

ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

DEPARTMENT OF PROJECT MANAGEMENT

GREYWATER RECYCLING FOR SUSTAINABLE HOUSING IN ADDIS ABABA – A CASE OF KOYE FECHE CONDOMINIUM

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A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR MASTER OF ARTS IN PROJECT MANAGEMENT

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Statement of Declaration

I declare that the research thesis entitled “Greywater Recycling for Sustainable Housing in Addis Ababa – A Case of Koye Feche Condominium” is my original work and it has not previously been submitted for any degree or academic qualification. All sources of material used for the work have been duly acknowledged.

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Date:……..

STATEMENT OF CERTIFICATION

This is to certify that, this thesis “Greywater Recycling for Sustainable Housing in Addis Ababa – A Case of Koye Feche Condominium", undertaken by Redeit Aklilu in partial fulfillment of the requirements for Master of Arts in Project Management at Addis Ababa University School of Commerce, is an original work and has not previously been submitted for any degree either at this university or any other university.

…..…….

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Thesis advisor

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PROJECT MANAGEMENT PROGRAM

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Abstract

This study examined greywater recycling as a sustainable housing solution in Addis Ababa, using Koye Feche Condominium as the case study. The study was driven by water scarcity challenges and limited practice of greywater reuse in condominiums. The general objective was to investigate sustainable greywater integration using project management dimensions, including project planning, technology evaluation, cost, risk management, stakeholder engagement, and sustainability. A mixed- method approach was used. Twenty-seven residents participated in the questionnaire survey for quantitative data, and qualitative data were collected from 7 key informants through interviews. Descriptive statistics, Pearson correlation, and multiple regression were used to analyze the quantitative data using SPSS version 27 software, while thematic analysis was used for the qualitative data. Sustainability had the highest mean score according to descriptive results, followed by planning, cost, stakeholder engagement, and technology. Correlation analysis showed a positive and statistically significant relationship with the acceptance of greywater, including planning, technology, stakeholder engagement, and sustainability. In multiple regression analysis, planning and technology were further indicated as the only significant predictors of acceptance. Water shortage is a major challenge in Koye Feche Condominium, as shown in the interview findings. The study concludes that greywater recycling has strong potential as a sustainable housing solution, still effective planning, appropriate technology, awareness creation, stakeholder participation, and institutional support are the main factors that ensure successful implementation.

Keywords: greywater recycling, sustainable housing, acceptance, project planning, technology evaluation, Koye Feche Condominium, Addis Ababa

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Addis Ababa, the capital city of Ethiopia, is experiencing rapid population growth and urban expansion. Large-scale housing projects such as the Koye Feche Condominium have helped address the housing shortage by providing relatively affordable homes to thousands of residents. However, these developments have also created significant challenges related to reliable water supply and wastewater management (Ministry of Urban Development and Housing, 2015; UN-Habitat, 2017). One promising approach discussed in the literature is greywater recycling, which has been recognized as an effective strategy for reducing freshwater demand and improving water-use efficiency in residential areas (Al-Jayyousi, 2003; Dixon et al., 1999; World Health Organization, 2006).

Many residents experience frequent interruptions in water supply and are often forced to purchase water from private vendors at relatively high prices. At the same time, the greywater generated from household activities, including showers, hand-washing basins, kitchen sinks, and laundry, is discharged directly into drainage systems without treatment or reuse. This practice not only wastes a potentially valuable water resource but also contributes to environmental pollution and public health risks (Al-Jayyousi, 2003; Eriksson et al., 2002; Li et al., 2009; World Health Organization, 2006).

Several countries, including Australia, Israel, and South Africa, have successfully implemented greywater recycling systems to reduce freshwater consumption, with reported water conservations of up to 30% (Dixon et al., 1999; Friedler, 2004; Gross et al., 2007). Despite increasing water scarcity, Ethiopia has not widely adopted greywater recycling because of limited public awareness, inadequate technical

capacity, insufficient policy support, and institutional challenges (Alemayehu & Bewket, 2021; Teshome, 2020).

Consequently, alternative water conservation strategies such as greywater recycling should be considered as part of sustainable housing development. This study, entitled "*Greywater Recycling for Sustainable Housing in Addis Ababa: A Case of Koye Feche Condominium,"* examines perceptions of technical feasibility, social acceptance, and potential economic benefits of implementing greywater recycling systems within the Ethiopian context (Friedler & Hadari, 2006; Li et al., 2009; Silvius & Schipper, 2014).

Although previous studies have examined the technical aspects of greywater recycling, limited attention has been given to the project management factors that influence its implementation in Ethiopian condominium housing. In particular, little empirical evidence exists regarding the effects of project planning, technology evaluation, cost management, risk management, stakeholder engagement, and sustainability on the successful implementation of greywater recycling systems in Koye Feche Condominium. Therefore, this study seeks to address this research gap by examining greywater recycling not only as a sustainable housing solution but also as a project management issue.

1.2 Background of the Case Area

Koye Feche Condominium is one of the largest government-led affordable housing schemes in Addis Ababa. It was developed to provide affordable housing to low- and middle-income households. The project has contributed significantly to the city's housing supply; however, it has also increased pressure on basic urban services such as reliable water supply, sanitation, drainage, and wastewater management (Ministry of Urban Development and Housing, 2015; UN-Habitat, 2017).

Despite these achievements, residents of Koye Feche Condominium continue to experience frequent water supply interruptions. These shortages affect daily

household activities and force many residents to purchase water from private vendors, thereby increasing household expenses and reducing residents' overall satisfaction with the housing services provided.

At the same time, the greywater generated from household activities such as bathing, hand washing, and laundry is discharged without any reuse or treatment. This shows that Koye Feche faced two related problems: shortage of reliable water supply and underutilization of reusable household wastewater. Literature shows that greywater can be treated and reused for non-potable purposes such as toilet flushing, irrigation, and cleaning when properly managed (Al-Jayyousi, 2003; Eriksson et al., 2002; Li et al., 2009; World Health Organization, 2006).

Koye Feche Condominium is an appropriate case area for this study because it is one of the largest residential settings in Addis Ababa where water demand is high, water supply interruption is experienced, and greywater reuse is not widely practiced. The site provides an excellent opportunity to examine how project management dimensions—including project planning, technology evaluation, cost management, risk management, stakeholder engagement, and sustainability—influence the implementation of greywater recycling systems. Consequently, Koye Feche Condominium offers a practical and relevant setting for evaluating the potential of greywater recycling as part of a broader sustainable housing strategy in Addis Ababa.

1.3 Statement of the Problem

Large-scale housing projects in Addis Ababa, such as the Koye Feche Condominium, create pressure on basic urban services such as water supply, sanitation, and wastewater management (Ministry of Urban Development and Housing, 2015; UN-Habitat, 2017). Although technical solutions such as greywater recycling exist, their adoption in Ethiopia has been limited due to gaps in project planning, stakeholder coordination, financial prioritization, and policy integration (Alemayehu & Bewket, 2021; Project Management Institute, 2021).

According to responses collected from residents of Koye Feche Condominium, frequent water shortages force households to purchase water from private vendors, thereby increasing household expenses and reducing residents' satisfaction with housing services. Meanwhile, greywater generated from household activities is discharged without treatment or reuse, representing a missed opportunity to conserve freshwater resources, reduce water costs, and improve environmental sustainability (Al-Jayyousi, 2003; Eriksson et al., 2002; Teshome, 2020).

Furthermore, housing authorities require evidence-based methods for incorporating sustainability into condominium projects because they lack a systematic project management framework to assess, develop, and execute greywater recycling systems. This institutional and management gap draws attention to a larger management issue: how to plan and carry out housing projects that strike a balance between long-term sustainability objectives, stakeholder acceptance, economic viability, and technical feasibility (Freeman, 2010; Kerzner, 2019; Marcelino-Sádaba et al., 2019).

Therefore, the fundamental problem addressed by this study is the absence of an integrated project management approach for evaluating and implementing greywater recycling systems in Addis Ababa's condominium housing developments. The problem extends beyond technical feasibility and includes project planning, technology evaluation, cost management, risk management, stakeholder participation, policy alignment, sustainability management, and institutional support. Without effective planning, coordination, and management, housing authorities are unable to implement sustainable water management strategies that could improve water service reliability, reduce environmental impacts, and promote efficient resource utilization (Li et al., 2009; Project Management Institute, 2021; Silvius & Schipper, 2020).

1.4 Basic Research Questions

This study was guided by the following research questions:

1. How can project management frameworks be used to efficiently design and incorporate greywater recycling into large-scale housing developments like Koye Feche?

2. When considering not just technical viability but also cost-effectiveness, scalability, long-term sustainability, and project risk management, which greywater recycling methods are most appropriate?
3. How do locals and important stakeholders view the reuse of greywater, and what project management techniques can encourage them to embrace and support such initiatives?
4. What are the economic, environmental, and social benefits of greywater recycling when assessed through project management tools such as cost-benefit analysis and sustainability metrics?
5. How can housing authorities and legislators use structured project management frameworks to integrate greywater recycling into more comprehensive urban development strategies?

1.5 Objectives of the Study

1.5.1 General Objective

The general objective was to examine greywater recycling as a sustainable housing solution using project management dimensions, with Koye Feche Condominium as the case study.

1.5.2 Specific Objectives

The specific objectives were:

1. To investigate how efficient project planning, resource allocation, and implementation techniques may integrate greywater recycling into housing projects.
2. To assess how technology evaluation contributes to the implementation of greywater recycling in Koye Feche Condominium.
3. To determine how cost and financial management influence the implementation of greywater recycling in Koye Feche Condominium.
4. To analyze residents' and stakeholders' perceptions and acceptance levels, and to identify project-management strategies that can improve stakeholder engagement and support adoption of greywater recycling systems.

5. To examine how risk management supports the safe implementation of greywater recycling in Koye Feche Condominium.
6. To provide project management recommendations for improving the implementation of greywater recycling in condominium housing.
7. To assess how sustainability management supports the implementation of greywater recycling in Koye Feche Condominium.

1.6 Significance of the Study

This study is significant because it has practical, policy, and academic contributions. From a practical perspective, the study identifies the project management factors that influence the implementation of greywater recycling systems in Koye Feche Condominium. The findings provide valuable information for condominium management, housing authorities, urban planners, and project managers by highlighting the importance of effective project planning, appropriate technology selection, cost management, risk management, stakeholder engagement, and sustainability management before implementing greywater recycling systems.

From a policy perspective, the study provides empirical evidence that can support the integration of greywater recycling into future housing designs, sustainable housing policies, and urban water management strategies. Furthermore, it emphasizes the need for appropriate safety standards, institutional support, public awareness programs, and pilot projects before large-scale implementation.

