality assurance through interviews with stakeholders. This would be useful in informing the construction of a framework, but it may not provide a complete picture of present practices.

The mixed-methodologies research design provides a complete approach by mixing qualitative and quantitative methods. This would allow researchers to collect thorough information about existing practices while also investigating the underlying causes and potential correlations between various quality assurance variables. This approach would provide a comprehensive grasp of the issue, making it an excellent choice for building a quality assurance framework for public housing projects.

The general approach followed to this research is summarized in the Figure 3.2, as shown below.



**Figure 3. 2:** General approach followed to the research

**Source:** Researcher's own research design

### 3.3.1. Data Type and Source

The data types employed in this investigation were qualitative and quantitative. Qualitative data were gathered through interviews, as well as surveys of stakeholders participating in Addis Ababa public housing projects. This would provide insights into present quality assurance techniques as well as the socioeconomic, political, and environmental issues that influence the quality of public housing projects. Quantitative data were gathered through surveys, and questionnaires on construction materials, workforce skills, and regulatory compliance. This would provide extensive information on the specific elements that affect the quality of public housing projects.

The data for this study would come from public housing project stakeholders such as developers, contractors, architects, engineers, government officials, and inhabitants. Data were also gathered from site inspections, construction material suppliers, regulatory organizations, and pertinent documents on public housing projects in Addis Ababa.

### **3.4.Population and Sampling Frame**

The study's populations included public housing development projects in Addis Ababa, Ethiopia. Respondents could include developers, contractors, architects, engineers, government officials, homeowners, building material suppliers, and regulatory organizations. The study also considered the factors that influence their quality.

A sampling frame is a list or description of the population from which a sample was selected for the research inquiry. In this study, the sampling frame would be carefully selected to guarantee that the sample is representative of the population and that the findings are generalizable to the larger population. The sampling frames for the study included public housing buildings in Addis Ababa. Its respondents include developers and contractors involved in public housing projects, architects and engineers working on public housing projects, government officials in charge of public housing and construction regulations, residents of public housing projects, construction material suppliers, and regulatory agencies overseeing public housing projects in Addis Ababa.

The study's objectives were to collect information and perspectives from these stakeholders in order to better understand current quality assurance practices, specific challenges of quality assurance process in Addis Ababa, key factor impacts quality assurance of public housing project and the development of a comprehensive framework for quality assurance implementation in public housing projects.

#### **3.4.1. Sampling Technique**

Sampling is a technique that allows researcher to infer information about a population based on the results of a subset of the population, rather than having to analyze each person. The most acceptable sampling method for this study was a combination of purposive and snowball sampling.

Purposive sampling was utilized to choose public building in Addis Ababa that demonstrates a variety of quality assurance techniques and requirements. This ensures that the study includes a varied range of opinions and experiences.

Snowball sampling was used to identify key stakeholders and experts in Addis Ababa's home development and quality assurance sectors. This would give the researchers access to people who have extensive knowledge and expertise with the specific characteristics and issues associated with public housing projects in Addis Ababa.

Using a combination of these sampling methodologies, the study could ensure that it covers a wide range of opinions and experiences essential to the creation of a quality assurance system for public housing projects in Addis Ababa.

### **3.4.2. Sample size determination**

Sample size determination is the procedure of picking representative units of a construction party for a study in a research investigation. It is critical to ensure that the sample size is sufficient to produce trustworthy and accurate results for the study. The sample size of the overall sampling frame was calculated to ensure the required number of respondents (representatives). The data collected using this technique will be more representative and dependable.

Cochran's Formula was used to calculate the sample size when population size is unknown (Statistics How To, 2018).

$$n = \frac{z^2 p(1-p)}{e^2}$$

Where: n is sample size, z is confidence interval corresponding to a level of confidence; p is population proportion and e is precision or error limit. Hence, by considering the value of Z=1.96 (95% Confidence Interval), p=0.5 (for unknown population size) and level precession e=10%.

To calculate the sample size of respondents was used above equation, as shown below:

$$n = \frac{z^2 p(1-p)}{e^2} = \frac{(1.96)^2 (0.5)(1-0.5)}{(0.1)^2} = 96$$

Therefore, the sample size is selected 96 respondents.

### **3.5.Data Collection Method**

Several data gathering approaches have been employed to collect data from both primary and secondary sources, including:

#### **3.5.1. Questionnaires**

The researcher created and distributed questionnaires to a group of public housing project stakeholders, which included developers, contractors, architects, engineers, and inhabitants. The questionnaires asked precise questions about the important elements influencing quality assurance in public housing projects and gathered feedback on the difficulties in Addis Ababa.

There are two sections of questionnaire parts. The part 1 questionnaire collects background information from the respondents. The information requested in part 2 of the questionnaire pertains to the quality assurance procedures that are information regarding the current quality assurance practices; challenges that public housing projects face in maintaining quality assurance and the impacts of poor quality assurance on public housing projects in Addis Ababa is gathered.

#### **3.5.2. Interviews**

The researcher was conducting interviews with key stakeholders involved in public housing projects in Addis Ababa, including government officials, construction experts, project managers, and quality assurance staff. This would facilitate the collection of information regarding the current quality assurance practices used, the specific challenges faced in implementing quality assurance, key factors that contribute to the poor quality assurance and implementation of quality assurance systems for public housing projects in Addis Ababa.

For the interview, ten key informants were purposefully chosen from the target population: one from developers, one from contractors engaged in public housing projects, one from architects, one from engineers, one from government officials, one from residents, one from construction material suppliers, and three from regulatory agencies in Addis Ababa public housing projects to answer questions about the issues of quality assurance strategy in public housing projects in addition, It also provides far more specific information than other data collection methods, such as a list of questions in surveys. Interview protocols, or the rules that govern the administration and implementation of interviews, were devised and followed while the interviews were being conducted.

Using a combination of these data gathering methodologies, a thorough understanding of present quality assurance processes, specific challenges in quality assurance process and significant impacts of poor quality and the development of a suitable framework for quality assurance implementation was obtained.

### **3.6.Data Analysis Techniques**

Based on the study's unique aims, the following data analysis approaches are most appropriate for consideration:

Data from the first section of the questionnaire (respondent's profile), which included respondents' educational background, role in the construction firm, profession, job experience, and affiliation with work, were analyzed descriptively using frequency, charts, and percentages.

The data collected from the specific challenges in Addis Ababa that are relevant to the development of a comprehensive framework for quality assurance in public housing projects is analyzed by mean score technique, which is used by SPSS software to calculate the average of the specific challenges in Addis Ababa that are relevant to the development of a comprehensive framework for quality assurance in public housing projects using a 5-point Likert scale: Strongly Disagree (SD) = 1, Disagree (D) = 2, moderately Agree (MA) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5 which is relevant conclusions were drawn using SPSS software.

Excel software employed the relative importance index (RII) technique to analyze the data, which was gathered from the main current quality assurance practices in Addis Ababa's public housing projects and compared to international standards. The relative importance index technique was then used to identify the most significant current quality assurance practices in Addis Ababa's public housing projects using a five-point Likert scale: Disagree (SD) = 1, Disagree (D) = 2, moderately Agree (MA) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5 which is relevant conclusions were drawn using excel software.

Data collected from the key impacts of poor quality assurance of public housing projects in Addis Ababa, including construction materials, workforce skills, and regulatory compliance, and analyzing their impact on the poor quality of public housing projects. The questionnaire was also evaluated using the relative relevance index technique to determine the relative most significant impacts as a result of poor quality assurance of public housing projects in Addis Ababa using a

five-point likert scale: Very low impact (VLI) = 1, Low impact (LI) = 2, Medium impact (MI) = 3, High impact (HI) = 4 and Very high impact (VHI) = 5 which is relevant conclusions were drawn using excel software. RII data analysis technique uses equation 3.2 to calculate the relative significance index, as shown below (Joro, 2013):

$$RII = \frac{\sum W_i f_{xi}}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{AN} \quad \dots \quad 3.2$$

Where i = 1, 2, 3, 4, and 5 is the frequency of responses, N is the total number of responses, RII is the relative importance indices, A is the highest weight (i.e. 5 in this case), is the number of respondents for value 5, is the number of respondents for value 4, is the number of respondents for value 3, is the number of respondents for value 2, and is the number of respondents for value one. According to the findings, suitable inferences were reached using SPSS and Excel software.

Framework development data analysis was used a descriptive statistics which is calculated mean and standard deviation for key performance indicators (KPIs), such as construction time, defect rates, and tenant satisfaction and content analysis which is analyzed qualitative data from tenant surveys and inspection reports to identify recurring themes and areas for improvement. Based on the data analysis, an identified critical challenge of project quality to develop a framework that outlines includes quality standards which are clear and measurable criteria for project design, construction, and maintenance; quality assurance processes which is procedures for inspections, testing, and monitoring to ensure compliance with standards; and quality improvement measures which is actions to address identified deficiencies and continuously improve quality.

