



School of Graduate studies
Department of Project Management

ASSESSMENT OF ENVIRONMENTAL SUSTAINABILITY PRACTICES
THE CASE OF ADDIS ABABA 40/60 CONDOMINIUM BUILDINGS

By
Eyob Tesfaye

2022
Addis Ababa

**ASSESSMENT OF ENVIRONMENTAL SUSTAINABILITY PRACTICES
THE CASE OF ADDIS ABABA 40/60 CONDOMINIUM BUILDINGS**

By

Eyob Tesfaye

Advisor

Dr. Yilkal Wassie (PhD)

**A THESIS SUBMITTED TO St. MARY'S UNIVERSITY SCHOOL OF GRADUATE
STUDIES IN PARTIAL FULFILLMENT FOR THE DEGREE OF MASTER OF
ARTS IN PROJECT MANAGMENT**

MAY 2022

Addis Ababa, Ethiopia

ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF PROJECT MANAGEMENT

ASSESSMENT OF ENVIRONMENTAL SUSTAINABILITY PRACTICES
THE CASE OF ADDIS ABABA 40/60 CONDOMINIUM BUILDINGS

BY

Eyob Tesfaye

APPROVED BY BOARD OF EXAMINERS

_____	_____	_____
Dean, Graduate Studies	Signature	Date
<u>Dr. Yilkal Wassie</u>	_____	_____
Advisor	Signature	Date
_____	_____	_____
External Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date

DECLARATION

The undersigned, Eyob Tesfaye, declares that this thesis is my own work, written under the supervision of Dr. Yilkal Wassie. All sources of information used in the thesis have been properly credited. I further confirm that the thesis has not been submitted to any other higher learning institution, in part or in whole, for the intention of obtaining a degree.

Eyob Tesfaye

Name

Signature

St. Mary's University, Addis Ababa, June 2022

Endorsement

With my consent as a university advisor, this thesis has been submitted to St. Mary's University's School of Graduate Studies for assessment.

Dr. Yilkal Wassie

Name

Signature

St. Mary's University, Addis Ababa, May 2022

ACKNOWLEDGMENT

First, I would like to sincerely thank Almighty God for providing so much knowledge, wisdom, inspiration and diligence to complete this article and fulfill my dream.

For all his help and advice in this research, I am grateful to Dr. Yilkal Wassie, who served as my advisor. I would like to thank everyone who helped me achieve in my academic endeavors.

Finally, I want to express my heartfelt gratitude to my wonderful family for their unconditional love and support.

Thank you all!

Eyob Tesfaye

Contents

Abstract.....	7
1. INTRODUCTION.....	8
1.1. Background.....	8
1.2. Statement of the Problem.....	9
1.3. Research Objectives.....	10
1.4. Objectives of the Study.....	11
1.4.1. General Objectives.....	11
1.4.2. Specific Objectives.....	11
1.5. Scope and Limitations of the Study.....	11
1.6. Significance of the study.....	12
1.7. Organization of the Thesis.....	12
2. LITERATURE REVIEW.....	13
2.1. Theoretical Literature.....	13
2.1.1. Sustainable Building Definition.....	13
2.1.2. Environmental Management Practices at Construction Sites.....	14
2.1.3. Construction Changes.....	14
2.1.4. Construction changes orders.....	15
2.1.5. Challenges in Important of Environmental Sustainability Practices.....	16
2.1.6. Challenges towards Compliance to Regulatory Framework.....	17
2.1.7. Housing and the Environment.....	18
2.1.8. Environmentally Sustainable Design.....	18
2.1.9. Sustainable Renovation.....	18
2.1.10. Problem in existing building.....	19
2.1.11. Impacts of Conventional Building.....	19
2.1.12. Components of Environmentally Sustainable Buildings.....	20
2.1.13. Energy, Efficiency and Renewable Energy.....	20
2.1.14. Environmentally Preferable Building Material.....	21
2.2. Empirical Review.....	23

2.2.1.	The Influence of Socio-Economic Factors on the Environmental Sustainability of Addis Ababa Condominium Housing Projects.....	23
2.2.2.	The Impact of Mitigation Measures on the Environmental Sustainability of Addis Ababa Condominium Housing Projects	24
2.3.	Conceptual Framework.....	25
3.	REASERCH METHODOLOGY.....	26
3.1.	Research Design.....	26
3.2.	Research Method	26
3.2.1.	Sampling Techniques, Target population and Sample Size	26
3.2.2.	Sources, Instruments and Procedures of Data collection	26
3.2.3.	Data collection Technique	27
3.2.4.	Validity of Data collection Instruments	27
3.2.5.	Data Analysis	28
4.	RESULT AND CONCLUSION.....	29
4.1.	Introduction.....	29
4.2.	Characteristics of the Respondent.....	29
4.3.	Environmental Management Practices at Condominium Building Project Site	32
4.4.	Natural Resource Extraction	32
4.5.	Energy use and Conservation.....	32
4.6.	Water use and Conservation	33
4.7.	Waste and Emission Management	33
4.8.	Health, Safety and Environmental Responsibility	33
4.9.	Communication on Sustainability Efforts.....	34
4.10.	Community Suggestions to Improve Environmental Sustainability	34
4.10.1.	Challenges in Implementing Environmental Sustainability Practices	34
4.10.2.	Workers Regular Training	35
4.10.3.	Support from Government	35
4.10.4.	Inadequate punitive Measures by the Government.....	36
5.	SUMMARY OF FINDINGS, CONCLUSION & RECOMMENDATION.....	37
5.1.	Introduction.....	37
5.2.	Summary of Findings.....	37
5.3.	Conclusion	38

5.4. Recommendation	38
5.5. Further Research	39
References	41
Appendix A.....	1

Abstract

This initiative aims to evaluate the status of environmentally sustainable practices of Addis Ababa condominium structures. The researcher has attempted to uncover some of the ecologically friendly methods practiced before, during and after construction based on the opinions of the respondents based on data acquired through questionnaires and interviews. The questionnaire was given to 100 employees at the head office, and 70 of them completed it and returned it. The questionnaire was disseminated to employees using simple random selection depending on the respondents' desire to participate and collaboration. The study used a descriptive research design using a qualitative and quantitative approach. Data was studied with statistical methods such as frequency, percentage, and mean; moreover, data acquired from interviews and document analysis was analyzed in narrative form to supplement the quantitative findings. On the topic of natural resource extraction, the data collected was examined using SPSS software, and it was discovered that the condominium project did not take adequate steps to limit natural resource extraction. The existing water usage and conservation system was also deemed to be insufficient, as there was no water management system in place to maximize sustainable water use and conservation. Waste minimization was another significant topic that the researcher wished to learn more about.

Key Words: Sustainability, assessment, environment, change orders, sustainability indicators;

1. INTRODUCTION

CHAPTER ONE

1.1. Background

Our environment, as well as the entire planet, is continually changing, attracting the attention of numerous specialists and rising calls for a fundamental shift in our lifestyles. According to (Emaculate et al., 2010), both governmental and non-governmental organizations, as well as concerned individuals, advocate for more sustainable lifestyles than the current one.

Since the turn of the twentieth century, the sensitivity of Earth's natural environment has grown, which encourages the idea of energy-conserving passive design, dodging numerous forms of energy-consuming active equipment and appliances.

As the greenhouse effect and global energy crises deepen, stakeholders all over the world are being forced to choose between energy-saving sustainable passive design and energy-consuming active design that satisfies comfort desires. This presents a novel way to energy management (Emaculate, et al, 2010).

Long-term sustainability is dependent on the environment. Natural resource shortage, landscape and biodiversity loss, and climate change are all challenges we presently face.

By consuming both renewable and nonrenewable natural resources, as well as producing waste and emissions during building construction and management, the construction industry has contributed to environmentally unsustainable practices. Because it has an impact on the environment throughout the life of the structure, the construction industry is one of the leading drivers of environmental damage.