From an academic perspective, the study contributes to the existing body of knowledge by examining greywater recycling from a project management perspective. While previous studies have primarily focused on technical aspects, this research integrates project management dimensions—including project planning, technology evaluation, cost management, risk management, stakeholder engagement, and sustainability management—into the assessment of greywater recycling implementation.

1.7 Delimitation / Scope of the Study

The study focused on the Koye Feche Condominium in Addis Ababa. It focused on greywater recycling as a sustainable housing solution and investigated project management dimensions that may influence its implementation. Specifically, the study investigated project planning, technology evaluation, cost management, risk management, stakeholder engagement, and sustainability management.

The study collected quantitative data through questionnaires administered to 27 residents and qualitative data through interviews with 7 key informants. However, the study did not include technical investigations such as direct measurement of greywater volume, laboratory analysis of greywater quality, detailed engineering system design, or comprehensive financial cost–benefit analysis. Therefore, the research primarily focused on residents' perceptions, stakeholder perspectives, and project management factors influencing the implementation of greywater recycling systems.

1.8 Limitations of the study

This study has several limitations. First, the study was limited to Koye Feche Condominium and did not cover other condominium sites within Addis Ababa or other regions of Ethiopia. Consequently, the findings are specific to the selected case area and should not be generalised to all condominium housing developments.

The small sample size is another major limitation of the study, consisting of 27 residents for the quantitative survey and 7 key informants for the qualitative interviews. Although this sample size was appropriate for the descriptive and exploratory nature of the study, larger samples would provide greater statistical power and improve the generalization of the findings.

The study relied on self-reported data collected through questionnaires and interviews. As a result, respondents' answers may have been influenced by personal opinions, misunderstandings of some questions, or response bias.

Finally, limitations related to time, financial resources, and access to technical data restricted the scope of the research. Consequently, the study focused primarily on project management and stakeholder perspectives rather than detailed engineering or laboratory-based analyses.

1.9 Organization of the Research Report

The final research report is organized into five chapters. The first chapter includes the background, problem statement, research questions, objectives, significance, scope, limitations, key terms, and organization of the report.

Chapter Two presents the Literature Review: theoretical review, empirical studies, and the conceptual framework of the study. It considers the major concepts of sustainable housing and project management dimensions.

Chapter Three explains Research Methodology: research design, research approach, sample size and technique, data collection tools and procedures, validity and reliability of instruments, and methods of data analysis with ethical consideration.

Chapter Four presents Results and Discussion: presentation, analysis, and interpretation of the findings that include response rate, demographic characteristics of respondents, descriptive statistics, correlation analysis, regression analysis, qualitative responses, and discussion of the results.

Chapter five presents Summary, Conclusion, and Recommendations – summary of major findings, conclusions, and practical and policy recommendations and suggestions for future research.

1.10 Definition of Key Terms

- Greywater: Wastewater generated from non-toilet household activities such as bathing, hand washing, dish washing, and laundry. It does not include wastewater from toilets (blackwater)(Eriksson et al., 2002; World Health Organization, 2006).

- Greywater recycling: refers to the collection, treatment, and reuse of greywater for non-potable purposes such as toilet flushing, landscape irrigation, cleaning, and other domestic uses (Al-Jayyousi, 2003; Li et al., 2009).

- Sustainable Housing: Housing that aims to reduce negative environmental impacts while remaining affordable and resource-efficient, and that contributes to the long-term resilience and well-being of residents(UN-Habitat, 2012; Winston, 2010).

- Project Planning: project planning refers to defining project objectives, scope, activities, resources, schedules, responsibilities, and implementation procedures before project execution (Kerzner, 2019; Project Management Institute, 2021).

- Technology Evaluation: Technology evaluation refers to assessing the suitability, safety, reliability, affordability, maintainability, and practicality of technology before implementation (Friedler & Hadari, 2006; Li et al., 2009).

- Cost and Financial Management: Cost and financial management refers to estimating, budgeting, controlling and monitoring project costs to ensure that a project can be implemented within available financial resources (Kerzner, 2019;Project Management Institute, 2021).

- Risk Management: refers to identifying, analyzing and responding to risks that may affect project cost,safety, performance, implementation, or public support (Project Management Institute, 2021; World Health Organization, 2006).

- Stakeholder Engagement: Stakeholder engagement refers to identifying, communicating with, involving, and managing the expectations of individuals or groups affected by a project, including residents, condominium management, housing authorities, technical experts, and policy makers (Freeman, 2010; Project Management Institute, 2021).

- Sustainable Management: refers to integrating environmental, social and economic considerations into project planning and implementation to ensure long-term benefits (Silvius & Schipper, 2014, 2020).

- Sustainable greywater integration: refers to the planned incorporation of greywater recycling into housing projects in way that considers technical suitability, cost, risk, stakeholder participation, environmental benefit, and long term operation (Li et al., 2009; Project Management Institute, 2021; Silvius & Schipper, 2014).

CHAPTER TWO

2. LITERATURE REVIEW

This chapter discusses international and local literature on greywater recycling, Sustainable housing, and project management to establish the theoretical and empirical foundation for assessing greywater recycling in condominium housing, with particular emphasis on Koye Feche Condominium in Addis Ababa. This study adopted project management theory, stakeholder theory, technology acceptance theory, and sustainability project management theory. These theories provide a framework for understanding the planning, implementation, monitoring, and evaluation of greywater recycling projects.

The chapter begins by discussing the theoretical foundations of project management, including the PMBOK knowledge areas, project life-cycle concepts, and project management principles. It also examines technology evaluation, cost management, risk management, stakeholder engagement, and sustainability management as key project management dimensions influencing the successful implementation of greywater recycling systems.

Stakeholder theory was used to explain the importance of residents, condominium management, housing authorities, technical experts, and policymakers in project implementation. Technology acceptance theory was used to explain how perceived usefulness, safety, reliability, and suitability of greywater recycling technology influence implementation. Sustainability project management theory was used to explain how environmental, social, and economic considerations can be integrated into greywater recycling projects in condominium housing (Davis, 1989; Freeman, 2010; Project Management Institute, 2021; Rogers, 2003; Silvius & Schipper, 2014).

The empirical review discusses global, African, and Ethiopian studies, highlighting lessons applicable to Koye Feche Condominium and concludes with a conceptual framework that shows the project management process with greywater recycling outcomes.

2.1 Theoretical Review

2.1.1 Project Management Theory

Project management theory provides the main theoretical foundation for this study. It offers a systematic approach for planning, executing, monitoring, controlling, and closing projects to achieve predefined objectives within specified constraints of scope, time, cost, and quality (Project Management Institute, 2021).

According to the PMBOK Guide (7th edition) principles, Project management consists of five processes: initiation, planning, execution, monitoring and controlling, and closure (Project Management Institute, 2021). In this study, project management theory was adapted to examine how planning, cost, risk, stakeholder engagement, technology evaluation, and sustainability management support the integration of greywater recycling in condominium housing (Kerzner, 2019; Project Management Institute, 2021).

2.1.2 Stakeholder Theory

Stakeholder Theory explains that project success depends on identifying, understanding, and effectively managing the interests and expectations of all individuals and groups affected by a project (Freeman, 2010). Residents, condominium management, housing authorities, technical experts, and policymakers are included in a project as stakeholders. Resistance to the system may happen in the project if residents are not informed or involved due to concern about safety, cost, maintenance, or reliability.

Therefore, stakeholder theory was adopted in this study to explain the importance of awareness, communication, participation, and trust in the implementation of greywater recycling (Freeman, 2010; Project Management Institute, 2021).

2.1.3 Technology Acceptance Theory

Technology Acceptance Theory explains the factors that influence users' acceptance or rejection of a technology. According to this theory, people are more likely to adopt

a technology when they perceive it to be useful, easy to use, reliable, safe, and beneficial. Greywater recycling is one of the new technologies in Ethiopian condominium housing contexts. Therefore, this theory was adopted to explain how residents' views about safety, usefulness, reliability, and sustainability of greywater recycling technology may influence its implementation (Davis, 1989; Rogers, 2003).

2.1.4 Sustainability Project Management Theory

Greywater recycling plays an important role in reducing freshwater consumption, decreasing wastewater discharge, and supporting long-term resource efficiency (Prakash et al., 2024). Sustainable project management also promotes life-cycle thinking by considering environmental, economic, and social impacts from project initiation through project closure (Labuschagne & Brent, 2005). Within condominium housing, sustainability requires consideration of affordability, maintenance capacity, community acceptance, institutional support, and long-term operational performance (Marcelino-Sádaba et al., 2019).

In developed countries, greywater recycling is often supported by stronger regulatory systems, advanced treatment technologies, better financing mechanisms, and clearer.

maintenance standards. In contrast, developing-country contexts such as Ethiopia may face challenges related to limited technical capacity, low awareness, weak policy enforcement, limited financing, and maintenance difficulties.

Therefore, successful implementation of sustainable greywater recycling systems in Ethiopian condominium housing requires greater emphasis on affordability, institutional coordination, appropriate technology selection, community awareness, and long-term maintenance planning. Consequently, project management approaches used in developed countries should be adapted to the local social, economic, technical, and institutional context rather than being directly adopted (Silvius & Schipper, 2014; Silvius & Schipper, 2020; UN-Habitat, 2012).

2.2 Review of Study Constructs

2.2.1 Project Planning

Project planning refers to the process of defining project objectives, scope, activities, resources, schedules, responsibilities, and implementation procedures before project execution. In greywater recycling projects, planning helps identify greywater sources, treatment requirements, reuse purposes, implementation activities, budget needs, and maintenance responsibilities.

Project management theory supports project planning because it explains that successful projects require clear scope definition, resource planning, scheduling, monitoring, and coordination. In this study, project planning was included because greywater recycling cannot be implemented successfully without clear objectives, defined responsibilities, and proper implementation procedures (Kerzner, 2019; Project Management Institute, 2021).

2.2.2 Technology Evaluation

Technology evaluation refers to assessing the suitability, safety, reliability, affordability, maintainability, and practicality of a technology before implementation. Greywater recycling technologies differ in treatment efficiency, maintenance requirements, installation cost, space demand, and operational complexity. In condominium housing, technology evaluation is important because the selected system must be safe, affordable, easy to maintain, and suitable for the existing infrastructure. Poor technology selection may increase cost, risk, and user resistance (Friedler & Hadari, 2006; Li et al., 2009).

2.2.3 Cost Management

Cost management involves estimating, budgeting, controlling, and monitoring project costs to ensure that a project can be implemented within available financial resources. Greywater recycling systems require both initial capital investment and ongoing operation and maintenance costs. In developing countries, affordability is often a

major concern because both residents and housing authorities have limited financial resources.

Therefore, effective cost management is essential for determining the financial feasibility and long-term sustainability of greywater recycling projects (Kerzner, 2019; Project Management Institute, 2021).