The data analysis enabled the development of a comprehensive framework for quality assurance implementation system that addresses the specific challenges of public housing projects in Addis Ababa. This system provides a roadmap for ensuring that projects are built to a high standard, meet the needs of tenants, and contribute to the city's overall infrastructure development.

Integrating qualitative and quantitative data provides a comprehensive understanding of quality assurance practices in public housing projects by combining the qualitative and quantitative data allows researchers to triangulate findings, provide context and explanation, identify areas for improvement and develop comprehensive recommendations. Qualitative data which is conduct interviews with residents, contractors, and government officials to understand their perceptions

of quality assurance practices and identify challenges and opportunities. Quantitative data which is conduct surveys to measure resident satisfaction with housing quality, collect data on construction defects and maintenance records, and analyze project budgets to assess the impact of quality assurance practices on project costs.

By integrating these data, the researchers could gain a comprehensive understanding of the quality assurance practices in these projects, including the strengths and weaknesses, the factors influencing their effectiveness, and areas for improvement. This would enable them to develop evidence-based recommendations for enhancing quality assurance practices and improving the quality of public housing in Addis Ababa.

### **3.7.Validity and Reliability**

Validity and reliability are terms used to assess the quality of research, indicating how well a method, technique, or test assesses something. Stilwell & Hoskins (2013), found that reliability and validity are the two most important criteria for evaluating data quality control, with validity presuming reliability.

#### **3.7.1. Validity of the research method**

Validity in research refers to the extent to which a study accurately measures what it is intended to measure, and the validity of questionnaire data is heavily influenced by respondents' capacity and desire to offer the requested information. The questionnaire was adapted from evaluated literature and similar study instruments and tailored to the current research context. Furthermore, the customized questions were pilot tested by advisers, professionals in the field, and experts to ensure validity. Overall, the researchers hope to increase the validity of their studies by using suitable measures, controlling for confounding variables, and ensuring that their findings can be applied to other populations or contexts.

In this sense, the intended purpose (research question) of the study was accurately and clearly addressed in its design. The study approach and the measurement instrument fulfill all of the construct, face, and content validity of the research because of the instrument's similarity to other quality assurance strategies in public housing project measurement scales, the comprehensive reviews of literatures of the constructs concepts identified by the variables in the two parts of the questionnaires, the advisor's review, the comments of University instructors, and subsequent

steps in the process that follow formal statistical and scientific approach in answering the research questions.

### **3.7.2. Reliability of Questionnaire**

A questionnaire's dependability refers to its consistent and stable performance throughout time. A trustworthy questionnaire produced consistent answers whether distributed to the same group of people at different dates or by different researchers. To ensure questionnaire reliability, employ standardized questions, clear instructions, and a consistent format on a small sample would aid in identifying any flaws with the questions or structure before presenting it to a larger sample. Overall, the reliability of questionnaire is required to collect accurate and trustworthy data for research purposes.

Cronbach's alpha coefficient, a statistical measure used to determine the internal consistency of questionnaire reliability, was examined. It illustrates how closely connected a group of elements is, as well as how they measure the same underlying construct. A high Cronbach's alpha coefficient (usually greater than 0.7) indicates that the questionnaire is reliable and consistent in measuring the anticipated outcomes. However, it is crucial to emphasize that reliability is only one component of questionnaire validity; other aspects such as content and construct validity were also evaluated.

Data acquired from the respondent's profile of the questionnaire reliability is test participants' personal qualities regarding the test environment and their condition can contribute to whether or not a test is effective. Purposive sampling and snowball sampling are methods in which the researcher bases the target population selection on the informant's dependability and expertise. This is a valid concern, particularly for key informants, on whom most of the data quality depends.

Data collected from the current quality assurance practices in public housing projects, the challenges of public housing projects on quality assurance, the factors that impacts poor quality assurance of public housing projects of the questionnaires, internal consistency reliability is also tested by Cronbach's alpha coefficient in rated on a five-point likert scale. Cronbach's alpha values were used to assess the reliability of each construct's pieces. Cronbach's alpha requires only one test administration to generate a unique estimate of dependability.

The reliability test, equation 3.3, is used to obtain the Cronbach's alpha as illustrated below (Namdeo & Rout, 2016):

$$\alpha = \left( \frac{k}{k-1} \right) \left( \frac{S_T^2 - \sum S_i^2}{S_T^2} \right) \dots \dots \dots 3.3$$

Where;  $\alpha$  is the cronbach alpha coefficient, K is the number of items,  $S_i^2$  is the variance of  $i^{th}$  item and  $S_T^2$  is the variance of total score formed by summing items.

Results of Reliability Analysis which is before conducting an analysis based on the results obtained from the questionnaire, Cronbach analysis was carried out to ascertain the internal consistency of the questions using a five point Likert scale. The Cronbach Alpha test that shows the reliability of the questionnaire and the result of the reliability test that was conducted on the current quality assurance practices in public housing projects, the challenges of public housing projects on quality assurance and the factors that impact the poor quality assurance of public housing projects in Addis Ababa is represented in the Table 3.2, as shown below.

Responses of Reliability Analysis: Prior to completing an analysis based on the questionnaire responses, Cronbach analysis was performed to determine the internal consistency of the questions using a five-point Likert scale. The Cronbach Alpha test, which shows the reliability of the questionnaire, and the results of the reliability test, which was conducted on the current quality assurance practices in public housing projects, the challenges of public housing projects on quality assurance, and the factors that influence the poor quality assurance of public housing projects in Addis Ababa, are shown in Table 3.1, as shown below.

Table 3. 1: Result of Reliability test

| Reliability Statistics                                                     | Cronbach's Alpha | No of items |
|----------------------------------------------------------------------------|------------------|-------------|
| The current quality assurance practices in public housing projects         | 0.788            | 20          |
| The challenges of quality assurance in public housing projects             | 0.810            | 18          |
| The factors that impacts poor quality assurance of public housing projects | 0.715            | 22          |
| Over all                                                                   | 0.771            | 60          |

Source: Own survey data analysis

As a result, the researchers conclude that both the test and the questions were reliable.

### **3.8.Ethical consideration**

This study raised some ethical concerns. When designing and administering a questionnaire, it is critical to consider ethical standards such as informed consent, confidentiality, and privacy. The research participants were thoroughly informed about the study's goal, rights, and how their data would be utilized. Furthermore, research participants were given the option of declining participation or withdrawing from the study at any moment without penalty. It is also critical to safeguard the confidentiality and privacy of research participants by securely storing data and using anonymous or pseudonymous identifiers. Finally, the researcher ensured that the study's potential benefits outweighed any risks or harm to participants.

The research does not identify any participants by name, and information confidentiality is ensured. The other ethical aspect for this research is to ensure that the findings are not detrimental to participants. The author may not knowingly misreport findings that might be detrimental to the participants.

## CHAPTER FOUR

### RESULTS AND DISCUSSIONS

#### 4.1. Introduction

The findings and discussion are the most important aspects of the study. This topic is based around the research purpose and offers the findings. The main findings were directly related to the development of a comprehensive framework for ensuring the quality of public housing projects in Addis Ababa, Ethiopia.

The material gathered through interviews and questionnaires is examined within the context of the study's objectives. The analysis was carried out using mean score, RII method, focusing on the current quality assurance practices in public housing projects, the specific challenges that is relevant to the development of a comprehensive framework for quality assurance in public housing projects, the key impacts of poor quality assurance on public housing projects, and an appropriate framework for quality assurance implementation system. As a result, interpretations and comments were offered based on the findings. Thus, this issue aims to examine the significance of the findings in respect to the research objectives.

Respondents were given 112 questionnaires that covered a comprehensive understanding of current quality assurance practices, key impacts of poor quality, challenges, and the development of an appropriate framework for quality assurance implementation system for public housing projects in Addis Ababa. However, only 96 questionnaires were gathered, with 85.7% of the responses being usable; interviews and pertinent documents were also analyzed. Given the difficulty of collecting data in public housing developments, an 85.7% response rate is reasonable and extremely good, as shown in Table 4.1 below.

Table 4. 1: Frequency distribution of sample respondent's rate

| No of distributed questionnaire | No of returned Responses | % of returned Responses |
|---------------------------------|--------------------------|-------------------------|
| 112                             | 96                       | 85.7%                   |

Source: Own survey data analysis

#### 4.2. Respondent's Profile

Education, as a cultural requirement, is the most significant aspect in promoting overall growth. Furthermore, it is critical to improve the degree of capacity in collaboration with others, which

might influence the quality assurance process at a particular level. The educational statuses of the sample of respondents are provided in Table 4.2 below.