Construction has been a major focus of East Africa's economy over the past two decades. As a result, Ethiopia's construction industry has played a key part in the country's economic recovery. According to (UN-HABITAT 2008), the construction sector has experienced double-digit growth, expanding at a pace of 37% per year, ushering in a new era of development for the country. Environmental protection is becoming increasingly difficult as the sector grows.

An integrated housing development program (condominium housing) was launched in 2004 with the goal of creating 175,000 residential condominium apartments in Addis Ababa, according to (UN-HABITAT 2008). The integrated housing development program's comprehensive building project aims to address Addis Ababa's massive housing shortage. It will also provide work for a large number of men and women while also boosting the economy of the country. Condominium flats provide both home ownership and financial stability to those who receive them. However, in order to free the planet from ecologically unsustainable development, it is critical to assess the environmental sustainability of condominium buildings and the project, as well as to implement measures to that end in the planning, construction, and selection of environmentally friendly locations.

However, taking the environmental sustainability of the condominium buildings and the project as a whole into account and taking measures to that effect in designing, constructing, and selecting sites that are in harmony with nature is required in order to relieve the planet of environmentally unsustainable development (Yewoinishet, 2007).

We must figure out how to create the necessary housing while also protecting the ecology in order to achieve environmental sustainability. Changes in how we use energy, water, and other resources, as well as a greater reliance on renewables, can help us achieve this. This is what the environment expects of us at a time when our dependence on it is waning.

Environmental sustainability demands that we develop ways to build the essential structures while simultaneously saving the environment. This can be accomplished by altering how we use energy, water, and other resources; relying more on renewable resources; and recognizing limits in the use of nonrenewable resources, while being aware of the harm to nature and the environment. This is what nature expects of us at a time when our reliance on the natural world is growing unsustainable.

1.2. Statement of the Problem

The process of urbanization necessitates more use of resources and nonrenewable energy, as well as a bigger built-up area. Around 40% of the growth is due to a high rate of rural-to-urban migration. Addis Ababa is presently one of the continent's fastest expanding cities, owing to natural population growth and a plethora of challenges, including environmental deterioration.

(UN-HABITAT, 2008).

Chronic housing shortages as a result of the rising slum, deteriorating urban environments, and a massive housing backlog, as well as the demand for cheap housing and a lack of funding, eventually led to government action. The then-mayor of Addis Ababa, Arkebe Oqubay, started a condominium housing initiative in 2004. However, the initiative concentrates solely on housing issues, with no teaching or even an attempt to promote environmental sustainability. The problem is deciding on a location without considering the environmental implications. With the goal of lowering building costs, the government gives land for condominium housing developments. According to (Emaculate et al, 2010), condominium housing project construction sites were chosen at random for the project on open areas in the inner city.

(Addisalem, 2009) said that condominium buildings lack integrated design when the number of people on the building is considered, notably the quantity of pipes. In terms of sanitary and waste disposal, the condominium housing project did not fully achieve its intended goal of creating a cleaner environment because of the ever-increasing population in Addis Ababa in search of better opportunities and services. The drainage and sewer pipes are frequently busting and blocked as they fail to cope with increasing pressure. This research will fill the gap of researchers like (Yohannes 2019) who only consider the construction process have impact on the environment in his research. But this study attempts to fill the gap in Yohannes's research by starting from the material selection including finishing the construction and up to residents acquire the sites. It is referred by Kibert, C. (2007) that buildings have environmental impact throughout the lifetime of the building meaning starting from site selection. The researcher having advantage on personal interest, expertise and exposure on the subject matter, this paper will include ongoing and built-up condominium housing projects.

1.3. Research Objectives

In addition, the following research questions will be examined and addressed in detail:

1. How are environmentally sustainable elements used in condominium housing projects?

2. How does environmental mindfulness affect the sustainability of Addis Ababa condominium housing projects?
3. What has to be done to make condominiums more environmentally sustainable?

1.4. Objectives of the Study

1.4.1. General Objectives

The research's main goal to assess the environmentally sustainable practices of condominium buildings in Addis Ababa.

1.4.2. Specific Objectives

- To identify the elements of environmentally sustainable practices in the Addis Ababa condominium housing projects and to assess the progress practices.
- To investigate how environmental knowledge affects the environmental sustainability of Addis Ababa condominium housing projects.
- To identify what has to be done to make condominium buildings more environmentally sustainable.

1.5. Scope and Limitations of the Study

From a variety of viewpoints, the topic of sustainable development has been addressed in theory and application. Sustainable development is defined as a set of indicators used in a multi-criteria analysis that takes into account environmental, social, and economic factors and gives data on the economic, ecological, and social elements of development. In this analysis, air pollution variation, income, energy consumption, and selected social indicators are analyzed. In this thesis, the environmental aspect of sustainability and its relationship to socioeconomic factors were considered because it is the fundamental idea that designers, consultants, contractors, the government, and society must keep in mind as they work towards achieving sustainability.

There are some limitations to this study. To begin, the locals were careful while responding questions regarding the government during the interview since they may be perceived as a judgment of the administration, which could land them in hot water. Another limitation was

financial, which was imposed owing to the locations' dispersed position. One was on the outskirts of town, and the other two were in the heart of the city. Third, Ethiopia lacks a grading system for determining how environmentally sustainable a building is, allowing for a precise environmental sustainability statistic to be provided at the conclusion of the research.

1.6. Significance of the study

Sustainable development has been studied from a variety of angles, both theoretically and practically. The study's findings were enabled stakeholders in the condominium housing project to identify how environmentally sustainable the condominium buildings are, as well as how environmental sustainability might be integrated into the building's design and use. Using plans to develop 400,000 additional condominiums over the next decade, the environmental effect would be massive if they were not designed with ecologically friendly aspects. As a result, understanding how ecologically sustainable present buildings are is crucial so that any changes that need to be made to future constructions may be identified and executed. Second, since housing is a critical problem that affects all people, the government may utilize this opportunity to offer The findings of the study can be used by people and the government to promote environmental sustainability.

1.7. Organization of the Thesis

This explains the topic, offers background information, and hints at the study's objective and relevance. The second chapter describes the study technique, including how the research was developed and data gathered and evaluated. The third chapter examines theoretical and empirical literature on the concept of ecologically sustainable building from both local and foreign academics. Chapter four investigates the condominium housing project, displays case studies of selected areas, analyzes and interprets the findings, and compares condominium structures to the concept of ecologically friendly buildings. Chapter 5 presents the research's conclusion and recommendations based on the findings.

2. LITERATURE REVIEW

CHAPTER TWO

2.1. Theoretical Literature

2.1.1. Sustainable Building Definition

A sustainable building has the least amount of negative impact on the natural environment, materials, and resources as possible. This type of structure does not deny human needs because it considers human existence to be a part of nature; rather, it is built with the idea that humanity can coexist, multiply, build, and prosper with nature and the earth's natural processes without jeopardizing the planet's long-term habitability (Press, 2006). To be termed a sustainable building, a structure must exhibit qualities and is likely to be evaluated using a rating scheme. Sustainable buildings prevent the loss of natural areas, ecosystems, and biodiversity, as well as air pollution, water pollution, and solid waste, while also lowering operating, maintenance, and environmental expenses. Natural resource consumption is minimized because renewable energy sources are used instead of non-renewable natural resources. This type of architecture reduces negative external environmental consequences such as greenhouse emissions, global warming, and acid rain while also improving the internal atmosphere and thermal comfort. A sustainable building also has higher long-term economic worth, as well as higher human happiness and productivity (Garzone2006). Building, as a product of the construction industry, is a vital part of everyone's life, especially residential buildings, which may not only give a place for people to live, but are also being handled as a work place, such as SOHO small office home office, which implies work from home (Kilbert 2012). When applied to residential building development, the phrase might be interpreted as "the design of sustainable houses must satisfy the demands of the present without jeopardizing future generations' capacity to meet their needs of having a comfortable living situation."

The 1987 concept of sustainable development plays an vital role. The 14 modified definitions can help lead the sustainable construction of residential buildings in the right direction. Furthermore, the number of residential buildings is enormous and unique for living, which is the foundation for

people's pleasure. And sustainable houses will undoubtedly propel overall sustainable growth and the entire society to a higher and more pleasant standard of life.