2.2.4 Risk Management

Risk management refers to identifying, analyzing, and responding to potential risks that may affect project performance, safety, cost, or public support. Greywater projects face risks such as negative public perception, maintenance challenges, system failure, and microbial contamination. In condominium housing, residents may reject the system if they fear health risks or unreliable operation. Therefore, safety assurance and risk communication are necessary for successful greywater recycling implementation (Li et al., 2009; Project Management Institute, 2021; World Health Organization, 2006).

2.2.5 Stakeholder Management

Stakeholder management refers to identifying stakeholders, understanding their expectations, maintaining effective communication, and encouraging their active participation throughout the project life cycle. It is important because residents are the final users of the system, and their awareness, trust, and participation can influence implementation. Without effective stakeholder engagement, technically feasible projects may still fail because of public resistance or inadequate user participation (Freeman, 2010; Project Management Institute, 2021).

2.2.6 Sustainability Management

Sustainability management refers to integrating environmental, social, and economic considerations into project planning and implementation to ensure long-term benefits. Greywater recycling contributes to environmental sustainability by conserving

freshwater resources and reducing wastewater discharge. It also contributes to social sustainability by improving water availability for non-potable uses and to economic sustainability by potentially reducing household water expenses.

However, within the Ethiopian context, sustainability management also requires affordability, institutional support, maintenance capacity, public awareness, policy integration, and long-term operational planning (Silvius & Schipper, 2014; Silvius & Schipper, 2020; UN-Habitat, 2012).

2.3 Empirical Review

2.3.1 Global Studies

Global studies conclude that 25-50% of water consumption is reduced by greywater recycling projects and viable finance if it is implemented at scale (Jefferson et al., 2004). Studies from countries such as Australia, Israel, and Spain show that greywater reuse can be effective when supported by appropriate technology, safety standards, user awareness, and institutional regulation. They demonstrate that clear regulation and strong project governance essential for effective greywater reuse rather than technology (Dixon et al., 1999; Friedler & Hadari, 2006; Gross et al., 2007).

2.3.2 African Studies

Challenges are emphasized in African studies in the implementation of greywater recycling projects. These challenges include limited technical capacity, funding constraints, and regulatory gaps. Despite these, projects in Kenya, South Africa, and Tanzania show that low-cost systems can be successfully implemented with the support of community engagement and proper project planning. These findings are relevant to Ethiopia because condominium housing requires solutions that are technically appropriate, affordable, and socially acceptable (Maimon et al., 2010; Mwangi, 2018).

2.3.3 Ethiopian Studies

Research in Ethiopia indicated that greywater may constitute approximately 60–70% of household wastewater, which makes it a valuable resource for reuse. Existing Ethiopian studies mainly focus on greywater characterization, treatment options, and water demand management in condominium settings. In the case of Addis Ababa condominiums, studies show high water demand, frequent shortages, untreated greywater discharge, and consent from residents to use the system. However, limited attention has been given to project management dimensions that influence implementation, such as planning, technology evaluation, cost, risk management, stakeholder engagement, and sustainability. This shows the need for a study that examines greywater recycling from a project management perspective in Addis Ababa condominium housing (Alemayehu & Bewket, 2021; Teshome, 2020).

2.3.4 Lessons for Koye Feche Condominium

Evidence suggests that Greywater may constitute approximately 60–70% of household wastewater. through different cases (Alemayehu & Bewket,2021), but the success depends on project planning, stakeholder engagement, risk mitigation, and a clear governance structure (Project Management Institute, 2021). These factors are consistent with PMBOK principles and sustainability project management frameworks (Silvius & Schipper, 2014).

2.4 Summary of Literature gap

Most studies focus on treatment technology, water quality, and reuse potential, while less attention is given to project management dimensions. In the Ethiopia context, studies in greywater recycling in condominium housing remain limited, and there is also limited evidence on how planning, technology evaluation, cost, risk management, stakeholder engagement, and sustainability affect implementation. In addition, stakeholder views and residents' perceptions are not sufficiently examined in relation to greywater recycling projects. Therefore, this study addresses the gap by examining greywater recycling as both a sustainable housing solution and a project management issue in Koye Feche Condominium.

2.5 Conceptual Framework

The conceptual framework illustrates how project management mechanisms may influence the successful integration of greywater reuse in housing developments such as Koye Feche Condominium. Project management theory supports the inclusion of project planning, cost and financial management, and risk management because greywater recycling requires clear objectives, defined scope, cost control, risk response, and implementation planning. Stakeholder theory supports the inclusion of stakeholder engagement because residents, condominium management, housing authorities, and technical experts are directly affected by the project. Technology acceptance theory supports the inclusion of technology evaluation because greywater recycling can only be implemented successfully when the technology is perceived as safe, useful, reliable, and suitable for the housing context. Sustainability project management theory supports the inclusion of sustainability management because greywater recycling should consider environmental, social, and economic benefits throughout the project life cycle (Davis, 1989; Freeman, 2010; Project Management Institute, 2021; Rogers, 2003; Silvius & Schipper, 2014).

2.5.1 Dependent Variable

Sustainable Greywater Integration (SGI)

In this study, Sustainable Greywater Integration is a dependent variable since it represents an outcome influenced by project management practices, technical feasibility, and stakeholder dynamics. SGI reflects the extent to which greywater recycling can be effectively planned, implemented, and sustained within condominium housing in Addis Ababa.

2.5.2 Independent Variable

Independent variables of this study are the project management dimensions that are expected to influence sustainable greywater integration in Koye Feche Condominium.

These variables include project management, technology evaluation, financial management, risk management, stakeholder engagement, and sustainability management. These dimensions were selected because greywater recycling requires not only technical treatment, but also proper planning, appropriate technology, cost control, risk response, stakeholder participation, and long-term sustainability management.

Project planning and Scope definition state that successful planning provides clarity, reduces scope ambiguity, and improves implementation efficiency. These also define system boundaries, identify greywater sources, determine treatment requirements, and align project objectives with housing needs. In greywater recycling projects, planning helps identify greywater sources, treatment requirements, reuse purposes, maintenance responsibilities, and implementation procedures. Therefore, project planning is expected to support sustainable greywater integration in condominium housing (Kerzner, 2019; Project Management Institute, 2021).

Technology Evaluation and Selection in which appropriate technology ensures system reliability, reduces operational risks, and ensures compatibility with condominium infrastructure. In the context of greywater recycling, technology evaluation is important because different treatment systems have different levels of cost, treatment efficiency, space requirements, operational complexity, and maintenance demand. For condominium housing, the selected technology should be suitable for the existing building infrastructure, safe for users, affordable for residents, and manageable by condominium administrators or service providers. Therefore, technology evaluation is important for ensuring that the greywater recycling system can be implemented effectively and sustainably (Friedler & Hadari, 2006; Li et al., 2009).

Cost and Financial Management includes cost-benefit analysis, life cycle costing, budgeting, and financial feasibility assessment. Affordability, reduction in long-term cost, and sustainable operation are ensured by financial management. For greywater recycling, this includes installation costs, operation cost, maintenance cost, and possible long-term savings from reduced freshwater use. Since condominium housing often serves low- and middle-income residents, affordability and cost transparency are important for implementation and long-term operation (Kerzner, 2019; Project Management Institute, 2021).

Risk Management refers to practices that protect system performance, reduce failures, and increase stakeholder confidence by identifying, analyzing, and responding to possible risks. In greywater recycling, risk may include health concerns, contamination, odor, poor maintenance, system failure, and negative public perception. Therefore, risk management is important for ensuring safe and reliable greywater reuse in condominium housing (Li et al., 2009; Project Management Institute, 2021; World Health Organization, 2006).

Stakeholder Engagement and Communication includes the creation of awareness, resident consultation, feedback mechanisms, and decision-making. These measures can result in the improvement of acceptance, long-term system sustainability, reduction in resistance, improved acceptance, reduced resistance, and enhanced long-term system sustainability. In this study, stakeholders include residents, condominium management, housing authorities, experts, and policymakers. Since residents are the final users of the system, their awareness, trust, participation, and willingness to cooperate are important for successful implementation (Freeman, 2010; Project Management Institute, 2021).

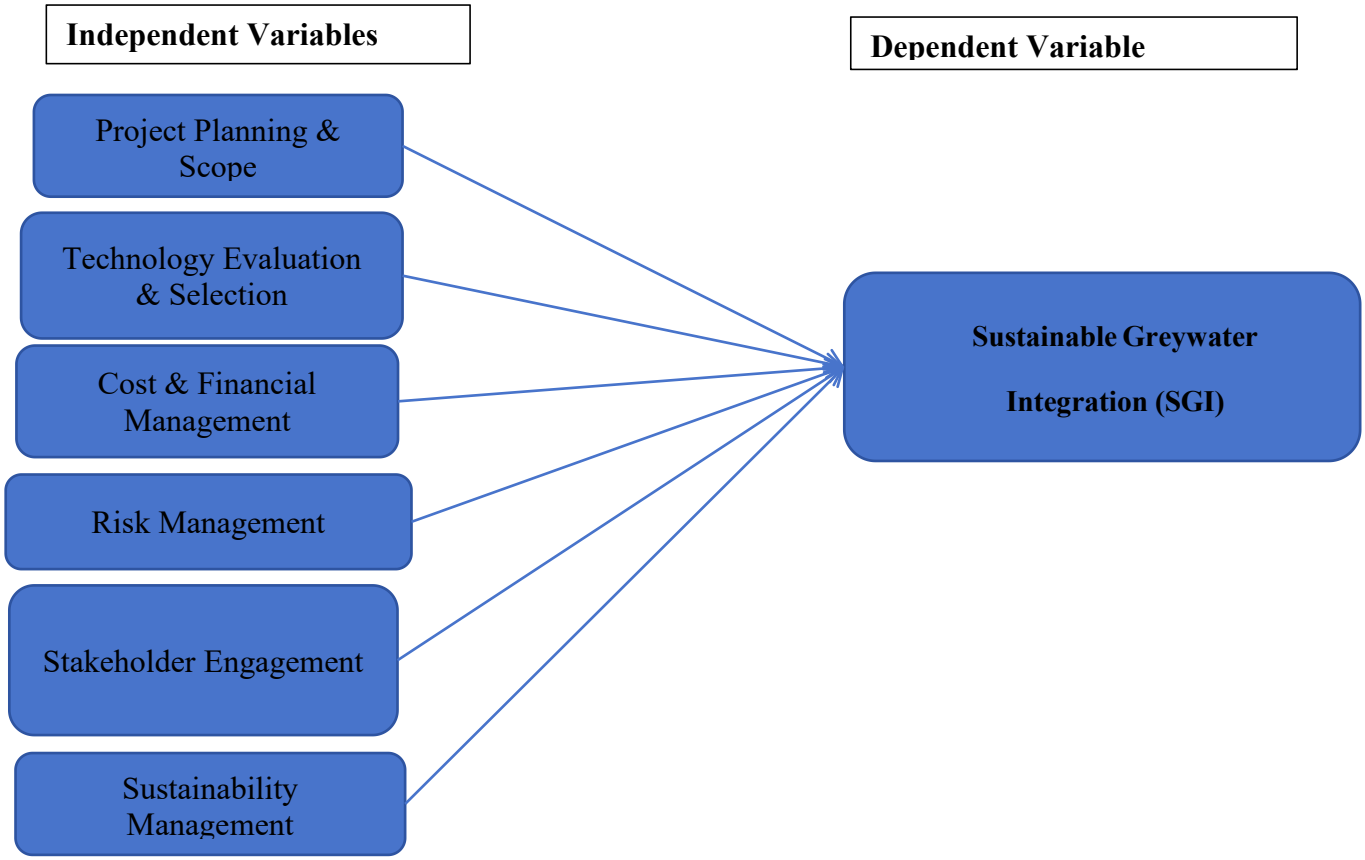
Sustainability and Environmental Management, which includes water conservation, resource efficiency, evaluating environmental impact, and alignment with sustainability goals. In greywater recycling, sustainability management ensures that the systems contribute to long-term ecological and social benefits through water conservation, reduced wastewater discharge, affordability, social support, and long-term operation and maintenance. Therefore, sustainability management is important for ensuring that greywater recycling contributes to sustainable housing development in Koye Feche Condominium (Silvius & Schipper, 2014; Silvius & Schipper, 2020; UN-Habitat, 2012).