Table 4. 2: Respondents Educational background

|       |                | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|----------------|-----------|---------|---------------|--------------------|
| Valid | Below Diploma  | 9         | 11.4    | 11.4          | 11.4               |
|       | Diploma        | 21        | 26.6    | 26.6          | 38.0               |
|       | BSc/ BA        | 39        | 49.4    | 49.4          | 87.3               |
|       | MSc/MA & above | 10        | 12.7    | 12.7          | 100.0              |
|       | Total          | 79        | 100.0   | 100.0         |                    |

Source: Own survey data analysis

According to the aforementioned research from Table 4.2, the respondents' highest educational levels were bachelor's and diploma degrees. The majority of respondents (49.4%) hold a first degree, followed by diploma holders (26.6%), master's degree holders (12.7%), and those with less than a diploma (11.4%). This signified highly educated individuals with extensive skill and knowledge of the subject matter. This also aided the researcher in efficiently collecting data because the responders could read, write, and interpret the questions. As a result, highly educated respondents played an important role in supplying appropriate and relevant data, which determined the research outcome sensibly and logically.

The study sought to find out the construction firm employed of respondents and the responses were analyzed as shown in Table 4.3 below.

Table 4. 3: The Respondents role in the construction firm employed

| The construction firm employed | Frequency                    | Percent | Valid % | Cumulative % |
|--------------------------------|------------------------------|---------|---------|--------------|
| Valid                          | Project Manager              | 15      | 19.0    | 19.0         |
|                                | Resident engineer            | 12      | 15.2    | 34.2         |
|                                | Contract administration team | 8       | 10.1    | 44.3         |
|                                | Technical Team member        | 13      | 16.5    | 60.8         |
|                                | Project Consultancy          | 15      | 19.0    | 79.7         |
|                                | Project supervisor           | 16      | 20.3    | 100.0        |
|                                | Total                        | 79      | 100.0   | 100.0        |

Source: Own survey data analysis

With regard to the construction firm employed by the respondents, 15 (19.0%) were project managers, 12 (15.2%) were resident engineers, 8 (10.1%) were contract administration team members, 13 (16.5%) were technical team members, 15 (19.0%) were project consultants, and 16 (20.3%) were project supervisors. This shows that the majority of respondents were able to perform construction work, which allowed them to have a grasp of how to control quality assurance in construction projects.

The frequency table 4.4 shows that the respondents were architect profession have 7 (8.9%) from the total respondents, 8 (10.1%) from the total respondents have surveyor profession 8 (10.1%) from the total respondents have surveyor profession, 33 (41.8%) from the total respondents have civil engineer profession, 25 (31.6%) from the total respondents have COTM profession and 6 (7.6%) from the total respondents have other profession. The obtained results of respondent's occupation are given in the following table 4.4, as shown below.

Table 4. 4: Respondents Profession

|       | Profession     | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|----------------|-----------|---------|---------------|--------------------|
| Valid | Architect      | 7         | 8.9     | 8.9           | 8.9                |
|       | Surveyor       | 8         | 10.1    | 10.1          | 19.0               |
|       | Civil Engineer | 33        | 41.8    | 41.8          | 60.8               |
|       | COTM           | 25        | 31.6    | 31.6          | 92.4               |
|       | Others         | 6         | 7.6     | 7.6           | 100.0              |
|       | Total          | 79        | 100.0   | 100.0         |                    |

Source: Own survey data analysis

The survey result showed that more than 92% of respondents are professional. Therefore, professional respondents were crucial role players in supplying appropriate and relevant data which determine the research outcome reasonably and logically.

The frequency According to Table 4.5, 17.7% of respondents have less than 6 years of work experience, 19% have years of experience between 6 and 10 years, 36.7% have years of

experience between 11 and 15 years, and 26.6% have years of experience greater than 15 years. The outcomes of the respondent's year of work experience are presented in Table 4.5 below.

Table 4. 5: Respondents work experience

|       | Work experience   | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-------------------|-----------|---------|---------------|--------------------|
| Valid | Less than 6 years | 14        | 17.7    | 17.7          | 17.7               |
|       | 6 - 10 Years      | 15        | 19.0    | 19.0          | 36.7               |
|       | 11 - 15 Years     | 29        | 36.7    | 36.7          | 73.4               |
|       | above 15 years    | 21        | 26.6    | 26.6          | 100.0              |
|       | Total             | 79        | 100.0   | 100.0         |                    |

Source: Own survey data analysis

These findings show that more than 82 percent of respondents have more than 6 years of work experience. These results will also provide some assurance that the gathered data will reflect what it was intended for. Those respondents are in a good position inside their organizations to provide confidential and precise data. As a result, highly experienced respondents played critical roles in giving appropriate and relevant data that determined the research's sensible and logical outcome.

According to the survey results, the respondents were almost evenly distributed in their work association stakeholders, that is, 28 (35.4%) of the total respondents work association stakeholders were Addis Ababa Housing Development Project Office (AAHDPO), 12 (15.2%) of the total respondents work association stakeholders were Small and Micro Enterprise (SME), 20 (25.3%) of the total respondents work association stakeholders were Contractor, and 19 (24.1%) of the total target. The work association stakeholders of the sample of respondents are provided in Table 4.6 below.

Table 4. 6: Respondents work association stakeholders

|       | Work association stakeholders                           | Frequency | Percent | Valid % | Cumulative % |
|-------|---------------------------------------------------------|-----------|---------|---------|--------------|
| Valid | Addis Ababa Housing Development Project Office (AAHDPO) | 28        | 35.4    | 35.4    | 35.4         |
|       | Small and Micro Enterprise (SME)                        | 12        | 15.2    | 15.2    | 50.6         |

|            |    |       |       |       |
|------------|----|-------|-------|-------|
| Contractor | 20 | 25.3  | 25.3  | 75.9  |
| Consultant | 19 | 24.1  | 24.1  | 100.0 |
| Total      | 79 | 100.0 | 100.0 |       |

**Source:** Own survey data analysis

Based on the demographics of the respondents, the researcher determined that there is no significant difference between the different demographic groups when testing the factors analyzed. Furthermore, 62% of respondents have a first-degree or higher education, and more than 82% have more than 6 years of expertise in low-cost house construction quality work. As a result, an acceptable level of education and extensive work experience in low-cost house building ensure that the respondents played an important role in providing adequate and relevant data, enhancing the validity of the research findings.

#### **4.3. Current Quality Assurance Practices in Public Housing Construction Projects**

Assess current quality assurance processes in public housing projects and compare them to worldwide standards of performance for each main feature. Consider how well existing quality assurance techniques support each of the criteria. The overview evaluation was conducted using the relative importance index strategy, and respondents were asked to rate the present quality assurance practices in public housing developments in Addis Ababa and compare them to worldwide norms. The various current quality assurance practice levels are ranked according to their RII value and the interpretation of the RII values. The RII values are ranked from highest to lowest, resulting in rankings of 20 common current quality assurance practices in public housing projects based on previous studies and practices. This means that all twenty variables are evaluated as current quality assurance techniques in public housing projects in Addis Ababa and compared to international standards. Table 4.7 shows the value analysis performed on the data using the relative important index.

Table 4. 7: Current quality assurance practices in public housing projects

| <b>Current quality assurance practices in public housing projects</b>                                          | <b>N</b> | <b>RII</b> | <b>Rank</b> |
|----------------------------------------------------------------------------------------------------------------|----------|------------|-------------|
| The quality of construction materials used in public housing projects meets or exceeds international standards | 79       | 0.76       | 1           |

|                                                                                                                                                            |    |       |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------|----|
| Involving relevant stakeholders in inspection processes to enhance transparency and accountability                                                         | 79 | 0.74  | 2  |
| The documentation and implementation of quality assurance measures in public housing projects reflect a high level of adherence to international standards | 79 | 0.71  | 3  |
| Public housing projects demonstrate robustness and durability in line with globally accepted quality benchmarks                                            | 79 | 0.70  | 4  |
| Implementing quality control measures to ensure compliance with construction standards and specifications                                                  | 79 | 0.69  | 5  |
| The project planning process is thorough and well-documented                                                                                               | 79 | 0.68  | 6  |
| Conducting material testing and quality checks at various stages of construction                                                                           | 79 | 0.67  | 7  |
| Utilizing technology tools such as project management software for real-time monitoring and reporting                                                      | 79 | 0.64  | 8  |
| Stakeholders are actively involved in decision-making processes                                                                                            | 79 | 0.63  | 9  |
| Materials used in the project are of high quality and durable                                                                                              | 79 | 0.62  | 10 |
| Conducting regular reviews of building code requirements and updating project plans accordingly                                                            | 79 | 0.6   | 11 |
| The project complies with all relevant building codes and regulations                                                                                      | 79 | 0.605 | 12 |
| Regularly monitoring workmanship and construction processes to identify and address quality issues promptly                                                | 79 | 0.603 | 13 |
| Quality assurance practices in public housing projects in Addis Ababa align with international quality standards                                           | 79 | 0.60  | 14 |
| Providing training programs for project personnel on quality assurance practices, safety protocols, and construction techniques                            | 79 | 0.59  | 15 |
| The current quality assurance practices in public housing projects effectively meet internationally recognized quality standards                           | 79 | 0.58  | 16 |
| Conducting regular inspections by qualified inspectors to verify compliance with design plans and building codes                                           | 79 | 0.54  | 17 |

|                                                                                                                                |    |      |    |
|--------------------------------------------------------------------------------------------------------------------------------|----|------|----|
| consistency in the adherence to international quality standards across various stages of public housing project implementation | 79 | 0.52 | 18 |
| Routine inspections and compliance checks in public housing projects effectively uphold international quality standards        | 79 | 0.51 | 19 |
| Documenting inspection findings and ensuring timely resolution of identified issues                                            | 79 | 0.50 | 20 |
| Valid N (list wise)                                                                                                            | 79 |      |    |