2.1.2. Environmental Management Practices at Construction Sites

Construction is one of the most essential drivers of economic growth, thus it must be both commercially and socially and environmentally viable (Hassan, 2012). On a global scale, the construction industry contributes to global warming by spewing around 23% of greenhouse gases and dust particles into the atmosphere (Huang 2018). Environmental degradation is caused by the overexploitation of nearly half of all-natural resources utilized in construction, as well as the generation of half of all solid waste (Probert et al., 2010). This rate of degradation has sparked environmental awareness in an attempt to shift toward more sustainable building (Zhou, L., and Lowe, D. J., 2003).

To build ecologically sustainable techniques, a large number of studies on a worldwide and regional scale have been used. The Building Research Establishment's Environmental Impact Study Methodology was employed in this inquiry (2009). The methodology (Figure 1) outlines the themes or criteria that construction sites should adhere to in order to create a long-term sustainable environment.

The quality of the work, as well as the availability of resources, determine the success of building projects (Lamet et 2009). Raw materials, water, electricity, and soil are just a few of the resources available. The current status of the global environment, as shown by ecosystem degradation due to increased extraction and consumption of natural resources beyond replenishing rates (Pearson, 2009).

2.1.3. Construction Changes

Water is essential in the building business since it is used in practically all construction activities (Waylenn 2011). Domestic use, such as consumption by construction workers, general site activities, such as cleaning of tools and plant equipment, mixing of construction materials such as cement, sand, and gravel, groundworks, such as drilling, sprinkling water to reduce dust, and developing of boreholes are just a few of the processes (Waylenn,2011).

Given all of the operations that necessitate water in building, it is critical to save and utilize it effectively. The hierarchy that should be followed is given by (Waylennat2011). The first alternative is to eliminate on-site water waste, the second is to enhance water use efficiency, and the third option is to gather rainwater.

Waylenn's report is supported by the Chinese University of Hong Kong, which states that water usage at construction sites should be decreased and water leakage avoided. Other water conservation techniques prescribed by the university include the recycling of purified water for non-portable usage. The university also supports the idea of collecting rainfall and channeling storm water into water channels to avoid harming habitats and perhaps increasing pollution levels (Burger, 2016).

To avoid groundwater contamination and pollution of natural streams, wastewater generated at construction sites should be properly managed (Kim et al., 2005; Netregs, 2012). Directing wastewater to siltation facilities such as U-channels and acquiring legal permissions for every discharge point for effluent draining to public drains are just a few of the management techniques. Before discharge, any muddy water should be sedimented to remove mud, and the discharge should follow all rules. Wherever feasible, treated wastewater can be recycled for dust suppression. Other methods of sewage management, such as the use of septic tanks, should also be used.

2.1.4. Construction changes orders

Any building project will almost certainly result in the generation of solid trash. Effective waste management is necessary to avoid land and water pollution. The following is a solid waste management strategy provided by the Chinese University of Hong Kong in 2013: Construction trash should be separated at the source, and rubbish should be collected by a qualified waste collector. Useful trash should also be re-used or recycled whenever possible. The waste management plan also specifies how asbestos trash should be treated and how licensed waste collectors should handle it.

According to (Gangoellset 2014), careful planning and management can help to reduce trash generation during the construction process. It is possible to recycle the garbage.

All chemicals and chemical wastes should be handled with care, according to the Chinese University of Hong Kong (2013), and information on the chemicals should be readily available. Chemical wastes should be stored separately with clear signage and collected by a licensed chemical waste collector for proper disposal.

Noise from construction sites can also cause annoyances, in addition to solid and wastewater from construction sites (Abdul-Rahman 2016). Abdul-Rahman et al., 2016 recommend periodic machinery servicing and rescheduling of building activities at predetermined times as a mitigation

measure. This is done to ensure that the community living near the construction sites is not disturbed. For example, to avoid causing nuisance to the general public, (EMCA, 2009) forbids emissions beyond the specified thresholds.

Emissions from building sites not only pollute the air, but they also contribute significantly to material deterioration (Ivaskovaet 2015). Chinese University of Hong Kong (2013) proposes covering all materials on site and spraying water on a regular basis to decrease dust during dry weather as a mitigation measure. To avoid dust emissions, the stockpiles must be handled with extreme caution. The reuse of treated wastewater for dust reduction and vehicle movement management is promoted.

In Nairobi County, Kenya, Gichamba and Kithinji (2019) assessed the impact of environmental legislation on building project performance. The study's specific objectives were to determine how Nairobi County's water, waste management, noise and vibration laws, and physical planning requirements influenced construction sites. The study discovered that water and waste management restrictions have a considerable impact on construction project performance. Noise and vibration laws were found to have little impact on construction project performance, while physical planning regulations had no impact on construction project performance. According to the study, building companies should complete environmental impact assessments in order to improve their chances of receiving a construction permit from the appropriate authorities. Recycling, open dumping, and landfilling should all be used by construction companies to improve waste management.

2.1.5. Challenges in Important of Environmental Sustainability Practices

Despite the benefits received from the construction sector, (Leiper e2003) has underlined the construction industry's delayed adoption of sustainable techniques. Gichamba and Kithinji (2019) investigated the impact of environmental legislation on building project performance in Nairobi County, Kenya. The study's precise goals were to see how Nairobi County's water, waste, noise, and vibration rules, as well as physical planning requirements, influenced construction sites. Another issue identified by (Pitt a2009) is the ineffective enforcement of building laws based on the rule of law in order to ensure sustainable construction.

Onkangi (2018) looked into the barriers to environmental management in Nairobi building sites, as well as the factors that drive adoption. A lack of sustainable resources, according to the report, is one of the most significant impediments to applying environmental management methods in Kenya, making proper environmental management through material selection challenging.

Financial costs are also a disincentive (major deterrent) because they are believed to reduce profit margins. Other impediments include inexperienced environmental managers, a lack of incentives to assist the mainstreaming of environmental management techniques into the construction industry, a lack of senior management support, a lack of environmental awareness, and workers with low technical credentials.

2.1.6. Challenges towards Compliance to Regulatory Framework

Aggressive enforcement, social awareness surrounding public health, environmental footprints, and natural resource protection are some of the issues contributing to requests for environmental sustainability practices in the construction industry.

Ethiopia has so far implemented programs such as the Big Four Agenda to cater for its rising population. Under the Environmental Management and Coordination Act, the government has made it a priority to harmonize environmental regulations (EMCA) 1999 for coordinating environmental management in order to mitigate environmental difficulties that arise as a result of building. This Act emphasizes the importance of conducting an environmental impact assessment (EIA) and issuing licenses afterward for all new projects.

EIA is important because it analyses potential environmental repercussions from development operations and identifies mitigation methods while optimizing positive impacts. Environmental Impact Assessments (EIAs) are necessary for making informed decisions regarding proposed development (GoK, 2002). Given the enormous environmental implications of the building sector, it is critical that project proponents follow the EIA requirements for socioeconomic and environmental soundness.

Environmental sustainability criteria are evidently in place in the building business, since they are mandated by law. However, there are signs that there is little or no enforcement. This could be due to a lack of clearly defined oversight powers, as well as developers' unwillingness to follow the regulations (Menard, S., 2012).

According to a study undertaken by Njoroge (2013) on how Kenya's existing regulatory framework supports building sustainability, the regulatory framework has not been enforced effectively to promote construction sustainability.

There are countless examples of environmental disregard at construction sites, with the most fundamental and simplest environmental practices being ignored. The majority of casual employees are unaware of any current environmental norms or measures on a building site. Additionally, in order to break even financially, some developers minimize expenditures and may disregard environmental management regulations. Such a mindset is costly in the long term, as the

developer will be responsible for pollution remediation expenditures, which may constrain the project's progress.

2.1.7. Housing and the Environment

Buildings account for half of global greenhouse gas emissions, making them the greatest contributor, surpassing industries and transportation. If no effort is made to make these emissions more sustainable, they will grow by 37% by 2030 (Yudelson) (2007).