2.5.3 Conceptual Framework Diagram

Figure 1 presents the conceptual framework developed by the researcher, the researcher's own construction, adapted from PMBOK (7th edition) project

management principles and literature on sustainable greywater reuse, showing the relationship between the Independent Variables (Project Management Mechanisms) and the Dependent Variable (Sustainable Greywater Integration).

Figure 2.5.3 Conceptual Framework



Source: Adapted from Project Management Institute (2021), Davis (1989), Freeman (2010), Rogers (2003), and Silvius and Schipper (2014).

2.6 Hypotheses

H1: Project planning has a statistically significant positive effect on sustainable greywater integration in Koye Feche Condominium.

H2: Technology evaluation has a statistically significant positive effect on sustainable greywater integration in Koye Feche Condominium.

H3: Cost and financial management have a statistically significant positive effect on sustainable greywater integration in Koye Feche Condominium.

H4: Risk management has a statistically significant positive effect on sustainable greywater integration in Koye Feche Condominium.

H5: Stakeholder engagement has a statistically significant positive effect on sustainable greywater integration in Koye Feche Condominium.

H6: Sustainability management has a statistically significant positive effect on sustainable greywater integration in Koye Feche Condominium.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Description of the study area

The study was conducted in Koye Feche Condominium, which is located in Addis Ababa, Ethiopia. The main concern of Addis Ababa is continuous pressure on housing, water supply, and infrastructure. Addis Ababa is commonly known for government-led housing development projects aimed at addressing the growing demand for affordable residential units.

Koye Feche Condominium is one of the government-led housing projects that was established to meet the demand for affordable housing for low-income and middle-income residents, which plays a significant role in reducing house shortage in the city. However, the condominium faces recurring challenges related to water supply interruptions, increased household water costs, and insufficient wastewater management. There are environmental and resource management concerns due to the large amount of greywater from domestic activities such as bathing, laundry, and hand washing being discharged without treatment or reuse.

Project management mechanisms may influence the feasibility and successful integration of greywater recycling of greywater recycling as a sustainable housing solution because of the concerns above. The site provides a practical context for assessing how project management mechanisms such as planning, technology, cost management, risk management, stakeholder management, and sustainability integration can support the successful implementation of greywater recycling systems. Therefore, the study was conducted at Koye Feche Condominium to generate insights that can improve sustainable water management, strengthen housing project planning, and support long-term environmental and social benefits.

3.1.1 Research Approach:

This study used a mixed-methods research approach by combining both qualitative and quantitative methods. The quantitative approach was used to collect measurable data by using questionnaires. This enabled us to assess issues like water supply

challenges, cost, risk level, water scarcity, willingness to adopt the system, awareness of greywater, policy, future outlook, and overall acceptance. The use of statistical analysis to identify patterns and summarize responses was also supported by the quantitative approach. Qualitative data were collected through interviews and observations by using interviews and observations, which gave deeper insight into concerns, expectations, and practical challenges. The mixed-method approach was selected because both numerical evidence and detailed contextual understanding made it suitable for this study. Therefore, by using the mixed- method approach, the study was able to generate a more complete assessment of greywater recycling as a sustainable housing solution in Koye Feche Condominium.

3.1.2 Research Design

A descriptive and exploratory research design was applied in this study. The descriptive design described the existing condition of water supply, greywater generation, wastewater disposal practices, and residents' perceptions in Koye Feche Condominium. The major issue related to water use was described in more detail and provided a detailed understanding by using a descriptive research design.

In the context of Addis Ababa condominium housing, the exploratory design was applied because recycling is still a relatively under-explored area. The study explores how planning, technology, cost management, risk management, stakeholder engagement, and sustainability management can support the integration of greywater recycling systems. Qualitative data were collected through interviews and observations of feasibility, acceptance, and possible implementation challenges of greywater recycling is allowed by an exploratory design.

Therefore, both descriptive and exploratory research designs were suitable because the study both described the existing condition and explored a less-studied issue in Ethiopia condominium context.

3.1.3 Target Population, sample size, and sampling technique

3.1.3.1 Target population

The target population of the study consisted of residents of Koye Feche Condominium, condominium management representatives, housing officials, and technical experts with relevant knowledge of housing management, water supply, sustainability, or greywater recycling. The residents were included because they directly experience water-supply interruptions, household water costs, wastewater-disposal practices, and other water-related challenges within the condominium. They were therefore considered capable of providing relevant information regarding awareness, acceptance, perceived cost, risk, and willingness to support the implementation of a greywater recycling system.

The key informants included condominium management representatives, housing officials, and technical experts. They were selected because of their knowledge and experience related to condominium administration, project planning, infrastructure management, sustainability, and the possible implementation of greywater recycling systems. Their participation provided additional insights into institutional responsibilities, implementation challenges, technical feasibility, and long-term management requirements.

The exact total number of residents living in Koye Feche Condominium was not available to the researcher during the study period, and no complete or reliable list of residents could be obtained. Therefore, the accessible population consisted of residents who were available during the data-collection period, willing to participate, and able to provide information relevant to the study. The accessible population also included key informants who possessed relevant professional or managerial experience.

Category	Population group
Residents of Koye Feche Condominium	Household residents
Condominium management representative	Key informants
Housing officials/ technical experts	Key informants

Table 3.1 Target Population Categories

3.1.3.2 Sample Size

The sample size of respondents consisted of both qualitative and quantitative parts of the research. Since it is a mixed-method approach, the research uses separate sample sizes by questionnaire and interview.

Twenty-seven respondents participated in the quantitative study collected by questionnaire survey. Information was provided by the respondents on water supply problems, awareness of greywater recycling, cost, risk, and stakeholder and sustainability issues. 7 key informants were involved in the interview session. The selected respondents provided insight into housing management, project planning, and implementation challenges. Therefore, 34 participants were involved in the study, which included 27 participants with questionnaires and 7 interview participants. Since the study was descriptive and exploratory in nature and focused on a single case area, the sample size was determined based on accessibility, willingness of respondents, relevance of participants' contributions to the study topic, and the time and resource limitations of the research. Although the sample size was limited, it was considered useful for generating case-specific insight about greywater recycling implementation in Koye Feche Condominium.

However, because the sample size was small, the findings were interpreted carefully and were not generalized to all condominium housing projects in Addis Ababa. Future

studies should use larger sample sizes and wider study areas to improve statistical power and generalizability.

Table 3.2 Sample size of respondents

Method of collection	Respondents	Sample size
Questionnaire	Residents	27
Interview	Key informants	7
Total		34

3.1.3.3 Sampling Technique

The study used non-probability sampling techniques. To obtain direct information from participants who experience the challenges, the study selected participants by using questionnaires (quantitative part) as well as qualitative part of the study used 7 participants response. This was appropriate because the interview required respondents who could provide detailed and relevant information about the study problem. Purposive and convenience sampling are non-probability sampling techniques. In this study, purposive sampling was used for key informants because they were selected based on their knowledge and experience about housing management, sustainability, and greywater recycling. Convenience sampling was used for residents because the full list of all residents was not available and data collection depended on availability and willingness. Random sampling could improve representativeness if a complete sampling frame was available, but it was not practical in this study due to access and time limitations.

By using questionnaires and interviews, the study was able to generate both numerical evidence and deeper explanatory insights. These support and strengthen the overall quality of the study and mainly support a comprehensive assessment of greywater recycling in Koye Feche Condominium.

3.1.4 Data source and Collection Method

Both primary and secondary data sources were used in the study. This helped to obtain relevant information to assess greywater recycling as a sustainable housing solution in Koye Feche Condominium.

3.1.4.1 Primary data Sources

These data were collected directly from residents by using interviews and questionnaires. The data provided first-hand information that helped to understand the existing challenges regarding water supply, household water use, cost, and risks. In addition, the data that is collected from the interviews provide deeper insight into issues related to condominium management, water-related challenges, and project planning.

3.1.4.2 Secondary data collection

This data was obtained from published and unpublished books, journal articles, and previous research works. These data were used to support empirical review and theoretical review of the study.

3.1.4.3 Data collection Method

The study used both primary and secondary data sources. Primary data were collected from residents and key informants. Quantitative data were collected from residents using structured questionnaires. The questionnaire included items related to project planning, technology evaluation, cost, risk management, stakeholder engagement, sustainability management, and greywater recycling implementation.

Qualitative data were collected from 7 key informants using semi-structured interviews. The interview questions focused on water supply challenges, awareness of greywater recycling, implementation barriers, safety concerns, cost issues, stakeholder participation, and sustainability considerations. The interview method was useful because it allowed participants to explain their views and experiences in more detail.

Secondary data were collected from books, journal articles, previous research works, reports, and relevant documents related to greywater recycling, sustainable housing, and project management. These sources were used to support the theoretical and empirical review of the study.

3.1.5 Validity and Reliability

3.1.5.1 Validity Test

In this study, Content validity was supported by aligning the questionnaire and interview guide with and interview questions that are aligned with the research objectives, research questions, and the conceptual framework of the study. The questionnaire includes items on project planning, technology, cost, stakeholder engagement, sustainability, and overall acceptance of greywater recycling to capture the key dimensions of the study.

The research instruments were carefully reviewed to make sure that they addressed the major challenges under investigation, which helped improve validity. Necessary improvements were made to increase the quality of the instrument after the results of the pilot test.

Questionnaires and interviews were used to compare and support findings obtained from different sources and also to strengthen validity through triangulation. This also helped to compare quantitative findings with qualitative explanations from key informants.