**Source:** Own survey data analysis

As the results of the study shown above it clear indicates that the dominant top five most significant current quality assurance practices in public housing projects in Addis Ababa and compare them to international standards are quality of construction materials used in public housing projects meets or exceeds international standards with the RII value of 0.76, Involving relevant stakeholders in inspection processes to enhance transparency and accountability with the RII value of 0.74, documentation and implementation of quality assurance measures in public housing projects reflect a high level of adherence to international standards with the RII value of 0.71, Public housing projects demonstrate robustness and durability in line with globally accepted quality benchmarks with the RII value of 0.70 and Implementing quality control measures to ensure compliance with construction standards and specifications with the RII value of 0.69. Discussion and conclusions on the most significant current quality assurance practices in public housing projects in Addis Ababa, and their comparison to international norms:

The quality of construction materials, which ensures that the materials used in public housing projects in Addis Ababa meet or surpass international standards, is critical to the buildings' longevity and safety. Adhering to these standards increases the likelihood that the projects will withstand environmental factors and provide a higher standard of living for residents.

Engaging key stakeholders in the inspection processes of public housing developments improves transparency and accountability. This technique ensures that all parties are aware of the quality assurance procedures being implemented and can provide comments or raise issues as needed. This level of participation can help avert problems and increase overall project quality.

The documentation and implementation of quality assurance methods in public housing projects in Addis Ababa should demonstrate a high level of compliance with international standards. Proper documentation ensures that all parts of the project are recorded and monitored, whereas thorough implementation ensures that the measures are carried out correctly. This attention to detail is critical to ensuring quality throughout the construction process.

Robustness and durability of public housing projects are critical, and they must meet globally established quality standards. Buildings that are built to last not only provide residents with a safe and secure living environment, but they also save money on maintenance costs over time. By satisfying international durability criteria, public housing projects can ensure their long-term viability.

Implementing quality control techniques is critical for assuring compliance with building standards and specifications. Implementing these methods allows public housing projects to identify and fix any difficulties that may develop during construction. This proactive approach to quality assurance reduces faults and guarantees that the final product satisfies the specified requirements.

When comparing these quality assurance measures in public housing developments in Addis Ababa to international standards, it is worth noting that many of them are consistent with worldwide best practices. International construction standards include the use of high-quality construction materials, stakeholder involvement in inspections, adherence to documentation and implementation processes, a focus on robustness and durability, and the implementation of quality control measures.

However, public housing projects in Addis Ababa must constantly try to achieve or exceed these international standards in order to assure the greatest degree of quality in their development projects. By regularly analyzing and improving their quality assurance methods, public housing developments can improve their reputation, increase resident satisfaction, and contribute to the city's overall growth.

In a qualitative interview analysis about current quality assurance practices in public housing projects in Addis Ababa, several key themes and insights can be identified:

Use of quality assurance tools and techniques which is the interviews revealed that there is a reliance on traditional quality assurance tools and techniques such as checklists, inspections, and testing. However, there were concerns raised about the adequacy of these methods in ensuring comprehensive quality control, especially in large-scale housing projects.

Training and certification of construction personnel which is the interviews highlighted a lack of standardized training and certification programs for construction personnel involved in public housing projects. This was seen as a significant gap in ensuring consistent quality across different projects.

Collaboration with external stakeholders which is there was a consensus among interviewees about the importance of collaboration with external stakeholders such as architects, engineers, and contractors. However, the interviews also revealed challenges in establishing effective communication and coordination between these parties, which could impact quality assurance efforts.

Resident engagement in quality control which is the interviews indicated a limited level of resident engagement in quality control processes. There were suggestions that involving residents in inspections and feedback mechanisms could be beneficial in identifying and addressing quality issues from the end-user perspective.

Use of technology for quality management which is there was a recognition of the potential benefits of using technology for quality management, including digital inspections and data analytics. However, the interviews also highlighted barriers such as limited access to technology and a lack of expertise in implementing these tools effectively.

Overall, the qualitative data suggests that while there are some established quality assurance practices in public housing projects in Addis Ababa, there are also significant areas for improvement. This includes the need for more advanced quality assurance tools, standardized training for construction personnel, improved collaboration with external stakeholders, increased resident engagement, and greater utilization of technology for quality management. Addressing these gaps could lead to more effective quality assurance practices and ultimately improve the overall quality of public housing projects in the city.

#### 4.4. Challenges of Quality Assurance in Public Housing Construction Projects

The contribution of each of the variables to the overall challenges in Addis Ababa that is relevant to the development of a comprehensive framework for quality assurance in public housing projects was examined, and the ranking of the attributes in terms of their criticality as perceived by the respondents was done by using the mean score technique five point likert-scale: (1 - Strongly Disagree, 2 - Disagree, 3 - Moderately Agree, 4 - Agree and 5 - Strongly Agree) which was computed most significant challenges and rankings of 18 common challenges of quality assurance. The numerous most critical quality assurance difficulties in public housing projects were rated according to their mean score value, with the mean values interpreted from highest to lowest, resulting in rankings of 18 common factors. This means that all eighteen variables are treated as quality assurance difficulties for public housing projects in Addis Ababa, and the findings are provided in Tables 4.8, as shown below.

Table 4. 8: Challenges of quality assurance in public housing projects

| <b>Challenges of quality assurance in public housing projects</b>          | <b>N</b> | <b>Mean</b> | <b>Std. Dv.</b> | <b>Rank</b> |
|----------------------------------------------------------------------------|----------|-------------|-----------------|-------------|
| Limited communication and transparency with stakeholders.                  | 79       | 3.19        | 1.051           | 1           |
| Lack of enforcement of regulations.                                        | 79       | 3.16        | 1.006           | 2           |
| Inaccurate cost estimates leading to financial constraints.                | 79       | 3.16        | 1.137           | 3           |
| Budget overruns and lack of financial transparency.                        | 79       | 3.15        | 1.156           | 4           |
| Complex regulatory requirements and approval processes.                    | 79       | 3.03        | 1.209           | 5           |
| Limited access to funding sources for public housing projects.             | 79       | 3.01        | 1.193           | 6           |
| Non-compliance with building codes and standards.                          | 79       | 3.00        | .961            | 7           |
| Lack of community engagement in project planning.                          | 79       | 2.97        | 1.143           | 8           |
| Lack of skilled labor leading to quality compromises.                      | 79       | 2.96        | 1.055           | 9           |
| Disregard for community needs and preferences.                             | 79       | 2.95        | 1.061           | 10          |
| Inefficient project scheduling and management.                             | 79       | 2.89        | 1.143           | 11          |
| External factors like weather conditions impacting construction timelines. | 79       | 2.85        | 1.051           | 12          |
| Lack of emphasis on energy efficiency and environmental impact             | 79       | 2.85        | 1.051           | 13          |
| Deficiencies in materials used for public housing projects.                | 79       | 2.84        | 1.018           | 14          |
| Inadequate quality control measures during construction.                   | 79       | 2.78        | 1.117           | 15          |

|                                                              |    |      |       |    |
|--------------------------------------------------------------|----|------|-------|----|
| Delays in project completion affecting housing availability. | 79 | 2.65 | 1.166 | 16 |
| Limited adoption of eco-friendly construction practices.     | 79 | 2.49 | 1.142 | 17 |
| Insufficient focus on sustainable materials and designs.     | 79 | 2.44 | 0.712 | 18 |
| Valid N (list wise)                                          | 79 |      |       |    |

**Source:** Own survey data analysis

Based on the mean score and standard deviation technique obtained in the above Table 4.8, relatively the following points were the challenges in Addis Ababa that is relevant to the development of a comprehensive framework for quality assurance in public housing projects in chronological order. Thus, top five most significant the challenges in Addis Ababa that is relevant to the development of a comprehensive framework for quality assurance in public housing projects are limited communication and transparency with stakeholders with the mean value of 3.19, Inaccurate cost estimates leading to financial constraints with the mean value of 3.16, Lack of enforcement of regulations with the mean value of 3.16, Budget overruns and lack of financial transparency with the mean value of 3.15 and Complex regulatory requirements and approval processes with the mean value of 3.03.