In the developing world, the difficulties of the urban environment posed by housing are increasingly evident. Rapid urbanization, and with it, vast slum regions, degrades the urban environment by allowing for unplanned and hence unsustainable settlements. Poor water, air, and soil quality, as well as a lack of access to sanitation, define such towns, resulting in a difficult urban environment (Emaculate et.al, 2010).

2.1.8. Environmentally Sustainable Design

A sustainable design is one that uses little to no nonrenewable energy and conserves resources. In general, ES methods implemented during construction safeguard the health of both people and the environment during building usage. A high-performance building saves at least 50% of the energy used by a typical structure. Reducing energy usage necessitates the use of natural site advantages and envelope alternatives, which will affect cooling and heating as well as how much we can utilize energy options like as solar or wind (Yudelson, 2007).

A ventilation system based on natural air movements to reduce cooling and heating loads and guarantee interior air quality comprises three components: air inlets, air outlet points, and a roof-level outlet. (Towers 2005) Other elements to consider in sustainable design include making the best use of natural light and having enough of green space. In the event of natural light, the building's long axis should be aligned east to west, allowing maximum solar illumination from both north and south-facing windows (Yudelson, 2007).

2.1.9. Sustainable Renovation

The process of upgrading a structure is known as renovation (also known as remodeling). We realize that the term "renovation" refers to remodeling, modernization, restoration, retrofitting, and rehabilitation, all of which are methods of renovation. Renovation design, according to (Opoku, A. and Fortune, C. 2013) has two emphases: immutable and movable. 16 Immutable refers to the ancient, which respects the building's history and culture, whereas movable refers to the new, which meets current standards. They are equal things that are placed on opposite sides of a balance.

People occupying the dwellings must also be carefully considered while renovating residential buildings. The term "renovation" refers to the reuse of an existing structure (including structure and components) on the site, as well as the integration of its structure and the possibility of

upgrading or extending it. It is presently very widespread in the sector of heritage structures due to its cultural importance. While rehabilitation is conceivable in many other existing buildings with little historic or cultural significance, it is also possible to improve their quality. Renovation may bridge the gap between ordinary house upkeep and deconstruction by allowing for the establishment of closed loops for building utilization. It is a crucial tool for moving building usage from 'cradle-to-grave' to 'cradle-to-cradle,' which implies that 'Renovation' can give an opportunity for structures to be reborn by reusing certain old components that are still dependable, and upgrading those aspects that should 'retire.' In this situation, renovation may be viewed as the 'loop's cornerstone; or, in other words, 'renovation' plays an important function in building reuse.

2.1.10. Problem in existing building

Despite the fact that green buildings are the way of the future, the vast majority of structures are not green, and they will be used for many years. Retrofitting, which can encompass anything from installing more energy-efficient fixtures to increasing the amount of insulation in a structure, is a common way to improve the energy efficiency of existing structures. While greening existing buildings may not receive the same attention as new green buildings, when it comes to reducing the environmental impact of buildings across the country, it is undoubtedly more important.

2.1.11. Impacts of Conventional Building

Buildings have massive environmental implications. Traditional structures require a lot of energy, land, water, and raw materials to create and operate. They are a significant source of greenhouse gas (GHG) and other damaging air pollutants. They also produce a lot of trash from construction and demolition (C&D), which is harmful to the environment and wildlife. The magnitude of the problem is demonstrated through an examination of these topics. The greatest impact on global warming, resource depletion, indoor air quality, and ecological toxicity has been shown to be buildings and building commodities. Buildings and construction materials have a significant environmental effect over their existence. There are several ways for quantifying these environmental consequences, and much study has been conducted to provide quantitative data on them. Junnila and Horvath (2003), for example, conducted study on a new high-end office building during a 50-year service life to determine its environmental effect. Furthermore, much study has been conducted to determine which building materials are the most environmentally beneficial to utilize in building construction. Gustavsson and Sathre (2005) investigated a wood and concrete framed structure to determine which was the most ecologically friendly material based on energy consumption, CO₂ emissions, and use. According to this study, wood is more environmentally friendly than concrete. Vukotic (2010) conducted additional study in which they examined two simple single-story constructions. The first structure was a timber load-bearing paneled wall, whereas the second was a steel frame structure with concrete block construction. The goal was to determine the embodied energy and carbon dioxide of buildings during their lifetime, as well as which stage of a building's life uses the most embodied energy. The results demonstrated that a

timber-framed structure was more efficient, and the conclusion of a building's life is the most critical point. As a result of all of this study, buildings have a significant environmental effect over their lifetime, and it is our responsibility to reduce these environmental consequences in order to maintain the planet for present and future generations. Many scientists have sought to discover a method to reduce these environmental problems, and sustainable development is one approach.

2.1.12. Components of Environmentally Sustainable Buildings

Green buildings are known to have five major distinguishing characteristics when using the LEED method of certification, which are ES site development, promote efficient use of water resources, energy conservation and renewable energy use, building material conservation and waste reduction, and protection and enhancement of indoor environmental quality (Yudelson, 2007). The US EPA adds recycling and optimization of operating and maintenance methods to the list of ESB components. EPA (2011). In general, based on environmental risks and the need to conserve resources and safeguard natural surroundings, the following components of ESBs have been agreed upon and are discussed one by one:

Optimize site potential -A building's environmental sustainability begins with site selection. When choosing a location, there are various issues/aspects to consider. These include using a previously used and built site rather than clearing a new site; utilizing renewable and clean energy alternatives; and utilizing naturally cooling, heating, and ventilation systems. These are the things that should be considered while choosing a location (Yudelson, 2007). Aside from the more obvious environmental benefits of reduced carbon emissions and the conservation of nonrenewable resources such as fossil fuels that could have been used, clean energy sources such as hydroelectric power, solar power, wind power, and biofuel have the long-term advantage of being more sustainable. According to Smith, during the industrial revolution, the burning of fossil fuels and deforestation has raised the carbon dioxide content in the atmosphere by 26%. As a result, including the usage of renewable energy sources into the design of a building will result in increased energy efficiency and a cleaner environment (Smith, 2005).

2.1.13. Energy, Efficiency and Renewable Energy

Aside from the more obvious environmental benefits of reduced carbon emissions and the conservation of nonrenewable resources such as fossil fuels that could have been used, clean energy sources such as hydroelectric power, solar power, wind power, and biofuel have the long-term advantage of being more sustainable. According to Smith, during the industrial revolution, the burning of fossil fuels and deforestation has raised the carbon dioxide content in the atmosphere by 26%. As a result, including the usage of renewable energy sources into the design of a building will result in increased energy efficiency and a cleaner environment (Smith, 2005). Renewable and nonrenewable energy sources Renewable energy resources are those that can be harvested or grown at a rate that outpaces human consumption. By definition, using these materials is environmentally friendly. Two examples of renewable energy sources are the wind and the sun.

Currently, non-renewable energy use is mostly based on the use of fossil fuels as a source of energy. This energy is finite and is being used faster than it can be replenished. These types of energy are also a major source of greenhouse gas emissions (Jin Kim and Rigdon, 1998)

Water efficiency-Another advantage of ESBs is that they save water. Because water is a limited resource, attempts to conserve it are one method of recognizing ESBs. Water efficiency also implies a decrease in the CO₂ emissions that might have occurred during the water's generation, as well as a reduction in the need for chemicals required to treat drinkable water. Other water-saving strategies include recycling spent water in the building and utilizing rainwater. Water-saving measures, such as adopting systems that consume very little water, may also result in resource conservation (Towers, 2005). Treating wastewater and recycling it allows wastewater generated by buildings to be reused rather than being disposed away, hence reducing environmental pollution. Gray water, defined as wastewater other than toilet and food waste (Wudneh, 2009), is treated on-site or can be utilized for cleaning, irrigation, floor washing, vehicle washing, gardening, and building following treatment. "...Washing water can be gathered from sinks, washing machines, basins, bathtubs, and showers." It is then collected in a tank after passing through a basic filter to eliminate any big solid particles. Grey water is ideal for flushing toilets and may also be utilized for other reasons such as watering plants...." Towers (2005)

2.1.14. Environmentally Preferable Building Material

Another component of ESBs is the use of ecologically preferred building materials (EPBMs), which have comparatively low carbon emissions throughout the manufacturing process. Building construction consumes 40% of raw stone, gravel, and sand globally each year, and 25% of virgin wood raw materials (Lauren E. Abraham et al, 1996, p. 25), indicating how much a significant reduction in carbon emissions during production and transportation of these materials would mean to the environment. The life cycle design philosophy emphasizes recycling and reusing materials during demolition/deconstruction. This ensures lower carbon emissions and, as a result, a cleaner environment (Jin Kim and Rigdon, 1998).