3.1.5.2 Reliability test

The consistency of the study is ensured by the reliability of the study variables. The reliability of the quantitative data was assessed by using Cronbach's Alpha coefficient. A Cronbach's alpha coefficient of 0.70 or above is considered acceptable.

In this study, the reliability test results indicated that the questionnaire items were suitable for the actual data collection and showed acceptable internal consistency across the study. The reliability was tested using Cronbach's Alpha coefficient in SPSS. A Cronbach's Alpha value of 0.70 and above was used as the acceptable threshold for reliability. This means that variables with alpha values above 0.70 were considered internally consistent and reliable. The pilot-test results showed the following Cronbach's Alpha values:

Table 3.3 Cronbach's Alpha values

Variable	**Cronbach's alpha**
Planning Scale	0.826
Technology Scale	0.821
Cost Scale	0.801
Risk Scale	0.786
Stakeholder Scale	0.921
Sustainability Scale	0.811
Overall Scale	0.875

Source: Pilot survey data ,2026

3.1.6 Data Analysis

To make sure the study has both measurable and detailed explanatory insights, the data were collected through questionnaires and interviews and analysed using both quantitative and qualitative methods. The analyses were done by entering the responses collected through questionnaires for quantitative data. The responses were coded into statistical software SPSS version 27 for analysis.

The responses regarding planning, technology, cost, risk, stakeholder engagement, sustainability, and overall acceptance of greywater recycling were summarized by descriptive statistics such as frequency, percentage, mean, and standard deviation, which were used to summarize respondent demographic characteristics and responses to study variables. The level of agreement among participants and pattern of responses were briefly described by those statistical tools.

Pearson correlation analysis was used to examine the relationship between the independent variables and sustainable greywater integration. Multiple regression analysis was used to identify which project management dimensions significantly influenced sustainable greywater integration. Before interpreting the regression results, assumption tests such as normality, linearity, and multicollinearity were checked.

The interview was used as a tool to collect the qualitative data, and responses were analyzed based on thematic analysis. The responses were grouped into major themes, carefully reviewed and interpreted. This process identified recurring ideas, concerns, and experiences.

The qualitative and quantitative results were presented using tables and figures. The two sets of findings were integrated to provide a comprehensive interpretation.

3.2 Ethical Considerations

The study followed basic ethical principles of research, such as protecting the rights and dignity of participants by getting consent from respondents before they were involved in the study, and every participant's information was protected by adding data anonymity and using secure storage. Before collecting data, the participants were informed that the study purpose was only for academic use, that their participation was voluntary, and they had the right to refuse to participate or withdraw from the study at any stage without any consequence.

Confidentiality and privacy were protected by omitting respondents' names and restricting access to the collected data. Generally, the study was carried out with respect for honesty, confidentiality, voluntary participation, and the responsible use of information obtained from the participants.

CHAPTER FOUR

4. DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

The data analysis and interpretation of the results obtained from the study on greywater recycling for sustainable housing in Addis Ababa, which focuses on Koye Feche Condominium, are presented in this chapter. Quantitative data collected through questionnaires were analysed using IBM SPSS Statistics version 27. Descriptive statistics, Pearson correlation analysis, and multiple regression analysis were used in accordance with the study objectives. Descriptive statistics, correlation analysis, and regression analysis were presented based on the findings that align with the objectives of the study.

4.2 Response Rate

Questionnaires were administered to 27 selected residents of Koye Feche Condominium, and the responses were collected for analysis purposes. The qualitative part of the study was conducted using interviews. 7 participants were interviewed, and their responses obtained were sufficient for the descriptive and exploratory nature of the study.

Table 4.2 Response Rate

Method of data collection	Number of respondents
Questionnaire	27
Interview	7
Total	34

Source: Survey Data, 2026

4.3 Demographic profile of respondents

The questionnaire respondents were presented in this section. To have a general understanding of the background of the participants involved in the study, demographic analysis is conducted. This analysis contains variables like gender, age, household size, and length of residence in Koye Feche Condominium.

Table 4.3 Respondents gender distribution

Gender	Frequency	Percent
Female	9	33.3
Male	18	66.7
Total	27	100

Source: Survey Data, 2026

As shown in Table 4.3, Of the 27 questionnaire respondents, 18 (66.7%) were male and 9 (33.3%) were female. Therefore, male respondents constituted the majority of the sample.

Table 4.3.1 Respondents Age Distribution

Age category	Frequency	Percent
18-25	8	29.6
26-35	9	33.3
36-45	6	22.2
46-55	2	7.4
56+	2	7.4
Total	27	100

Source: Survey Data, 2026

As shown in Table 4.3, the age group of 26-35 years had the largest proportion of respondents with 33.3% of the total sample, followed by 29.6% of total respondents falling in the 18-25 years age group. The age groups of 36-45, 46-55 and 56+ years have 22.2%, 7.4%, and 7.4% of respondents, respectively.

Table 4.3.2 Household size of respondents

Household size	Frequency	Percent
1-2	4	14.8
3-4	8	29.6
5-6	12	44.4
7+	3	11.1
Total	27	100

Source: Survey Data, 2026

As shown in Table 4.4, respondents with high percentage and frequency are grouped under 5-6, while 29.6% and a frequency of 8 are grouped with 3-4 household members. The respondents with household members of 1-2 and 7+ had 14.8% and 11.1%, respectively. This shows that the respondents live in medium-to-relatively large-sized households.

Table 4.3.3 Respondents' Length of residence

Length of residency	Frequency	Percent
Less than 1 year	7	25.9
1-3 years	5	18.5
4-6 years	8	29.6
More than 6 years	7	25.9
Total	27	100

Source: survey Data, 2026

As shown in Table 4.5, Residents who lived 4-6 years had the largest frequency and percent, with 8 and 29.6%, followed by groups of more than 6 years and less than 1 year with equal frequency and percent. The last group, with a frequency of 5 and a percentage of 18.5%, is grouped under 1-3 years. This helped as an indicator of respondents with varied living experience, which is useful for understanding their view on water-related challenges and the possible adoption of greywater recycling systems.

4.4 Descriptive Statistics

To summarize the main variables of the study, Descriptive statistics were used to summarize the study variables like project planning, technology, cost, stakeholder engagement, risk, sustainability, and acceptance of greywater recycling. In order to describe the response, mean and standard deviation were used.
The following scale was used for the interpretation of the mean value:

- ✔ 1-1.80= strongly Disagree
- ✔ 1.81-2.60=Disagree
- ✔ 2.61-3.40=Neutral
- ✔ 3.41-4.20=Agree
- ✔ 4.21-5.00=strongly agree

Table 4.4 Descriptive statistics of study variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Planning score	27	2.75	4.50	3.7593	.52110
Technology score	27	2.00	4.75	3.5185	.79034
Cost Score	27	3.00	4.5	3.7870	.37148
Risk Score	27	3.00	4.33	3.3333	.30662
Stakeholder Score	27	2.00	5.00	3.7531	.86030
Sustainability Score	27	3.33	5.00	4.4198	.51964
Sustainable Greywater Integration	27	1.67	5.00	3.2099	1.33701
Valid N (listwise)	27				

Source: Survey Data, 2026

As shown in Table 4.6, the planning construct had a mean of 3.7593 and a standard deviation of .52110, which indicates that scope definition and planning play a key role in having successful integration of greywater recycling in Koye Feche Condominium. Low standard deviation relative to the others shows the respondents should have a fairly consistent view.

The mean and standard deviation score for Technology score is 3.5185 and .79034. This shows that respondents have good insight into technology, and they can support the implementation of greywater recycling. While the higher standard deviation indicates there is a difference in respondents' views on technology.

Cost score has a mean and standard deviation of 3.7870 and .37148 respectively. This denotes respondents are willing to participate in the financial issues that consider the affordability and financial transparency of the project. The respondents have similar views on cost matters, which indicates a lower standard deviation.

Risk management has fallen in the neutral range, which has a mean and standard deviation score of 3.3333 and .30662 that demonstrate respondents are uncertain or

moderately positioned regarding risk- related issues such as health concerns, maintenance challenges, and possible system failure.

The mean score of stakeholder engagement is 3.7531 with a standard deviation of .86030. This signifies respondents' participation and communication are key to a successful implementation of a project within the community. Sustainability, with the highest agreement range, has a mean score of 4.4198 and .51964 standard deviation. This is evidence for respondents' strong value on sustainability, environmental protection, and long-term water security.

The overall acceptance has a mean score of 3.2099 and a 1.33701 standard deviation that falls within the neutral range and reveals respondents, on average, have a moderately positive overall acceptance of greywater recycling. Response variations resulted in the largest standard deviation, which shows some respondents are supportive and others hesitate.

In conclusion, Descriptive statistics results show planning, technology, cost, and stakeholder engagement were rated positively, while sustainability received the strongest support. A moderate result that indicates uncertainty and mixed opinion falls under risk management and acceptance.

4.5 Correlation analysis

The analysis was conducted to examine the relationship between independent and dependent variables by using Pearson correlation analysis. Planning, technology evaluation, cost and financial management, risk management, stakeholder engagement, and sustainability are the independent variables.

Table 4.5 Correlation Analysis Result

Variables	Planning	Technology	Cost	Risk	Stakeholder	Sustainability	Acceptance
Planning_score	1	.612**	.408*	.020	.570**	.541**	.798**
Technology_score	.612**	1	.260	-.106	.681**	.683**	.736**
Cost_score	.408*	.260	1	.084	.230	.298	.152
Risk_score	.020	-.106	.084	1	.032	-.027	.021
Stakeholder_score	.570**	.681**	.230	.032	1	.623**	.589**
Sustainability_score	.541**	.683**	.298	-.027	.623**	1	.483*
Sustainable Greywater Integration (SGI)	.798**	.736**	.152	.021	.589**	.483*	1

Note:

*Correlation is significant at the 0.05 level (two-tailed)

**Correlation is significant at the 0.01 level (two-tailed)

As indicated in Table 4.7, strong positive and a statistically significant relationship with acceptance (r=.798, p< .001) lies under planning. This implies that better planning is associated with higher acceptance of greywater recycling.

Technology evaluation also has a strong positive and statistically significant relationship with acceptance (r=.736, p< .001). This implies respondents will accept greywater recycling if they get suitable technology.

The acceptance of Cost had a weak positive but statistically non-significant relationship with acceptance (r=.152, p=.451). This revealed cost concerns are present but did not show a significant direct relationship with acceptance. Additionally, risk and acceptance are also positive but not statistically significant (r=.021, p= .918). This provided evidence that risk-related perceptions did not significantly influence acceptance at the correlation level.

Both stakeholder engagement and sustainability have a moderate positive and statistically significant relationship with acceptance (r = .589, p = .001) and (r=.483,

p=.011). This shows that resident involvement and participation in valuing sustainability will support the successful implementation of greywater recycling.