Discussion and conclusions on the top five most serious difficulties in Addis Ababa that relate to the implementation of a comprehensive framework for quality assurance in public housing projects:

Limited communication and transparency with stakeholders which is effective communication and transparency with stakeholders are crucial for the success of public housing projects. By engaging with stakeholders and keeping they informed about the progress, challenges, and quality assurance measures of the projects, trust can be built, and concerns can be addressed in a timely manner. Improving communication channels and transparency can enhance resident satisfaction and support the overall success of public housing projects.

Inaccurate cost estimates cause financial limits, whereas accurate cost assessment is critical for the successful implementation of public housing projects. Inaccurate projections can result in cost constraints, delays, and sacrifices in quality assurance procedures. Creating thorough cost estimation frameworks that take into account all important aspects and potential hazards will

assist alleviate financial issues and ensure that public housing projects are completed on time and within budget.

Lack of enforcement of regulations which is regulations are not enforced adequately, which is required to maintain quality standards in public housing complexes. Without sufficient oversight, there is a risk of noncompliance with regulations, compromising building safety and quality. Establishing strong monitoring systems and constantly enforcing laws can assist prevent problems and guarantee that quality assurance procedures are used throughout the construction process.

Budget overruns and a lack of financial transparency have a substantial impact on the viability of public housing projects. Transparent financial management techniques are critical for ensuring that resources are allocated efficiently and effectively in order to meet quality assurance requirements. Implementing measures to track expenses, monitor budgets, and accurately report financial information can help public housing projects avoid budget overruns and increase financial transparency.

Complex regulatory requirements and approval processes which is Complex regulatory regulations and approval processes might create substantial hurdles for public housing developments in Addis Ababa. Navigating several layers of rules and securing permits can cause delays, higher expenses, and significant compliance difficulties. Streamlining regulatory processes, offering clear information to stakeholders, and streamlining approval procedures can all help to address these issues and ease the timely deployment of quality assurance measures in public housing projects.

To summarize, tackling these key challenges in Addis Ababa is critical for developing a comprehensive framework for quality assurance in public housing projects. Public housing projects can improve their quality assurance measures and contribute to the city's long-term development by improving communication with stakeholders, enhancing cost estimation practices, strengthening regulatory enforcement, ensuring financial transparency, and streamlining regulatory processes.

The qualitative interview analysis about quality assurance challenges in public housing projects in Addis Ababa highlighted several key issues:

Corruption and unethical practices which is the interviews revealed concerns about corruption and unethical practices in the construction industry, leading to compromised quality in public housing projects. This could include the use of substandard materials, improper construction methods, and favoritism in awarding contracts. The presence of corruption can significantly undermine quality assurance efforts and lead to poor-quality housing.

Limited access to quality materials which is interviewees pointed out the challenge of limited access to quality construction materials. This could be due to factors such as supply chain issues, cost constraints, or a lack of local production of high-quality materials. The use of subpar materials can have a direct impact on the structural integrity and overall quality of public housing projects.

Lack of technology and innovation which is the interviews highlighted a lack of technological advancements and innovative practices in quality assurance processes. This could include the absence of digital tools for inspections, data analytics for quality control, and other modern quality management techniques. Without leveraging technology, it becomes difficult to ensure comprehensive and efficient quality assurance.

Weak enforcement of building codes and regulations which is the qualitative data indicated that there are challenges related to the enforcement of building codes and regulations in public housing projects. This could be due to inadequate oversight, insufficient resources for regulatory bodies, or a lack of political will to enforce standards. Weak enforcement can lead to non-compliance with quality standards and compromise the safety and durability of housing structures.

Post-construction neglect which is the interviews also brought attention to the issue of post-construction neglect, where completed housing projects may not receive adequate maintenance and upkeep. Neglecting maintenance can lead to the deterioration of building quality over time, impacting the long-term habitability and safety of the housing units.

Overall, the qualitative analysis revealed a range of significant challenges in quality assurance for public housing projects in Addis Ababa. These challenges encompass issues related to ethical conduct, material quality, technological advancement, regulatory compliance, and post-

construction maintenance. Addressing these challenges is crucial for improving the overall quality and sustainability of public housing in the city.

#### 4.5. The Impact of Poor Quality Assurance on Public Housing Construction Projects

Assessment of the impact of poor quality assurance on public housing projects at the major attribute level. This study aims to investigate the influence of poor quality assurance on public housing construction projects in Addis Ababa. The overview evaluation was conducted using the relative importance index strategy, and respondents were asked to rate which aspects of poor quality assurance on public housing projects were considered. The various consequences were rated according to their RII value, and the RII values were interpreted from highest to lowest, resulting in 20 common impacts of poor quality assurance on public housing projects based on past studies and practices. This means that all twenty variables are included when determining the impact of poor quality assurance on public housing development projects in Addis Ababa. Table 4.9 shows the value analysis performed on the data using the relative important index.

Table 4. 9: The impact of poor quality assurance on public housing projects

| <b>The impacts of poor quality assurance on public housing projects</b>                                                             | <b>RII</b> | <b>Rank</b> |
|-------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|
| Uncomfortable and unhealthy living conditions due to poor construction quality                                                      | 0.694      | 1           |
| Untimely project delivery                                                                                                           | 0.658      | 2           |
| Cost overruns                                                                                                                       | 0.646      | 3           |
| Compromised structural integrity, leading to potential building collapses or failures                                               | 0.628      | 4           |
| Long-term maintenance challenges                                                                                                    | 0.623      | 5           |
| Legal and regulatory implications                                                                                                   | 0.619      | 6           |
| Damage to reputation                                                                                                                | 0.614      | 7           |
| Poor infrastructural deliverables                                                                                                   | 0.609      | 8           |
| Affects the nation's development growth                                                                                             | 0.605      | 9           |
| Decreased property value                                                                                                            | 0.603      | 10          |
| Unhealthy living conditions can hinder educational and economic opportunities for occupants                                         | 0.600      | 11          |
| Poor indoor air quality due to inadequate ventilation and moisture control, leading to respiratory problems and other health issues | 0.585      | 12          |

|                                                                                                                                             |       |    |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------|----|
| Noise disturbances, inadequate lighting, & lack of privacy affect occupant well-being                                                       | 0.575 | 13 |
| Substandard materials and workmanship, resulting in safety hazards for occupants                                                            | 0.570 | 14 |
| Deficiencies in fire safety systems, increasing the risk of fires and injuries                                                              | 0.554 | 15 |
| Poor quality public housing can contribute to social inequality and perpetuate poverty                                                      | 0.552 | 16 |
| Poor workmanship and material failures necessitate costly repairs and replacements                                                          | 0.549 | 17 |
| Decreased energy efficiency                                                                                                                 | 0.534 | 18 |
| Lack of proper waste management, creating environmental pollution and health hazards                                                        | 0.532 | 19 |
| Use of harmful materials or finishes, posing health risks to occupants                                                                      | 0.522 | 20 |
| Reduced aesthetic appeal and functionality of the housing units, negatively impacting community pride and morale                            | 0.516 | 21 |
| Substandard construction leads to premature deterioration and frequent repairs, increasing maintenance costs for public housing authorities | 0.504 | 22 |

Source: Own survey data analysis

As the results of the study shown above it clear indicates that the dominant top ten relatively significant impact of poor quality assurance on public housing projects in Addis Ababa, including but not limited to, construction materials, workforce skills, and regulatory compliance are uncomfortable and unhealthy living conditions due to poor construction quality with the RII value of 0.694, untimely project delivery with the RII value of 0.658, cost overruns with the RII value of 0.646, compromised structural integrity, leading to potential building collapses or failures with the RII value of 0.628, long-term maintenance challenges with the RII value of 0.623, legal and regulatory implications with the RII value of 0.619, damage to reputation with the RII value of 0.614, poor infrastructural deliverables with the RII value of 0.609, affects the nation's development growth with the RII value of 0.605, and decreased property value with the RII value of 0.603.

Discussion and findings on the most significant impact of inadequate quality assurance on public housing construction projects in Addis Ababa, including but not limited to construction materials, worker skills, and regulatory compliance:

Uncomfortable and unhealthy living conditions caused by poor quality assurance in public housing construction projects can result in subpar living conditions for tenants. Improper insulation, poor ventilation, and substandard materials can cause discomfort and health problems for the inhabitants.

Untimely project delivery, along with poor quality assurance processes, can cause project completion delays. This has enormous ramifications for both the government and the citizens, who are eagerly awaiting the completion of the housing units.