Recycling-Recycling is defined as "resorting to utilizing materials that could have been disposed of"; in other words, it is resource conservation and preventing carbon emissions that may have occurred during extraction and manufacture. To ensure overall decreased carbon emissions and resource conservation, the use of recycled materials for building allows for the reuse of materials that would otherwise be discarded while also conserving energy and resources. Garbage recycling is one of 21 methods for putting waste generated by buildings to good use while also conserving resources and energy (Towers, 2005) the use of recyclable materials is one method for reducing carbon emissions from buildings by minimizing the carbon that would have been generated during resource extraction as well as manufacture. The utilization of recyclable construction materials repurposes demolished structures, cutting overall carbon emissions from buildings. (Rigdon and Jin Kim, 1998)

Waste reduction-Another advantage of ESBs is that resources are used effectively during construction, resulting in less waste. This is accomplished by the use of less packaging, the use of recycled materials, and the reuse of building materials and construction detritus on the construction site. These not only minimize trash, but also the necessity for landfills and the conservation of resources. Using prefabricated components is another approach for decreasing waste during the building of an ESB (Lauren E Abraham, et. al, 1996).

Indoor air quality-The interior air quality is influenced by the design, construction method, and building materials utilized. Aside from it, the building envelope, ventilation systems, maintenance, and occupants are controllable elements that contribute to improved indoor air quality (Lauren E. Abraham, et. al, 1996).

Optimization of operational and maintenances practices-The cost of operating and maintaining a structure during its life span far outweighs the cost of its construction and design (Lauren E Abraham, et. al, 1996). The ES of the building can only be protected if sustainable operation and maintenance techniques are followed. This necessitates training for building inhabitants, the use of clean items to ensure that no harmful materials are used that would harm the environment, indoor air quality, resource conservation, and reusing and recycling.

Green Areas -Trees provide a variety of advantages at a minimal cost, both in terms of decreasing the UHI impact and other environmental repercussions. Trees cool the city, cut energy costs, and prevent floods, erosion, and pollution. As a result, trees and plants in general are the most effective way of mitigating the UHI effect. Abof (2010) The plants' evaporation provides a cooling effect, and they act as a shade, preventing the urban surface from collecting heat. Abof et al. (2010) Green spaces are a natural approach to reducing greenhouse gas emissions and combating global warming. More vegetation implies we will be better equipped to absorb carbon; nevertheless, housing developments have the effect of damaging the natural environment, highlighting the necessity of green places such as greening space, vertical greening, and green roofs.

Vertical Greening-Vertical greening is the practice of restoring green space that has been lost due to the construction of buildings. The vegetation on and greening of a side of a building at the façade of each story is one way this may be done (Dr Johnny Wong Liang Heng, presentation) and can be used in a variety of ways, such as windbreaks, carbon dioxide absorbers, and oxygen generators. If properly incorporated into the building structure, it has the potential to significantly improve occupant comfort. Still, basic structural buildings might be utilized for some greening, and if it becomes a culture, the urban environment may be saved from becoming fully developed. Vegetation helps to moderate temperature and may be observed in both the building and the surrounding region, helping to lessen the urban heat island effect. There are three approaches to vertical greening structural design: Climbing plants with adventitious roots, Trellis system, and Modular system are all examples of climbing plants. When it comes to climbing plants with adventitious roots, the options are restricted to those that can maintain themselves on the wall. Plants climb trellis systems by twining on the curtail effect provided by wires linked to the wall.

The growing plants and irrigation system, which are part of the structure, are supported by the wall, which was designed specifically for the purpose in the modular system (Cheetham, 2012).

Green Roofs-Other than minimizing the heat absorption effect of the structure, turning the roofs of buildings into greening of open space for plants might help to counteract the impact the construction left on the natural environment. Extensive (six inches or shallower) and intense (more than 6 inches) vegetated roofs are the two varieties (U.S. Army corps of engineers, et, al, 2007).

2.2. Empirical Review

The Level at which Environmental Awareness Influences Environmental Sustainability of condominium housing projects in Addis Ababa Environmental education leads to environmental consciousness. The International Conference on Education, held in 1977 in Tbilisi, former USSR, and co-hosted by UNESCO and UNEP, was a watershed moment for environmental education on a global scale. Environmental awareness goals were characterized as: raising environmental awareness, imparting broad information for a fundamental grasp of the environment, gaining environmentally friendly attitudes and values, and developing new patterns of behavior toward the environment. "Education is crucial for supporting sustainable development and strengthening people's capacity to handle environmental and development challenges," according to Agenda 21, Chapter 36 on environmental education. Environmental education brings information, which provides data sources for monitoring real estate assets' environmental performance. Information can assist developers in making proper site selection for condominium housing projects, using environmentally friendly building materials, and adopting methods of making condominium houses environmentally sustainable, such as the use of renewable resources, recycling of water and waste, planting of trees around the premises, and many other things (Hoerisch, 2002).

2.2.1. The Influence of Socio-Economic Factors on the Environmental Sustainability of Addis Ababa Condominium Housing Projects

Socioeconomic variables, often known as socioeconomic status (SES), refer to the interaction between economic activities and social life. SES is defined by three indicators: financial resources or income, employment or occupation, and degree of education (Loomis, 2000). These metrics may be used to determine the environmental sustainability of condominium housing complexes as follows: Production and consumption have a link, according to basic economic theory. Financial resources or revenue are connected to production and consumption. The link is that the more the income, the greater the output and consumption possibilities. It is necessary to strive for sustainability in order to protect the environment. To conserve the environment, there is a need to aim for sustainability in consumption and production patterns, since they can limit the use of natural resources and carbon dioxide emissions, resulting in low carbon lifestyles and green economies in the long run. As a result, in order to address some of the environmental difficulties that we confront the global society must embrace more sustainable consumption and production

habits (Loomis, 2000). A greater understanding of the socioeconomic and behavioral variables driving unsustainable production and consumption is necessary to enhance Addis Ababa's environmental performance. Economic development, as measured by per capita national income, has an impact on environmental quality (Constantine& Martini, 2010). As the economy grows, so does environmental degradation. According to Yuksel, I. (2018). a number of variables vary monotonically with income and in different directions; for example, access to safe water, sanitation, clean energy such as solar panels, and sustainable building materials improve with economic growth, while CO2 emissions and waste generation deteriorate. Clearly, the richest nations' carbon emissions and resource consumption are continuing to rise above sustainable levels, but some emerging countries look to outperform developed ones in terms of environmental performance (Moran, 2008). As a result, economic expansion may not always be advantageous to environmental quality. Income dispersion, rather than average income levels, may be a key factor of environmental deterioration. Afroz, Keisuke, and (Irizarry, J. et al. (2012). performed a research to collect data on garbage creation, socioeconomic factors, and the desire of residential estate residents to separate waste. From 402 respondents in Dhaka City, it was determined that family size, income, environmental concern, and willingness to segregate garbage were the most influential variables influencing waste creation in homes. These aspects must be regulated in order to enhance waste management and prevent environmental deterioration in condominium residences.