Overall, Positive relationships with acceptance for planning, technology, risk, stakeholder engagement, and sustainability are shown by the correlation analysis, while cost and risk do not show statistically significant relationships with acceptance.

4.6 Regression analysis

The effect of project planning, technology, cost, risk, stakeholder engagement, and sustainability on acceptance of greywater recycling was measured by multiple linear regression. These variables are useful to predict acceptance when all predictors are considered together.

4.6.1 Model Summary

Table 4.6.1 Model Summary

Model	R	R square	Adjusted R Square	Std.Error of the estimate
1	.888	.788	.725	.70131

Source: Survey Data, 2026

The model summary in Table 4.8 shows, R value is 0.888, which indicate multiple correlation between observed and predicted dependent-variable values. The acceptance explained by planning, technology, cost, risk, stakeholder engagement, and sustainability is indicated by the R-squared value of .788 which holds 78.8% of the variation.

4.6.2 ANOVA Result

Table 4.6.2 ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	36.641	6	6.107	12.416	< .001
Residual	9.837	20	.492		
Total	46.477	26			

Source: Survey Data, 2026

The ANOVA result in Table 4.9 shows that the regression model is statistically significant (F=12.416, p< .001). The result shows that by considering all the independent variables together, they significantly predict acceptance of greywater recycling.

4.6.3 Regression coefficients and interpretation

Table 4.6.3 Regression Coefficients

Variable	B	Std. Error	Beta	t	Sig.	95% CI Lower Bound	95% CI Upper Bound
Constant	-2.587	2.187		-1.183	.251	-7.150	1.976
Planning score	1.668	.367	.650	4.540	< .001	.902	2.435
Technology score	.819	.282	.484	2.900	.009	.230	1.407
Cost score	-.742	.410	-.206	-1.811	.085	-1.598	.113
Risk score	.311	.459	.071	.677	.506	-.646	1.268
Stakeholder score	.047	.236	.030	.201	.843	-.445	.539

Sustainability score	-.398	.386	-.155	-1.030	.315	-1.203	.408

Source Data, 2026

As shown in Table 4.10, Project planning was the strongest statistically significant predictor of acceptance (B=1.668, β=.650, p<.001). Technology evaluation was also positively and significantly associated with acceptance (B=.819, β=.484, p=.009).

Cost management had a negative but statistically non-significant coefficient (B=−.742, β=−.206, p=.085). Risk management had a positive but non-significant coefficient (B=.311, β=.071, p=.506). Stakeholder engagement was also positive but non-significant (B=.047, β=.030, p=.843), whereas sustainability management had a negative and non-significant coefficient (B=−.398, β=−.155, p=.315). Therefore, only project planning and technology evaluation were statistically significant predictors in the model.

In conclusion, Planning and technology are the only variables that significantly predict acceptance of greywater recycling in Koye Feche Condominium from all predictor variables, as shown by regression analysis.

4.6.4 Assumptions and Tests

Assumptions were checked to determine whether the regression model was appropriate for the data before conducting the analysis. Examination of normality, linearity, and multicollinearity was done on these assumptions. To explain the acceptance of grey water, variables like project planning, technology evaluation, cost, risk management, stakeholder engagement, and sustainability were used to assess.

Normality Test

In this study, histogram, normal Q-Q plot, detrended normal Q-Q plot, boxplot, and the Shapiro-Wilk test were the tests used for normality. The residual of the model

should be approximately normally distributed for regression analysis to be valid. To inspect whether the residuals followed a bell-shaped distribution, the histogram was used to visually inspect, while the Q-Q plots were used to assess how closely the residuals followed the normal line. The normality of the residuals was statistically tested by using the Shapiro-Wilk test.

Figure 4.6.4 Histogram of unstandardized Residual

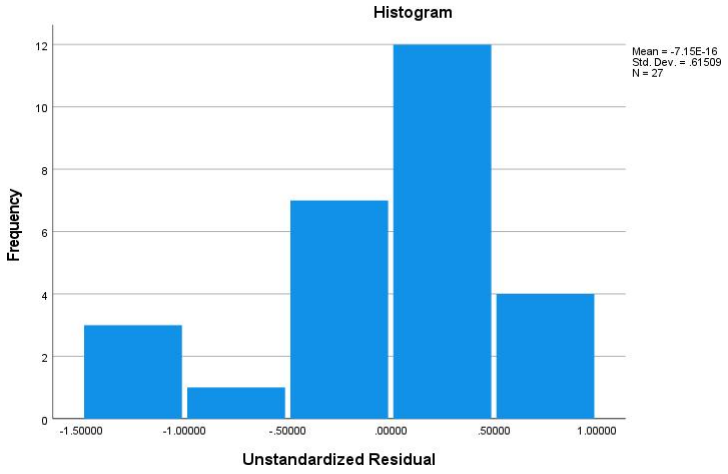


Table 4.6.4 Normality Test

Test	Statistic	df	Sig.
Kolmogorov-Smirnov	.157	27	.085
Shapiro-Wilk	.905	27	.017

Source: survey Data, 2026

As shown in Table 4.8, the Shapiro-Wilk test is more feasible for small sample sizes with result of p=.017<.05. This indicates statistically significant departure from normality.

As the result shows that, the Kolmogorov-Smirnov test produced a p-value of .085, which is above 0.05 in which the result suggests that the residuals are not perfectly normally distributed.

On the other hand, the residuals are not severely distorted as shown by the histogram, although the distribution is not perfectly bell-shaped. Additionally, the normal Q-Q plot shows that most points lie close to the diagonal line, though some deviations are observed at the tails. The detrended Q-Q plot also shows moderate departures from zero, especially at the lower and upper ends. Therefore, the normality assumption is not fully satisfied; the deviation appears moderate, and the regression analysis was still carried out with caution because the model remains useful for explanatory and exploratory purposes.

Figure 4.6.4.1 Normal Q-Q plot of unstandardized Residual

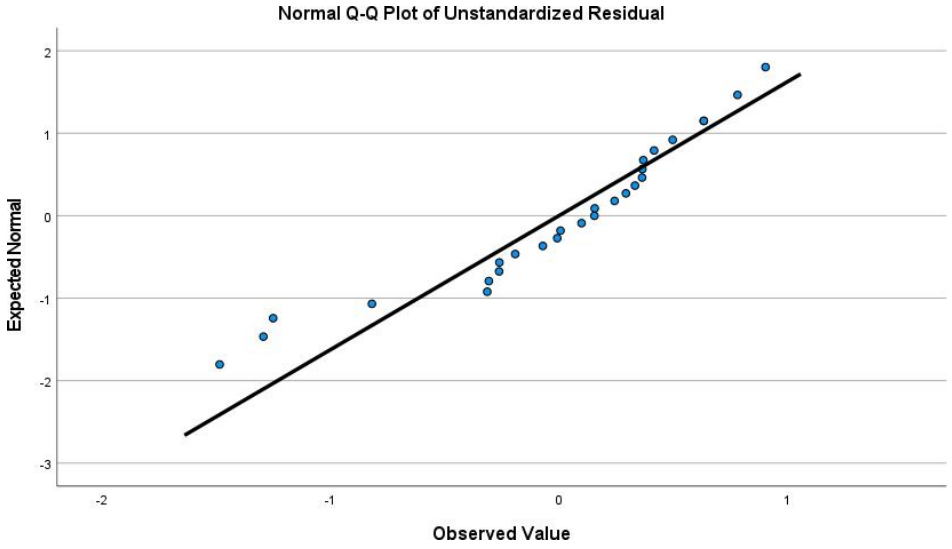
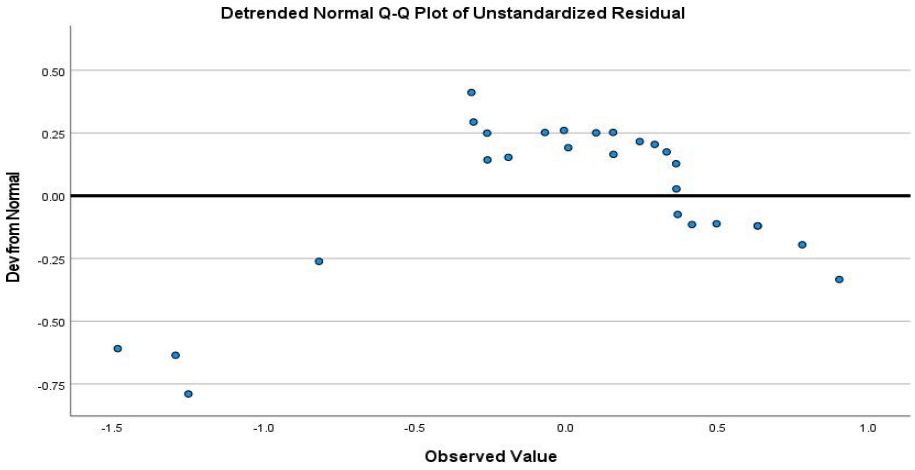
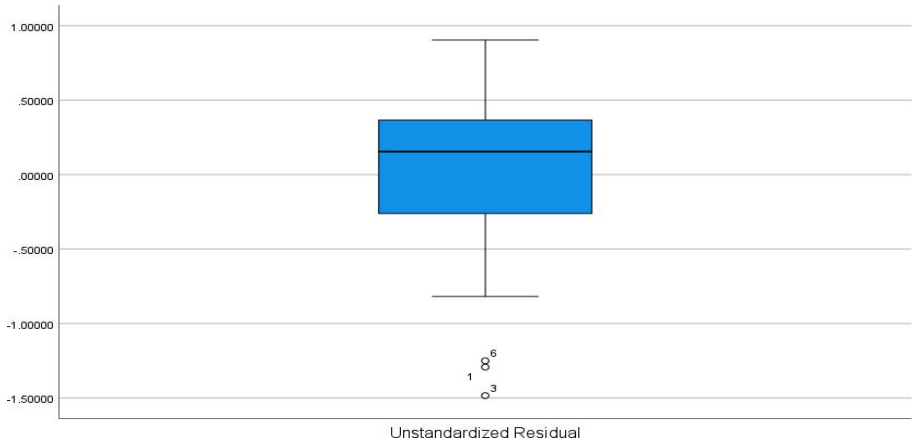