Cost overruns caused by poor quality assurance can result in rework, repairs, and replacements, all of which can significantly raise project costs. This might put a strain on the funds given to public housing projects, posing financial issues for the agencies concerned.

Compromised structural integrity which is poor quality assurance compromises structural integrity, posing a major risk to building stability. Structural failures can have devastating repercussions, endangering individuals' lives and causing severe property damage.

Long-term maintenance challenges which are substandard construction practices can result in buildings that require frequent maintenance and repairs. This not only increases the overall cost of ownership but also adds to the burden of maintaining public housing infrastructure.

Legal and regulatory implications which are poor quality assurance in public housing construction projects can lead to legal issues and non-compliance with building codes and regulations. This can result in fines, penalties, and even legal action against the parties involved in the project.

Damage to reputation which is substandard construction practices can tarnish the reputation of the government agencies, developers, and contractors involved in public housing projects. Negative publicity can impact future projects and partnerships, leading to a loss of trust and credibility in the industry.

Poor infrastructural deliverables, as well as inadequate quality assurance, can lead to buildings that fail to meet safety, durability, and functionality standards. This can lower the overall quality of public housing infrastructure and prevent residents from living in a comfortable and secure environment.

Affects the nation's development growth which is poor quality assurance in public housing construction projects can hinder the overall development and growth of Addis Ababa. Substandard housing units may not attract residents or investors, leading to stagnation in economic development and urban expansion.

Decreased property value means that buildings built with poor quality assurance are likely to have lower property values due to weakened structural integrity and bad living conditions. This could have a negative impact on the total real estate market in Addis Ababa, lowering the possibility for long-term investment returns.

To summarize, the considerable impact of poor quality assurance on public housing construction projects in Addis Ababa goes beyond construction materials, worker skills, and regulatory compliance. It also encompasses uncomfortable and unhealthy living conditions due to poor construction quality, untimely project delivery, cost overruns, compromised structural integrity, leading to potential building collapses or failures, long-term maintenance challenges, legal and regulatory implications, damage to reputation, poor infrastructural deliverables, effects on the nation's development growth, and decreased property value. Addressing these difficulties necessitates a holistic approach that focuses on upgrading construction materials, developing labor skills, and maintaining regulatory compliance throughout the project's lifecycle. By prioritizing quality assurance in public housing construction, authorities can reduce risks, deliver high-quality housing units, and protect residents' well-being. By investing in quality assurance practices, authorities can protect their reputation and contribute to Addis Ababa's long-term development.

Based on the interview, the broader societal economic costs of poor quality assurance in public housing projects in Addis Ababa can have far-reaching implications, impacting public health and placing strain on social services. Some of the key economic costs include:

Health impacts which are poor quality housing can pose significant risks to public health. Substandard construction materials, improper sanitation facilities, and inadequate ventilation can lead to increased exposure to health hazards such as mold, indoor air pollution, and waterborne diseases. This can result in higher healthcare costs, increased absenteeism from work or school due to illness, and a greater burden on the public healthcare system.

Safety concerns which are low-quality construction in public housing projects can lead to safety hazards such as structural weaknesses, fire risks, and electrical hazards. This can result in higher rates of accidents and injuries, leading to increased demand for emergency services and healthcare resources. Additionally, the potential for building collapses or other structural failures can have devastating consequences for residents and the broader community.

Strain on social services which is poor quality public housing may exacerbate social inequality and place strain on social services. Residents of substandard housing may face increased challenges related to mental health, well-being, and access to education and employment opportunities. This can lead to higher demand for social support programs, mental health services, and educational interventions, placing a strain on public resources and social service infrastructure.

Economic displacement which is in extreme cases, poor quality public housing may lead to displacement of residents due to safety concerns or deteriorating living conditions. This can result in additional economic costs associated with relocation assistance, homelessness services, and the disruption of social networks and community cohesion.

Long-term economic burden which is over time, the economic burden of poor quality public housing can be substantial. The need for constant repairs, maintenance, and retrofitting to address quality deficiencies can strain public budgets and divert resources from other critical infrastructure and development projects.

Reduced property values which are poor quality public housing can have a negative impact on the surrounding neighborhoods by reducing property values and hindering community development efforts. This can lead to decreased tax revenue for local governments and further strain on municipal resources.

Addressing the challenges of poor quality assurance in public housing projects is essential not only for ensuring the well-being and safety of residents but also for mitigating the broader economic costs that arise from substandard living conditions. Investing in high-quality construction practices, rigorous quality assurance processes, and ongoing maintenance can help alleviate these economic burdens and contribute to the overall health and prosperity of communities in Addis Ababa.

#### **4.6. Develop Appropriate Framework for Quality Assurance Implementation System on Public Housing Projects**

Appropriate framework for quality assurance implementation system on public housing projects in Addis Ababa:

Establish clear quality standards that define specific quality standards for public housing projects in Addis Ababa, taking into account local conditions and the impact of poor quality assurance, such as structural integrity and safety, building materials and finishes, energy efficiency and sustainability, accessibility and universal design, health and safety features, community amenities and public spaces.

Conduct regular inspections and tests establish a schedule for regular inspections throughout the project lifecycle, including Pre-construction inspections to verify site conditions and materials, during construction inspections to monitor progress and adherence to standards and Post-construction inspections to ensure quality. Increase the frequency of inspections during critical stages of construction, such as foundation work and structural framing.

Engage regulatory inspectors. Consider hiring independent inspectors to offer objective assessments of project quality. Inspectors should be qualified and experienced in public housing development in Addis Ababa.

Establish Independent quality assurance team is formed to establish and implement the quality management strategy, conduct inspections and audits, monitor and report on quality performance, and identify and resolve quality concerns. Ensure that the team possesses the requisite knowledge and resources to effectively address the problems of quality assurance in Addis Ababa.

Train and empower project teams by educating them on quality standards and inspection procedures, empowering them to identify and handle quality issues early on, and focusing on training local workers to increase their skills and knowledge.

Establish a quality control method that involves monitoring and ensuring the quality of materials, workmanship, and construction practices. This procedure should involve material testing and

certification, workmanship inspections, and progress tracking. Strengthen the company's subcontractor selection procedures and ensure fair subcontract conditions.

Implement a corrective action system that includes identifying, recording, and resolving non-conformances; ensuring that corrective actions are done quickly and effectively; and tracking and monitoring the effectiveness of corrective actions to prevent reoccurrence.

Regularly monitor and evaluate the quality performance of public housing developments in Addis Ababa. Use inspection, audit, and resident feedback data to identify areas for improvement and set performance metrics to assess the quality assurance system's efficacy.

Continuous improvement: It routinely analyzes and updates the quality assurance implementation system to verify its effectiveness and alignment with best practices. Seek feedback from stakeholders and implement lessons learned into future projects. Investigate the use of technology and innovation to improve quality assurance, such as mobile inspection apps and data analytics. The collected results are displayed in Figure 4.1 below.