One of the primary modern issues of our day is the difficulty in ensuring that natural resources are utilized, and trash is created at sustainable rates. Despite the fact that environmental sustainability was endorsed as one of the Millennium 25 Development Goals to be attained by 2015 in 2000, worldwide rates of consumption and waste generation were predicted to be at least 25% greater than the planet's capacity to produce resources and absorb trash. By 2007, this figure had risen to 50%. Social change through societal transformation is one method of achieving environmental sustainability. Spending is frequently associated with one's work. Those with profitable employment, for example, would likely to create more garbage and purchase high polluting costly automobiles to match their social position.

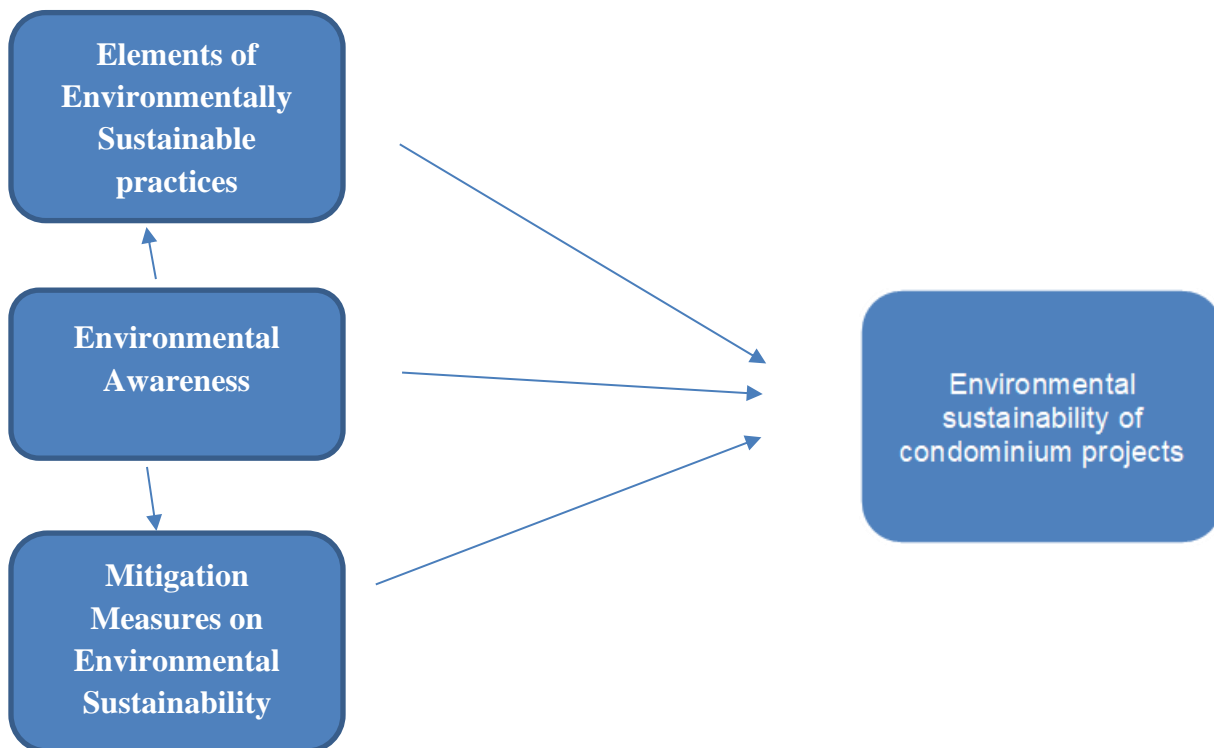
2.2.2. The Impact of Mitigation Measures on the Environmental Sustainability of Addis Ababa Condominium Housing Projects

Condominium housing developments have negative consequences such as displacement of current land uses and damage of ecologically sensitive regions. They can also endanger inhabitants by bringing dangerous circumstances such as air, water, and noise pollution, as well as excessive depletion of resources such as fuel or lumber, which diminishes forest cover, among other things. As a result, mitigating measures are implemented to ensure that condominium residences are environmentally sustainable. To maintain the environmental sustainability of condominium residences, several mitigating measures can be used. According to a research done by UN-Habitat (2012) concerning ecological housing in Setagaya-Ku Fukasawa in Tokyo, Japan, there were many

ecologically sustainable estate houses in 2007 in Japan with high levels of thermal insulation, solar collector for heating, and solar cells. There were also rainwater collecting systems built, wind turbines attached, heating and cooling technologies used, and the design was based on local wind patterns to allow for natural ventilation during the hot and humid summers. Green cover was also expanded by maintaining trees and erecting green rooftops, which worked as carbon sinks by balancing carbon dioxide through the carbon sequestration process. Some mitigating strategies that may be used to maintain the environmental sustainability of condominium residences are as follows: Another mitigating method that can improve the environmental sustainability of condominium residences is waste reduction, recycling, and reuse. A waste object or substance is one that has no utilitarian value to the person who owns it. It may contain any substance discharged, emitted, or deposited in sufficient volume in the environment to cause environmental change, whether liquid, solid, gaseous, or radioactive (Environmental Management and Coordination Act, 1999).

2.3. Conceptual Framework

To improve ecologically sustainable housing in Addis Ababa, it is proposed that factors such as environmental awareness, socioeconomic factors, and mitigation methods be reconsidered with the goal of striking a balance. As a consequence of this synthesis, there will be a greater understanding of environmental conservation concerns and mitigation methods while engaging in condominium home projects, a reduction in environmental deterioration, and an increase in sustainable real estate housing, to name a few outcomes.



3. REASERCH METHODOLOGY

CHAPTER THREE

3.1. Research Design

The researcher performed descriptive research to explore the perceived cause for condominium residences influencing environmental sustainability. As a result, the study took a descriptive survey research approach. This study used a cross-sectional survey design, in which questions on environmental problems were asked of several groups of people who differed in the variable of interest but shared other characteristics.

3.2. Research Method

3.2.1. Sampling Techniques, Target population and Sample Size

This study used nonprobability sampling technique because it is impossible to address all the population because of time and resource constraint. Purposive sampling was employed in this study instead of nonprobability sampling; the reason for this is that it can help pick the sample based on the study's goal. Three case study locations were chosen on purpose. They are the Sengatera Site, the Gerji Site and Megenagna site. The Sengatera Site is selected for several reasons. The site had been in use for roughly 8 years since inauguration at the time of the study. The Gerji Site located around Unity University and A lot of trees surround these buildings given them aesthetic qualities. The first qualities observed from this building are: it was clean on the outside and it is in a very suitable area close to markets, schools, transport and cafés. The Megenagna site is selected for the following reasons. Because it is the latest of the sites and therefore any environmentally sustainable building concepts considered and implemented by the government. The size of the sample was selected as representatively as possible to minimize sampling error. A minimum sample size of 100 respondents will be taken.

The minimum figure arrives at after considering the finances available for data collection and the length of time available to collect data. The thirty residents picked from each site were thought to be a enough sample because it was expected that most of them would have similar opinions regarding the condominiums. Contractors and government officials made up the remaining ten respondents.

3.2.2. Sources, Instruments and Procedures of Data collection

This study included both qualitative and quantitative data. The goal of quantitative is to use statistical procedures to quantify the investigative issue. Qualitative data, on the other hand, explained the phenomenon in a descriptive manner. To get qualitative and quantitative data, the study used both primary and secondary data sources. Primary data was collected using interviews and questionnaires because the researcher can collect precisely the information they want, and it

is fresh and first-hand information. The secondary source comprises the literature review, was collected by reviewing different research works and texts dealing with the environmentally sustainable building concepts in order to collect the required data the researcher used well-designed structure questionnaires.

The design of the questionnaire is prepared in simple and clear language to collect meaningful data from the respondent. On the form, there are both closed-ended and open-ended questions. In addition to closed and open-ended questions, the study used structured personal interviews to collect data from the five sites. The primary goal of employing personal interviews and questionnaires is to obtain detailed information, receive explanations, and increase the quality of information.