Figure 4.6.4.2 Detrended Normal Q-Q Plot of Unstandardized Residual



Source: Survey Data, 2026

Figure 4.6.4.3 Boxplot of Unstandardized Residual

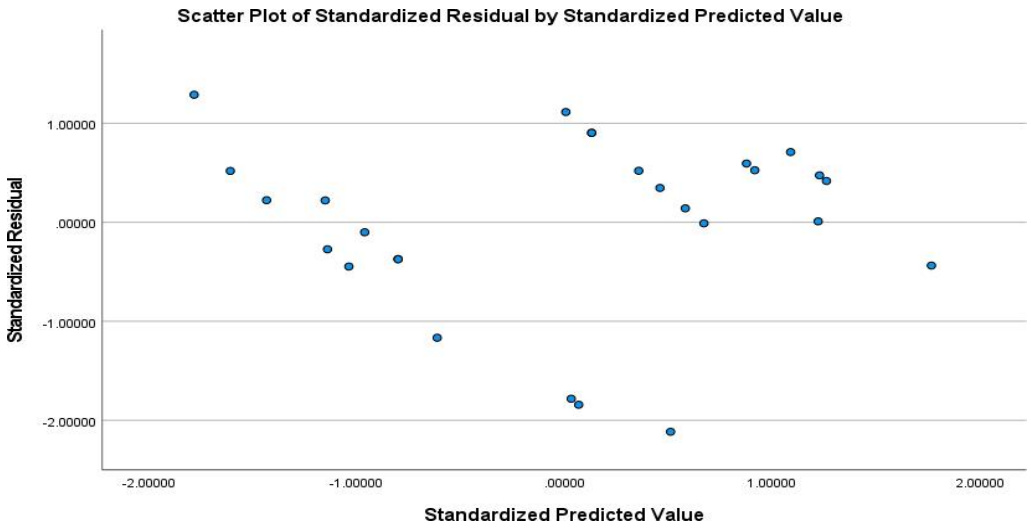


Source: Survey Data, 2026

Linearity Test

Linear relationship between the dependent variable and independent variables is called linearity. Linearity and homoscedasticity were assessed using a scatterplot of standardized residuals against standardized predicted values. The linearity assumption is considered reasonably satisfied if the points in the scatter plot are randomly distributed around the zero line without forming a clear curve, wave, or funnel shape.

Figure 4.6.4.4 Scatter plot standardized Residual by Standardized predicted value



Source: Survey Data, 2026

Although the scatter plot of a few points appears farther from the center, the overall pattern does not suggest a serious violation of linearity, and it also shows that the residuals are generally scattered around the zero line without forming a strong systematic curve or obvious funnel pattern. Therefore, for this study, the assumption of linearity can be considered reasonably satisfied for this.

4.6.5 Multicollinearity test

Collinearity statistics were examined to assess whether the predictor variables were highly correlated with one another.

Table 4.6.5 Collinearity Statistics

Variable	Tolerance	VIF
Planning score	.516	1.938
Technology score	.380	2.630
Cost score	.816	1.226
Risk score	.956	1.046
Stakeholder score	.459	2.177
Sustainability score	.470	2.127

Source: Survey Data, 2026

There is no serious multicollinearity problem among the independent variables because all VIF values are well below 10 and also tolerance values are above .10. Their values range from .380 to .956 for tolerance and VIF values from 1.046 to 2.630. These values show that the predictor variables are sufficiently distinct and suitable for inclusion in the same regression model.

4.6.6 Summary of Hypotheses

Table 4.6.6 Summary of Hypotheses

Hypothesis	Result	Decision
H1: Project planning has a statistically significant positive effect on acceptance of greywater recycling.	Significant ($p < .001$), positive ($\beta = .650$)	Accepted
H2: Technology evaluation has a statistically significant positive effect on acceptance of greywater recycling.	Significant ($p = .009$), positive ($\beta = .484$)	Accepted
H3: Cost and financial management have a statistically significant positive effect on acceptance of greywater recycling.	Not significant ($p = .085$), negative ($\beta = -.206$)	Not Accepted
H4: Risk management has a statistically significant positive effect on acceptance of greywater recycling.	Not significant ($p = .506$), positive ($\beta = .071$)	Not Accepted
H5: Stakeholder engagement has a statistically significant positive effect on acceptance of greywater recycling.	Not significant ($p = .843$), positive ($\beta = .030$)	Not Accepted
H6: Sustainability has a statistically significant positive effect on acceptance of greywater recycling.	Not significant ($p = .315$), negative ($\beta = -.155$)	Not Accepted

Source: Survey Data, 2026

As shown in Table 4.13, Positive effects on acceptance of greywater recycling are only on planning and technology evaluation. Respondents' acceptance increases due to well-planned projects and appropriate technology.

However, cost, risk, stakeholder, and sustainability do not have statistically significant effects on acceptance in the regression model. Even though all independent variables were considered together, they were not statistically significant predictors, with some variables showing positive relationships in correlation analysis. So, the hypotheses related to these variables were not accepted.

In conclusion, in this study, variables like planning and technology evaluation are the strongest determinants of acceptance of greywater by the regression analysis in Koye Feche Condominium.

4.7 Qualitative Data from Interview

Seven key informants participated in the interview data collection to describe the qualitative findings. Water supply challenges, awareness of greywater recycling, feasibility concerns, risk perception, stakeholder participation, and long-term sustainability were the common ideas that the qualitative analysis focused on.

Water supply challenges

Inconvenience in daily activities and burden on households were mainly raised by the respondents, and it is a very common problem in Koye Feche Condominium. They also stated that the shortage of water has become a major concern that requires alternative and sustainable solutions.

Awareness and perception of greywater recycling

Despite some participants having a basic understanding of the concept, the limitation of awareness on greywater recycling is still among some residents and stakeholders. However, interest in the idea was expressed in some participants after explaining the main concept about greywater recycling.

Technology and Feasibility Concerns

Some interview participants agreed that the concept of appropriate technology is the key to successful implementation of greywater recycling. If the system is safe, easy, and suitable for residents, they are more likely to be supportive of the system.

Cost and Financial Concerns

The main concern for participants is cost; they are supportive if it reduces long-term water expenses, but they are also concerned about the installation and maintenance costs. They state the need for cost transparency and affordability.

Risk and safety concerns

Health, contamination, system failure, and maintenance are the main concerns of the participants. The solution for these cases is in order to accept greywater recycling with clear safety standards, proper awareness creation, and visible assurance from responsible authorities.

Stakeholder participation

The result supported the qualitative data, as most interview participants agreed that residents should participate in planning and implementation of the greywater

recycling project. Additionally, awareness programs, training, and consultation meetings are the most important.

Sustainability and long-term benefits

Many participants believed that greywater recycling could help improve water scarcity, reduce waste, and contribute to environmental protection if it is properly planned and managed.

4.8 Discussion of results

The results show that respondents have a positive view of project planning, technology evaluation, cost, risk, stakeholder engagement, and sustainability of greywater recycling. The highest mean score is sustainability in descriptive results, where respondents strongly agree on the value of long-term environmental and resource management.

Despite the regression result revealing that only planning and technology remain statistically significant when all variables were tested together, planning and technology had the strongest direct influence on greywater recycling integration. This finding is reasonable because greywater recycling requires clear project scope, defined responsibilities, appropriate treatment technology, operation and maintenance planning, and safety assurance. It also agrees with related greywater studies which emphasize that treatment method selection, system design, and implementation planning are critical for reuse success. The correlation result shows that all variables, like planning, technology, stakeholder engagement, and sustainability, are positively and significantly related to greywater recycling. This ensures that these two variables are the strongest and most direct predictors of acceptance.

Although cost was positively rated in the descriptive result, it was not statistically significant in the regression model. This may be because residents in low- and middle-income condominium housing may recognize the importance of cost and affordability, but their support for greywater recycling may first depend on whether the project is clearly planned and whether the technology is safe and reliable. In other words, residents may not reject greywater recycling only because of cost; rather, they

may first need confidence that the system will work, be safe, and be properly managed. Cost may become more important during actual implementation when installation, maintenance, and payment responsibilities are clearly presented.

Risk management was also not a significant predictor in the regression result, although interview participants raised concerns about health, contamination, maintenance, and system failure. This suggests that risk may not directly predict support in the statistical model, but it remains practically important. Residents may not fully understand technical risks before the system is introduced, but once implementation begins, safety assurance and risk communication become essential. This supports the need for clear standards, training, maintenance responsibility, and institutional follow-up.

Water shortage is the main concern in the study area, as stated in the qualitative findings, and residents agree that the solutions should be properly planned, technologically feasible, affordable, and safe. Awareness creation and communication were suggested for the uncertainty around risk and overall acceptance.

Overall, the study results suggest greywater recycling has potential as a sustainable housing solution in Koye Feche Condominium. Strong project planning, good technology, effective stakeholder engagement, awareness of risks, stakeholder involvement, and institutional support are variables that successful acceptance is dependent on.

4.9 Summary of Chapter Four

Data collected from questionnaire respondents and interview participants were presented and analysed in this chapter. Sustainability received the highest mean score, while planning, technology, cost, and stakeholder engagement were also positively rated, and risk and acceptance showed moderate response in descriptive results.

In the correlation analysis, planning, technology, stakeholder engagement, and sustainability have positive relationships with acceptance of greywater recycling. However, cost and risk did not show statistically significant relationships at the correlation level. While all variables are analyzed together, planning and technology are the only significant predictors of acceptance in regression analysis. The regression

result showed that the overall model was statistically significant and explained 78.8% of the variation in greywater recycling support. This indicates that proper planning and appropriate technology are the strongest direct factors for greywater recycling implementation in Koye Feche Condominium. The qualitative results were supported by interview results that showed water shortage problems, the importance of awareness creation, involvement of stakeholders with great communication, and practical and affordable solutions.

The assumption tests showed that there was no serious multicollinearity problem among the predictors. Normality was not perfect, but graphical results indicated only moderate deviation, so the regression result was interpreted with caution. The qualitative findings supported the quantitative result by showing that water shortage, safety, affordability, awareness, stakeholder participation, and institutional support are important practical issues. Overall, the chapter shows that greywater recycling has potential in Koye Feche Condominium, but successful implementation depends mainly on strong planning and suitable technology.

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The summary of findings, conclusions from the study, and recommendations based on the results are presented in this chapter. Suggestions for future researchers to conduct further studies on greywater recycling for sustainable housing in Addis Ababa are also included.

5.2 Summary of Findings

This study analysed greywater recycling as a sustainable housing solution for Koye Feche Condominium in Addis Ababa as a case study. The key role of project management in shaping acceptance of grey water recycling, such as planning, technology evaluation, cost, risk, stakeholder engagement, and sustainability, was focused on in the study. The data collected from residents were analysed using IBM SPSS version 27, and the results were interpreted using descriptive statistics, correlation analysis, regression analysis, and thematic analysis of interview data. The major results are summarized, showing that sustainability had the highest mean score among all variables in the descriptive results.

As shown in the results, environmental protection, water security, and sustainability resource management are the most valued variables in the community. This shows that residents are generally supportive of sustainability ideas, but still require assurance about safety, cost, maintenance, and implementation. Participants believe planning, technology, cost, and stakeholder engagement play an important role in the success of projects like grey water recycling, as their mean value of the variables falls in the “agree” range. However, risk management and acceptance fell in the range of moderate that shows respondents still have uncertainty and have a view of possible health risks, system reliability, and overall willingness to adopt grey water recycling. Planning had the strongest correlation with acceptance, followed by technology evaluation. This result is obtained from correlation analysis, which also states that planning, technology, stakeholder engagement, and sustainability have positive and

statistically significant relationships with acceptance of greywater recycling. Cost and risk did not show a direct relationship with acceptance.