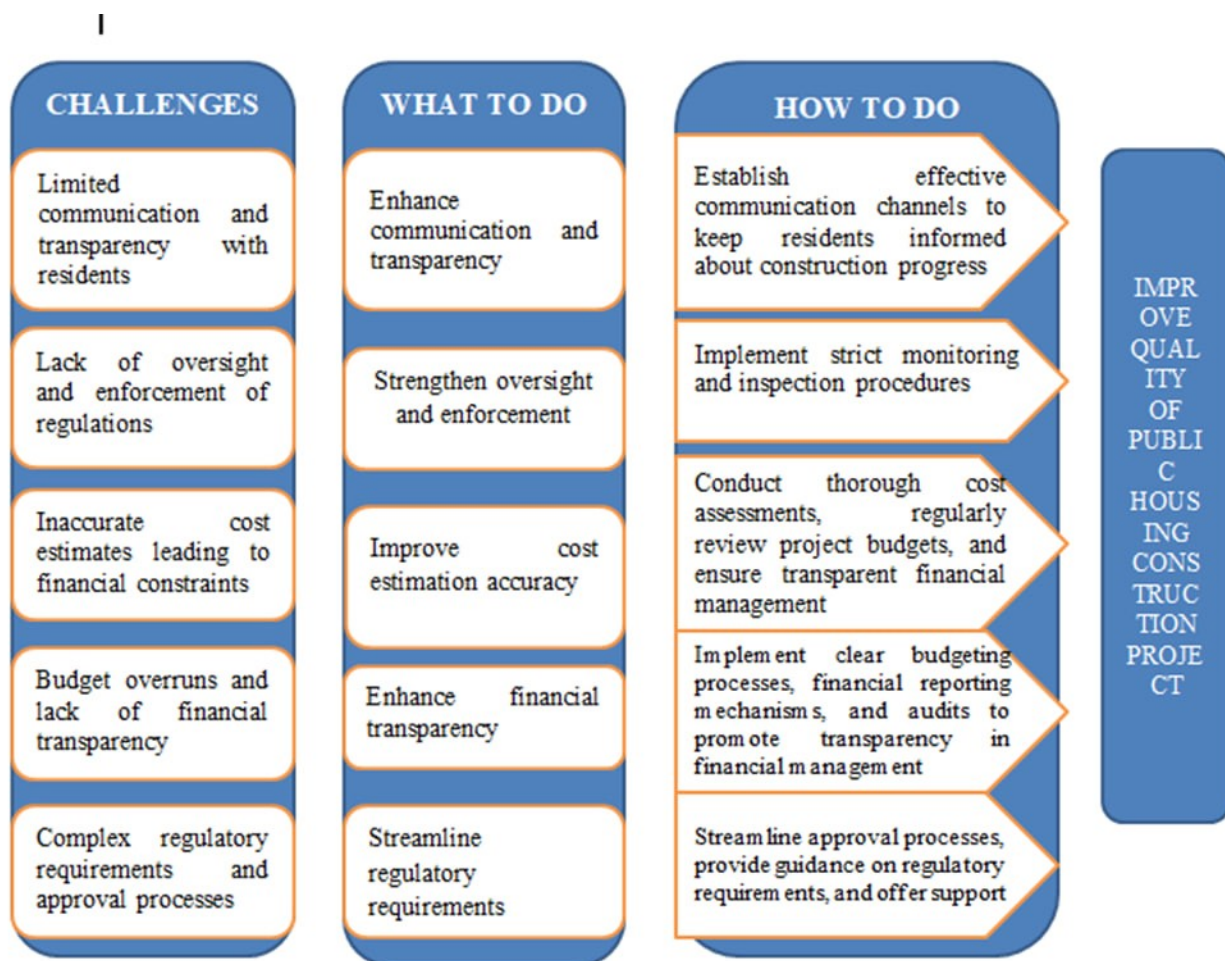


Figure 4. 1: Summary result to improving quality assurance implementation system on public housing projects in Addis Ababa

By implementing this framework, public housing authorities in Addis Ababa can address the quality assurance and deliver high-quality housing projects that meet the needs of residents and contribute to the overall well-being of the community. Additionally, implementing these strategies, the quality of public housing construction projects can be improved, leading to safer, more sustainable, and higher-quality living environments for residents.

## **CHAPTER FIVE**

### **CONCLUSIONS AND RECOMMENDATIONS**

In this chapter major findings of this study were addressed and recommendations for procuring entities were drawn.

#### **5.1.CONCLUSION**

The ultimate goal of this study was to create a comprehensive framework for verifying the quality of on-site public housing projects in Addis Ababa, Ethiopia. The specific objectives included to assess the current quality assurance practices, to analyze the specific challenges, to identify the key impacts of poor quality assurance and to develop appropriate framework for quality assurance implementation system for public housing projects in Addis Ababa. With this in mind, the conclusion focuses on the primary conclusions derived from the data analysis. Thus, the researcher has reached the following conclusion:

The existing quality assurance processes in public housing projects are being implemented in Addis Ababa, however there is a definite need for improvements to reach or exceed international standards. Improving the quality of construction materials, effectively involving stakeholders, improving documentation and implementation of quality assurance measures, ensuring robustness and durability, and implementing rigorous quality control measures are critical areas for improvement in public housing projects in order to meet global quality assurance standards.

Based on the research findings, the challenges have a significant impact on the quality of public housing projects in Addis Ababa, compromising the safety, health, and well-being of tenants. Addressing these challenges requires a comprehensive approach involving all stakeholders, clear and enforceable regulations, improved communication and transparency, and a commitment to quality assurance throughout the project lifecycle. Stakeholders can work together to achieve higher quality assurance standards in public housing projects by improving communication with stakeholders, ensuring accurate cost estimates, strengthening regulatory enforcement, promoting financial transparency, and simplifying regulatory processes.

The impacts of poor quality assurance on public housing development projects in Addis Ababa are multifaceted and far-reaching. It impacts not only inhabitants' immediate living conditions, but also the long-term viability and safety of public housing infrastructure. Addressing these

difficulties necessitates a holistic approach that focuses on upgrading construction materials, developing labor skills, and maintaining regulatory compliance throughout the project's lifecycle. By focusing quality assurance in public housing development, authorities may reduce risks, offer high-quality housing units, and protect residents' well-being.

Appropriate framework for quality assurance implementation system on public housing projects in Addis Ababa, addressing quality assurance, including establishing clear quality standards, implementing a comprehensive quality management plan, conducting regular inspections, engaging independent inspectors, establishing an independent quality assurance team, training and empowering project teams, establishing a quality control process, implementing a corrective action system, monitoring and evaluation By using this framework, Addis Ababa's public housing authority may handle quality assurance issues and create high-quality housing developments that suit residents' demands while also contributing to the community's general well-being.

## **5.2.RECOMMENDATION**

Recommendations for increasing the quality of public construction housing project outcomes in Addis Ababa require a reasonable approach. Based on the data and conclusions presented above, the following proposals and recommendations can be made to improve quality assurance outcomes:

From the study findings the following recommendations in general are forwarded:

### **Recommendations for the government**

- The government should implement Enforcement Regulation in public housing projects quality control measures throughout the construction process.
- The government should establish strict criteria for selecting contractors based on their track record of delivering high-quality projects. This can be done through evaluation of past performance, financial stability, and technical capabilities.
- The government should ensure transparency in the procurement process and hold contractors accountable for any deviations from quality standards. This can be achieved through regular reporting and public disclosure of project progress and quality assessments.

- The government should establish a task force to develop a comprehensive framework for contractor selection based on performance, financial stability and technical capabilities.

#### **Recommendations for contractors:**

- Contractors should strictly adhere to building codes, regulations, and industry standards to ensure the quality of construction. This includes using approved materials, following proper construction techniques, and employing skilled workers.
- Contractors should establish robust quality management systems that include documented procedures, regular inspections, and quality control checks. This will help identify and rectify any quality issues before they escalate.
- Contractors should engage experienced and qualified consultants who can provide expert advice on design, materials selection, and construction methods. This collaboration will help ensure that the project meets the required quality standards.

#### **Recommendations for consultants:**

- Consultants should conduct comprehensive design reviews to identify any potential flows or deficiencies that may affect the quality of construction. This includes ensuring that the design meets all relevant codes and standards.
- Consultants should regularly monitor construction activities to ensure that they are being carried out in accordance with the approved design and specifications. This includes conducting site visits, reviewing construction documentation, and verifying compliance with quality standards.
- Consultants should maintain open and transparent communication with both the government, contractors and client throughout the project. This includes promptly addressing any concerns or questions related to quality assurance and providing regular progress updates.

By implementing these recommendations into action, governments, contractors, and consultants can collaborate to improve the quality of public construction housing projects. This will result in more comfortable and healthier living circumstances for inhabitants, faster project delivery,

financial savings, increased structural integrity, easier short-term maintenance, legal compliance, an improved reputation, and better infrastructural outcomes.

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## APPENDIX

### Appendix A: Survey Questionnaire



Adama Science and Technology University  
School of Civil Engineering and Architecture  
Department of Civil Engineering

Questionnaire survey for thesis paper on a framework for quality assurance strategy in public housing project: in a case of Addis Ababa

**Dear/Sir;**

The purpose of this questionnaire is to collect data for the research study entitled **“a framework for quality assurance strategy in public housing project: in a case of Addis Ababa”** as a fulfillment of the requirement for the Degree of Master of Science in department of Civil Engineering. Thus, your genuine, professional opinion and timely responses are vital to determine the success of this study. Please note that the information you provide will only be used for academic purpose and all the information revealed will be kept confidential. To this end, you are kindly requested to contribute your own share by filling in the questionnaires honestly and responsibly for further recommendations to improve similar works in the future. Thank you in advance for your cooperation!

If you need further explanation, you can contact me through the address indicated below:

Roman Besheda Jima,      Mobile Number: +2519-83-482182 or +2519-38-115884

Email: [romanbeshedak2015@gmail.com](mailto:romanbeshedak2015@gmail.com)

#### General Instruction:

- No need of writing your name/address.
- To those questions with alternatives mark your response on the space provided by putting “  
✓ ”

- For any additional option or explanation you are kindly requested to write briefly on the space provided.