3.2.3. Data collection Technique

The data was analyzed using a hybrid technique of data analysis that comprised both qualitative and quantitative data analyses. The first stage in assessing the data was to summarize it with descriptive statistics, which is a type of quantitative analysis performed with SPSS. This enabled the researcher to meaningfully describe distribution of scores or measurements using a few statistics. Since the study involved research questions and objectives qualitative method of data analysis was also used to achieve this. All data that could not be quantified was subjected to qualitative analysis. This was done in a methodical manner in order to arrive at some beneficial insights and suggestions.

3.2.4. Validity of Data collection Instruments

Statistical validity also was used to measure the validity of the research though use of correct statistical procedure and instruments Neuman, (2007). The researcher was first tried to address related and extensive literature to have complete data on the research topics. This complete technique ensures the survey instrument's face and content validity. To construct survey questions, the researcher studied a significant amount of literature. The instrument and research method were also revised and comment by to professional advisor and expertise before going to data collection. Moreover, to ensure the statistical validity of the study, the researcher was collected quantitative data using survey questioner and analysis the data using correct statistical instruments like descriptive statistics, to see the link between the variables and get to a solid conclusion, use inferential statistics, correlation, and regression analysis.

Reliability is an indication of how consistent the findings are based on the method of data collection and analysis. The Cronbach alpha coefficient is the most frequent way for determining a scale's internal consistency for dependability (Hair, 1998). Scales with coefficient alpha between 0.6 and 0.7 suggest fair reliability, according to Zikmund (2010). The degree to which major characteristics of environmental sustainability practices are consistent. The result of the Cronbach's alpha laid in the acceptance range which is greater than 0.69

Reliability Statistics

Question	Cronbach's Alpha	N Of Items
Assessment of Environmental Sustainability Practice Question	.982	20

Source own survey 2022

3.2.5. Data Analysis

In this part of the paper, the researcher attempts to present the practically observed facts about the assessment of environmental sustainability practices data was collected from customers, workers on 40/60 condominium building, and by using tools mentioned in the methodology part of chapter three. For this purpose, the researcher distributed questionnaires to 100, Respondents from which 70 of the questionnaires were filled and returned to the researcher for analysis. This chapter presents and analyzes the information received from the questionnaire. After the required data had been collected, coded, processed, analyzed, and interpreted, the data was supplied. The analysis and the interpretation were carried out based on the data collected through questionnaire and from employee Instruments that used to present data are tools like tables, percent and charts and figure are for data presentation purpose as discussed below.

4. RESULT AND CONCLUSION

CHAPTER FOUR

4.1. Introduction

The main objective of this study was to assessment of environmental sustainability practices in the case of Addis Ababa 40/60condomnum building this regard, this chapter presents the results and findings of the study as collected from the sample population. The information was simply gathered using a questionnaire as a research technique. The questionnaire was designed with the study's objectives in mind. To enhance quality of data obtained, Likert-type questions were included whereby respondents indicated the level of agreement to which the variables were practiced in a five-point Likert scale. Coded replies were entered into the Statistical Package for the Social Sciences (SPSS) version 16 application for data analysis. The data have been presented by tabulation, and some figures. The chapter covers respondents' general information based on demographic information and findings based on how the research questions/objectives the and results are presented and discussed.

4.2. Characteristics of the Respondent

In this section, the demographic information and characteristics of the study's respondents were provided. The respondents' age, level of education, employment terms, and work specialization are among these criteria. Table 1 shows the demographics of the subcontractor employees, whereas Table 2 shows the demographics of the study participants from the area.

Table 4.1: Demographic Information of the Workers

Characteristic	Categories	Frequency	%
Age	18-30	24	34.2
	31-40	31	44
	41-50	11	15.7
	Above 50	4	5
Level of Education	Secondary school	22	31
	Elementary	17	24
	Diploma	21	30

	Degree,	9	12
Terms of employment	Permanent	30	42.9
	Contractual	40	57.1
Work	Skilled	40	57.7
Specialization	Unskilled	30	40.8

Source: own survey (2022)

The most of the workers were under the age of twenty. The energy-intensive nature of building site operations could be one reason for this. In terms of education, it was established that 39 had no formal education, 21 had diploma Primary level of education, 22 (31%) had a secondary education and 22 (31%) had a primary education. As a result, the majority of those interviewed had completed the required formal education to understand sustainable environmental sustainability practices. This justifies the use of self-completion surveys because the majority of people were able to fill them out correctly.

The large number of people with at least a primary education could be due to the project's location, which has a lot of schools. Institutions are sparse and far between, with the nearest being. This, together with social apathy toward practical training, may account for the low number of tertiary education graduates. In terms of employment, some of the research participants stated that they were employed full-time or on a permanent basis, while others stated that they were employed on a contract basis and did not disclose. A survey of the Project workers' work specialization revealed that 40 were skilled and 30 were unskilled. These findings could be attributed to the fact that most construction professions are considered entry-level jobs in several developing countries, according to Geneva ILO News (2001).

Table 4.2: Demographic Information of the Workers

Assessment of Environmental Sustainability Practice			
Question	n	mean	std. deviation
project is designed to promote environmental sustainability	70	3.56	0.735
project is designed to contribute significantly to fight climate change	70	3.91	0.756
project has designed and actively implemented environmental sustainability	70	3.83	0.538
project actively implement action to reduce rate of injuries occupational disease and work-related facilities among its workers	70	3.96	0.788

project is designed actively promote workers as well as general social health on safety	70	4.16	0.629
project waste and emission management system are designed to contribute minimal impact on the environment	70	4.04	0.842
project employees have been trained on waste minimization ice reduce, reuse or recycle waste	70	3.61	0.767
project management system is designed to maximize on sustainable water use and conservation	70	3.81	0.804
project employee and manager have been trained on waiter efficiency and sustainable	70	3.64	0.743
project employees have been trained on energy efficiency and sustainable energy	70	4.29	0.684
project uses green energy to power activates	70	4.27	0.679
project employees have been trained on reduction of noise emission	70	3.99	0.752
project takes constant steps to reduce natural resource extraction (stone, brick, sand, timber, roofing)	70	4.4	0.522
project have effectively communicated its sustainability massage to all stakeholder including employee investor, regulate or, community and other environmental sustainability interest	70	4.17	0.851
lack of commitment by management is a challenging factor in implementation of environmental sustainability practice	70	3.97	0.78
worker have regular training on implementation of environmental sustainability practice	70	3.84	0.754
there is enough support from local authorities controlling to successful implementation of environmental sustainability practice	70	3.89	0.808
in adequate punitive measure by the government is challenging factor to wards compliance to rule and regulation in environmental practice	70	3.9	0.801
project aims at leaving only a minor footprint on the environment	70	3.34	1.062
project uses green energy to power activities	70	3.61	0.767
Valid N (listwise)	70		

Source own survey 2022

4.3. Environmental Management Practices at Condominium Building Project Site

The goal of this section of the study was to assess the environmental management measures employed at the construction site. Natural resource exploitation, energy use and conservation, water use and conservation, wastes and emissions, and health, safety, and environmental responsibility are all discussed.

4.4. Natural Resource Extraction

The researcher sought to discover if the project takes frequent steps to reduce natural resource extraction from the environment (stone/brick, sand, lumber, cement, metal, etc.). The results in Table show that the mean was 4.44 and the standard deviation was .555, and the participants were unsure. According to the data, sub-contractor workers' perceptions point to a lack of effective steps to reduce resource exploitation from nature. This demonstrates that subcontractor workers believe Project's natural resource extraction does not seek to leave only a modest environmental footprint. This indicates that there are concerns about the influence of natural resource extraction on the environment. The Project did not make the necessary measures to reduce natural resource extraction, according to the findings. In addition, the project did not appear to be striving for a low environmental impact. The lack of worker participation in the planning or budgeting for raw materials could be linked to the strongly disputed conclusion that natural resource extraction by condominium developments is intended to have minimal environmental impact. Despite the high cost of raw materials, the workers did not attribute the "need to use resources efficiently" in order to avert natural resource depletion. They also didn't believe that mining these resources would have a negative impact on the environment. Following up on his observations, the researcher discovered several environmental techniques in use on the property.