Unlike all other variables, planning and technology are the only variables that significantly predict acceptance in the multiple regression analysis. The multiple regression results indicated that the overall regression model was statistically significant and explains a large proportion of the variation in acceptance of greywater recycling. This means that proper project planning and appropriate technology are the most important direct factors for sustainable greywater integration in Koye Feche Condominium. Similar studies in Addis Ababa condominiums have focused mainly on greywater treatment methods, water demand management, and reuse potential, while this study contributes by emphasizing project management factors, especially planning and technology evaluation.

The major challenge in Koye Feche Condominium is water shortage, which is shown by the findings of interviews with residents. The need for a sustainable solution was raised because of a major concern about the water supply's negative effect on daily life. Stakeholder participation, awareness creation, cost transparency, and clear safety standards were raised by respondents as important tools for improving the acceptance of greywater recycling.

Overall, success depends upon proper planning and technology with effective communication that is supported by institutions. In this study, greywater recycling has promising potential as a sustainable housing solution for Koye Feche Condominium.

5.3 Conclusion

The study indicates that to get a sustainable solution for water-related challenges, Grey water recycling is the best solution for long-term environmental management and water conservation. Successful implementation of such systems needs a defined project scope, clear communication, and a structured planning process in which project planning takes a full role in increasing the acceptance of greywater recycling, as shown by the statistical findings of respondents. If appropriate, safe, and practical

technology is selected for the condominium, respondents are more likely to support greywater recycling. This shows that technology evaluation is a significant factor influencing acceptance and essential for long- term implementation. In multiple regression, both stakeholder engagement and sustainability were not significant predictors, but in correlation analysis both showed a positive relationship. This shows that a potentially suitable solution when partly reflected with stronger factors like planning and technology. Compared to planning and technology, cost and risk management are not the strongest variables for the acceptance of greywater recycling as statistically significant predictive effects in a regression model.

In this study, the findings not only show that residents' challenges are technical, it is also managerial and transparent, and residents are not entirely resistant to greywater recycling however, their acceptance depends upon transparency and affordability supported by trustworthiness.

This study concludes that effective planning, appropriate technology, stakeholder awareness, clear safety assurance, and institutional commitment are requirements for successful integration of grey water recycling in Koye Feche Condominium. In theoretical implications, the study ensures that project management dimensions like planning and technology evaluations are the key variables for acceptance of sustainability-based housing interventions, and in practical implications, acceptance of greywater recycling can be improved through planning, technology confidence, awareness creation, and stakeholder involvement. These are shown through the findings in this study that are useful for housing authorities, condominium managers, and policymakers.

5.4 Recommendations

Based on the findings of the study, the Addis Ababa housing authorities, Koye Feche Condominium management, the Addis Ababa Water and Sewerage Authority, and other relevant institutions should jointly initiate a small-scale greywater recycling pilot project at Koye Feche Condominium. Before implementation, a detailed technical assessment should be conducted to determine greywater quantity, quality, treatment requirements, infrastructure compatibility, installation costs, and

maintenance needs. The pilot system should initially focus on non-potable uses, such as toilet flushing, landscape irrigation, and general cleaning. Residents should also receive awareness training on the safety, benefits, operation, and maintenance of the system.

A detailed implementation plan should be prepared before introducing the greywater recycling system. The plan should clearly define the project scope, objectives, activities, schedule, budget, responsibilities, monitoring procedures, and maintenance arrangements.

Housing authorities should collaborate with water engineers, environmental experts, and public-health professionals to identify a treatment technology suitable for the physical, financial, and institutional conditions of Koye Feche Condominium. The selected technology should be safe, affordable, reliable, easy to operate, and compatible with the existing building infrastructure.

A detailed financial assessment should be conducted to estimate installation, operation, maintenance, repair, and replacement costs. Possible financing arrangements may include government support, condominium contributions, development partners, or cost-sharing mechanisms. Residents should not be required to contribute financially before costs and benefits are clearly communicated.

Water-quality testing, treatment monitoring, regular inspection, and clear maintenance procedures should be established to reduce health and operational risks. The system should comply with relevant water-reuse and public-health standards. Emergency procedures should also be prepared for system failure, contamination, or poor maintenance.

Residents, condominium management, housing authorities, technical experts, and relevant government institutions should be involved from the planning stage. Consultation meetings, awareness programmes, training sessions, and feedback mechanisms should be established to improve trust, acceptance, and participation.

The system should include a long-term operation and maintenance plan, clearly assigned institutional responsibilities, regular performance monitoring, and sufficient financial and technical support. A responsible management body should be identified to supervise the system after installation.

Finally, greywater recycling should be introduced through pilot projects before full-scale implementation. A pilot project would allow housing authorities to test the system, identify technical and social challenges, evaluate cost and maintenance requirements, and improve the model before wider application.

5.5 Suggestions for Future Research

Future studies should be conducted in other condominium sites in Addis Ababa and other Ethiopian cities using larger sample sizes. This would improve generalizability and strengthen statistical power.

Future researchers should conduct laboratory testing of greywater quality and compare different treatment technologies such as sand filtration, constructed wetlands, membrane bioreactors, and disinfection systems.

Future studies should also conduct detailed engineering design and cost-benefit analysis to identify the most technically and economically feasible greywater recycling option for condominium housing.

Further research should examine institutional and policy arrangements for greywater recycling, including the roles of water authorities, housing bureaus, environmental agencies, condominium management, and residents.

Future research should also examine awareness, trust, safety perception, and willingness to pay because these factors may strongly influence the practical implementation of greywater recycling systems.

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Appendix

Addis Ababa University College of Business & Economics Management

Department of Project Management

Survey Questionnaire to be filled by Managers & Employees

Dear Respondents:

I would like to express my earnest appreciation for your generous time, honest and prompt response. The main purpose of this questionnaire is to collect data which will be helpful in research work titled **"GREYWATER RECYCLING FOR SUSTAINABLE HOUSING IN ADDIS ABABA – A CASE OF KOYE FECHE CONDOMINIUM "**. Your participation in this study was valuable and greatly appreciated.I want to assure you that this research is only for academic purpose. No other person will have access to the data collected. That is, the secrecy of the information you provide is strictly protected.

If you have any question, please feel free to contact me @ 0922105633 or use my email: redeitaklilu22@gmail.com

SECTION A: General Information

Question	Options
1. Gender	☐ Male ☐ Female ☐ Prefer not to say
2. Age	☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46–55 ☐ 56+
3. Household size	☐ 1–2 ☐ 3–4 ☐ 5–6 ☐ 7+
4.Length of residence	☐ <1 year ☐ 1–3 years ☐ 4–6 years ☐ >6 years

SECTION B: Project Planning & Scope Definition

Please read each statement that are indication of the project quality management practice and project success criteria carefully and show your level of agreement on the statements by putting "❒" mark in the boxes using the following 5-scale Likert scales: Strongly agreed , Agree, Neutral, Disagree and Strongly Disagree .

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5. Water shortages occur frequently in this condominium.	☐	☐	☐	☐	☐
6. There is a clear need for alternative water-saving solutions.	☐	☐	☐	☐	☐
7. The condominium management communicates clearly about water-related issues.	☐	☐	☐	☐	☐
8. I believe a greywater recycling project should be included in future housing plans.	☐	☐	☐	☐	☐

SECTION C: Technology Evaluation & Feasibility

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9. I understand the basic idea of greywater recycling.	☐	☐	☐	☐	☐
10. I believe greywater can be safely reused for non-drinking purposes.	☐	☐	☐	☐	☐
11. I think the condominium has enough space and infrastructure to install a greywater system.	☐	☐	☐	☐	☐
12. I trust that appropriate technology can be selected for our housing units.	☐	☐	☐	☐	☐

SECTION D: Cost & Financial Management

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
12. Water shortages increase my household expenses.	☐	☐	☐	☐	☐
13. Greywater recycling can reduce long-term water costs.	☐	☐	☐	☐	☐
14. I am willing to pay a small	☐ Yes☐ No				

maintenance fee if costs decrease.	☐ Depends				
15. Cost transparency is important for supporting the project.	☐	☐	☐	☐	☐

SECTION E: Risk Management

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
16. I am concerned about health risks from greywater reuse.	☐	☐	☐	☐	☐
17. I am concerned about system failure or poor maintenance.	☐	☐	☐	☐	☐
18. Clear risk-mitigation plans would increase my trust.	☐	☐	☐	☐	☐

SECTION F: Stakeholder Engagement & Communication

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
19. Residents should be involved in planning greywater projects.	☐	☐	☐	☐	☐
20. I would participate in meetings or trainings.	☐ Yes ☐ No ☐ Maybe				
21. I trust management to implement such a project effectively.	☐	☐	☐	☐	☐

SECTION G: Sustainability & Environmental Management

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
22. Greywater recycling can reduce environmental pollution.	☐	☐	☐	☐	☐

23. Sustainability should be a priority in housing projects.	☐	☐	☐	☐	☐
24. I support long-term solutions that improve water security.	☐	☐	☐	☐	☐

SECTION H: Overall Acceptance

Statement	Options
25. I support introducing a greywater recycling system.	☐ Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
26. I accept greywater reuse for:	☐ Toilet flushing ☐ Garden irrigation ☐ Cleaning floors ☐ None
27. Biggest concern:	
28. What would encourage you to support the project?	

Appendix B: Interview Questionnaire

Section 1: Introduction

1.How do you currently experience water supply in the Koye Feche Condominium?

2.What problems do you experience with water shortage and costs?

Section 2: Awareness and perception of greywater

3.Have you heard of graywater recycling before? If yes, what do you understand about it?

4.How do you feel about the idea of reusing water from showers, sinks, and laundry for non-drinking purposes (e.g., toilet flushing, irrigation)?

5.What concerns would you have about using recycled greywater in your home

Section 3: Acceptance and Willingness to Adopt

6.If the water bill is reduced, would you be willing to adopt greywater recycling systems?

7.What are the conditions that you will suggest to be more comfortable to use recycled water? (e.g., clear safety standards, government approval, community awareness)?

Section 4: Social and Community Dynamics

8.What do you think of the effect of greywater recycling in the life of the condominium?

9.What role should residents play in planning and managing such systems?

10.How can training help improve acceptance?

Section 5: Policy and Future Outlook

11.What support do you expect from housing authorities or the government if greywater recycling is introduced?

12.What do you think about long term sustainability of greywater recycling could contribute to Addis Ababa ?

13.What recommendations would you give to policy makers to make greywater recycling successful in your community?