**Part One: - General information about the respondents**

1. Educational background:
  - a. Below Diploma      b. Diploma      c. BSc/BA      d. MSc/MA & above
2. What is your role in the construction firm you are employed?
  - a. Project Manager      c. Contract administration team      e. Project Consultancy
  - b. Resident engineer      d. Technical Team member      f. Project supervisor
3. Profession
  - a. Architect      c. Civil Engineer      d. COTM
  - b. Surveyor      e. Others (Specify) \_\_\_\_\_
4. Your total work experience in housing construction activities.
  - a. Less than 5 years      b. 6 - 10 years      c. 11 - 15 years      d. above 15 years
5. With which of the stakeholders, does your association have work relation?
  - a. Addis Ababa Housing Development Project Office (AAHDPO)
  - b. Small and Micro Enterprise (SME)
  - c. Contractor      d. Consultant      e. Others (Specify) \_\_\_\_\_

**Part Two: - The quality assurance in public housing projects**

1. To what extent are you agree with the current quality assurance practices in public housing projects in Addis Ababa and compare them to international standards? Please indicate current quality assurance practices level by making on the appropriate box using the following a 5-point likert scale: Strongly Disagree (SD) = 1, Disagree (D) = 2, moderately Agree (MA) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5.

| R. No | The current quality assurance practices in public housing projects                                                                                          | 1 | 2 | 3 | 4 | 5 |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| 1     | Quality assurance practices in public housing projects in Addis Ababa align with international quality standards.                                           |   |   |   |   |   |
| 2     | The documentation and implementation of quality assurance measures in public housing projects reflect a high level of adherence to international standards. |   |   |   |   |   |

|    |                                                                                                                                          |  |  |  |  |  |
|----|------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| 3  | Routine inspections and compliance checks in public housing projects effectively uphold international quality standards.                 |  |  |  |  |  |
| 4  | There is consistency in the adherence to international quality standards across various stages of public housing project implementation. |  |  |  |  |  |
| 5  | The quality of construction materials used in public housing projects meets or exceeds international standards.                          |  |  |  |  |  |
| 6  | Public housing projects demonstrate robustness and durability in line with globally accepted quality benchmarks.                         |  |  |  |  |  |
| 7  | The current quality assurance practices in public housing projects effectively meet internationally recognized quality standards.        |  |  |  |  |  |
| 8  | The project planning process is thorough and well-documented.                                                                            |  |  |  |  |  |
| 9  | Materials used in the project are of high quality and durable.                                                                           |  |  |  |  |  |
| 10 | The project complies with all relevant building codes and regulations.                                                                   |  |  |  |  |  |
| 11 | Stakeholders are actively involved in decision-making processes.                                                                         |  |  |  |  |  |
| 12 | Implementing quality control measures to ensure compliance with construction standards and specifications.                               |  |  |  |  |  |
| 13 | Conducting material testing and quality checks at various stages of construction.                                                        |  |  |  |  |  |
| 14 | Regularly monitoring workmanship and construction processes to identify and address quality issues promptly.                             |  |  |  |  |  |
| 15 | Conducting regular inspections by qualified inspectors to verify compliance with design plans and building codes.                        |  |  |  |  |  |
| 16 | Documenting inspection findings and ensuring timely resolution of identified issues.                                                     |  |  |  |  |  |
| 17 | Involving relevant stakeholders in inspection processes to enhance transparency and accountability.                                      |  |  |  |  |  |
| 18 | Utilizing technology tools such as project management software for real-time monitoring and reporting.                                   |  |  |  |  |  |
| 19 | Conducting regular reviews of building code requirements and updating project plans accordingly.                                         |  |  |  |  |  |

|    |                                                                                                                                  |  |  |  |  |  |
|----|----------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| 20 | Providing training programs for project personnel on quality assurance practices, safety protocols, and construction techniques. |  |  |  |  |  |
|----|----------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|

2. To what extent are you agreeing with the challenges in Addis Ababa that is relevant to the development of a comprehensive framework for quality assurance in public housing projects? Please indicate the most challenges by making on the appropriate box using the following a 5-point likert scale: Strongly Disagree (SD) = 1, Disagree (D) = 2, moderately Agree (MA) = 3, Agree (A) = 4 and Strongly Agree (SA) = 5.

| R. No | Challenges of housing construction projects on quality assurance           | 1 | 2 | 3 | 4 | 5 |
|-------|----------------------------------------------------------------------------|---|---|---|---|---|
| 1     | Inadequate quality control measures during construction.                   |   |   |   |   |   |
| 2     | Deficiencies in materials used for public housing projects.                |   |   |   |   |   |
| 3     | Lack of skilled labor leading to quality compromises.                      |   |   |   |   |   |
| 4     | Delays in project completion affecting housing availability.               |   |   |   |   |   |
| 5     | Inefficient project scheduling and management.                             |   |   |   |   |   |
| 6     | External factors like weather conditions impacting construction timelines. |   |   |   |   |   |
| 7     | Budget overruns and lack of financial transparency.                        |   |   |   |   |   |
| 8     | Inaccurate cost estimates leading to financial constraints.                |   |   |   |   |   |
| 9     | Limited access to funding sources for public housing projects.             |   |   |   |   |   |
| 10    | Lack of community engagement in project planning.                          |   |   |   |   |   |
| 11    | Disregard for community needs and preferences.                             |   |   |   |   |   |
| 12    | Limited communication and transparency with residents.                     |   |   |   |   |   |
| 13    | Complex regulatory requirements and approval processes.                    |   |   |   |   |   |
| 14    | Non-compliance with building codes and standards.                          |   |   |   |   |   |
| 15    | Lack of Enforcement of regulations.                                        |   |   |   |   |   |
| 16    | Limited adoption of eco-friendly construction practices.                   |   |   |   |   |   |
| 17    | Lack of emphasis on energy efficiency and environmental impact.            |   |   |   |   |   |
| 18    | Insufficient focus on sustainable materials and designs.                   |   |   |   |   |   |

3. To what extent are you influence factor impacts poor quality assurance of public housing projects in Addis Ababa, including but not limited to, construction materials, workforce skills, and regulatory compliance? Please indicate the influence impact by making on the appropriate box using the following a 5-point likert scale: Very low impact (VLI) = 1, Low impact (LI) = 2, Medium impact (MI) = 3, High impact (HI) = 4 and Very high impact (VHI) = 5.

| <b>R. No</b> | <b>The factors that impact the poor quality assurance of public housing projects</b>                                                | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|
| 1            | Cost overruns                                                                                                                       |          |          |          |          |          |
| 2            | Damage to reputation                                                                                                                |          |          |          |          |          |
| 3            | Legal and regulatory implications                                                                                                   |          |          |          |          |          |
| 4            | Untimely project delivery                                                                                                           |          |          |          |          |          |
| 5            | Decreased property value                                                                                                            |          |          |          |          |          |
| 6            | Decreased energy efficiency                                                                                                         |          |          |          |          |          |
| 7            | Affects the nation's development growth                                                                                             |          |          |          |          |          |
| 8            | Poor infrastructural deliverables                                                                                                   |          |          |          |          |          |
| 9            | Long -term maintenance challenges                                                                                                   |          |          |          |          |          |
| 10           | Compromised structural integrity, leading to potential building collapses or failures                                               |          |          |          |          |          |
| 11           | Substandard materials and workmanship, resulting in safety hazards for occupants                                                    |          |          |          |          |          |
| 12           | Deficiencies in fire safety systems, increasing the risk of fires and injuries                                                      |          |          |          |          |          |
| 13           | Poor indoor air quality due to inadequate ventilation and moisture control, leading to respiratory problems and other health issues |          |          |          |          |          |
| 14           | Use of harmful materials or finishes, posing health risks to occupants                                                              |          |          |          |          |          |
| 15           | Lack of proper waste management, creating environmental pollution and health hazards                                                |          |          |          |          |          |

|    |                                                                                                                                             |  |  |  |  |  |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| 16 | Substandard construction leads to premature deterioration and frequent repairs, increasing maintenance costs for public housing authorities |  |  |  |  |  |
| 17 | Poor workmanship and material failures necessitate costly repairs and replacements                                                          |  |  |  |  |  |
| 18 | Uncomfortable and unhealthy living conditions due to poor construction quality                                                              |  |  |  |  |  |
| 19 | Noise disturbances, inadequate lighting, and lack of privacy affect occupant well-being                                                     |  |  |  |  |  |
| 20 | Reduced aesthetic appeal and functionality of the housing units, negatively impacting community pride and morale                            |  |  |  |  |  |
| 21 | Poor quality public housing can contribute to social inequality and perpetuate poverty                                                      |  |  |  |  |  |
| 22 | Unhealthy living conditions can hinder educational and economic opportunities for occupants                                                 |  |  |  |  |  |

## **Appendix B: Interviews Questionnaires**

1. What is the current quality assurance practices used in public housing projects in Addis Ababa?
2. What are the specific challenges faced in implementing quality assurance in public housing projects in Addis Ababa?
3. What are the key factors that contribute to the poor quality of public housing projects in Addis Ababa?
4. What should be included in a comprehensive framework for quality assurance in public housing projects in Addis Ababa?
5. What are appropriate quality assurance implementation systems for public housing projects in Addis Ababa?