4.5. Energy use and Conservation

The purpose of the study was to see how energy was utilized and conserved at the condominium project construction site, as well as if personnel were instructed on energy efficiency and sustainable energy use. Employees on the project have been taught in energy efficiency and sustainable energy. Discussions with contractors revealed that some of the contractors utilize low-carbon fuel and more energy-efficient machines and vehicles. Contractors also made sure that their plants and generators were serviced as often as possible. This was, however, the topic of a scientific expert opinion to determine the efficacy and credibility of the claims, particularly considering the perception that the fossil fuel on the market is contaminated and contains a high Sulfur content.

The fact that workers had not seen any green energy sources on site, such as solar panels, could explain the large percentage of respondents who strongly disagreed that project workers had been trained on energy efficiency and sustainable energy use. The finding could be due to the study's

focus on the construction of infrastructure, such as roads, which required the installation of water supply features and wastewater connections but did not require electricity, as opposed to the construction of buildings that are connected to the electric grid.

4.6. Water use and Conservation

Water use and conservation is another significant part of environmental sustainability practices that the researcher wished to study. The researchers wanted to determine if construction workers were taught about water efficiency and sustainable water use, and if the water management system was designed to maximize sustainable water use and conservation. According to the observation, water is used for mixing raw materials such as cement and sand, as shown in the plate, sprinkling of working areas to control dust, as shown in the plate, and for humans.

According to the strategic environmental assessment study and the Environmental Impact Assessment, management is interested in treating grey water for landscaping. There was, however, little evidence of a master plan for future water use and conservation. Because there were already boreholes on site at the time of the study, there was no shortage of water for construction and domestic needs, the high number of respondents who strongly disagreed that project employees and managers had been trained on efficiency and sustainable water use could be due to the fact that, at the time of the study, there were already boreholes on site and thus no shortage of water for construction and domestic needs. As a result, management and contractors were uninterested in properly training employees on how to conserve water. Rainwater harvesting was also recorded in numerous localities.

4.7. Waste and Emission Management

The trash and emission management at the building site was also evaluated as an environmental sustainability practice by the researcher. When asked if project staff had been instructed on waste minimization, such as how to minimize, reuse, or recycle waste, the mean average was 4.4 with a standard deviation of. 842 people disagreed. This demonstrated a notion that the project team's waste minimization skills are insufficient. Employees have been trained in noise reduction, and the project's waste and emissions management system is designed to have a low environmental impact. The fact that project employees had not been taught on waste minimization, i.e. reduce, reuse, or recycle garbage, could explain the large percentage of respondents who strongly disagreed.

4.8. Health, Safety and Environmental Responsibility

As a result, the study came to the conclusion that the project is not intended to improve environmental sustainability. The following results were discovered when Project was questioned if it has designed and actively implemented environmental sustainability standards. The majority of Project personnel were both unsure and disagreed that the project was planned to make a

significant contribution to combating climate change. The survey went on to question if the Project's sustainability message has been effectively communicated to all/most stakeholders, including employees, investors, regulators, the local community, and other environmental sustainability interest groups. Because the term "climate change" is too technical for them, a large percentage of respondents were unsure whether the Project is designed to contribute significantly to combating climate change.

4.9. Communication on Sustainability Efforts

On whether the Project's environmental sustainability message was effectively communicated to all/most stakeholders, including employees, investors, regulators, the surrounding community, and other environmental sustainability-interested parties. The majority of project managers were unsure if the efforts effectively communicated the sustainability message to all stakeholders, including employees, investors, regulators, the local community, and other environmental sustainability interest organizations.

4.10. Community Suggestions to Improve Environmental Sustainability

Members of the public were requested to offer comments on how the building industry may improve its environmental sustainability. The youth should be encouraged to develop tree nurseries, according to the respondents. They also recommended that water management systems be upgraded, that the community be assisted with rainwater collecting, that the community be trained on garbage disposal, and that solar lights be improved for increased security.

This demonstrates that the community is concerned about the environmental implications of development initiatives. that assesses the environmental impact of construction.

4.10.1. Challenges in Implementing Environmental Sustainability Practices

This part looked at the difficulties that were encountered when applying environmental principles on a condominium construction site. The obstacles that construction workers face in applying environmental sustainability strategies were polled. The construction employees were asked if the lack of commitment from management was a stumbling block to implementing environmental sustainability standards. The lack of commitment of management, as seen in the table above, is a limiting factor in implementing environmental sustainability policies. As a result, it's likely that environmental sustainability policies aren't being implemented properly.

Although it was evident that management was aware of sustainable environmental practices when a major change was introduced, it was also clear that employees had a different perspective. The fact that management had not emphasized the importance of hiring a NEMA-approved waste

collector could explain why a large majority of respondents considered management was unwilling to engage in environmental sustainability activities.

The investigation in the table above revealed that a lack of management commitment is a hard issue in implementing environmental sustainability strategies. As a result, it's likely that environmental sustainability policies aren't being implemented properly.

In such a study, management's lack of commitment to environmental sustainability policies was discovered. They figured out how to bring out proof of a lack of management commitment. When there is insufficient training on effective environmental sustainability procedures, top leaders are said to have weak environmental sustainability awareness. Failure of management to hire qualified trained workers, a lack of motivation to invest in novel safety technology, and a poorly structured information distribution system. Although the management was clearly aware of environmental sustainability practices as it carried out a change of user, environmental sustainability practices could be ascribed to the fact that the management had not highlighted the necessity to hire a NEMA registered waste collector procedures.

According to the findings, the construction site management did not successfully commit to implementing environmental sustainability principles. This is in line with the findings of (2012), who found several instances of environmental disrespect at building sites due to the most fundamental and elementary environmental measures.

4.10.2. Workers Regular Training

The study also wanted to know if employees are regularly trained on environmental sustainability techniques, and it came to the conclusion that such training is unlikely to exist. There are no toolbox meetings to train workers or develop awareness of environmental sustainability practices, demonstrating that this is the case.

4.10.3. Support from Government

The respondents were asked if government agencies at the county level (local governments) provide enough support for the adoption of environmental sustainability policies. "Another issue we have is political meddling, lack of willingness by contractors to comply with regulations," the officer added. "Another difficulty we face is zoning dynamics, in which land use changes have a negative influence on the environment," the officer continued. As a result of a successful change of user, way leaves, riparian and open places have been encroached upon."

The findings demonstrate that there were few inspections due to the constraints faced by enforcing agencies, such as a lack of enough money, trustworthy data on all building, and adequate skilled employees. As a result, central and local government help for the application of environmental sustainability principles has been minimal. This is in line with Muiruri (2012), who found that despite the fact that there are enough environmental sustainability rules and laws in place in the

construction business, there is little or no enforcement. This could be due to a lack of clearly defined supervision authority or a developer's unwillingness to follow the guidelines. Challenges to Compliance with National Rules and Regulations in Environmental Practices, this section of the research looked on the difficulties of complying with environmental statutes, rules, and regulations.

4.10.4. Inadequate punitive Measures by the Government

Inadequate punitive measures by the government are a stumbling block to compliance with environmental rules and regulations. The researcher discovers that insufficient disciplinary measures by the government are a challenging factor towards adherence to rules and regulations in environmental practices in an attempt to determine the problems that inhibit compliance with rules and regulations in environmental practices.

"Whenever there is a non-compliance situation, the agency takes multiple punitive steps," the officer remarked during a meeting. Improvement notices and restoration orders may be issued by the court to the developer or contractor." According to government officials, suitable laws have been enacted, as well as a number of disciplinary measures. This is in agreement with Muiruri (2012), who stated that the building industry has enough environmental sustainability criteria set out in law.

5. SUMMARY OF FINDINGS, CONCLUSION & RECOMMENDATION

CHAPTER 5

5.1. Introduction

The findings, conclusions, and recommendations of the study, as well as the study's limitations and future research directions, are summarized in this chapter. Based on the primary findings and outcomes, conclusions and recommendations were generated. One of the recommendations was to conduct a review of environmental sustainability practices.

5.2. Summary of Findings

The first goal was to put in place environmental sustainability strategies at the 40/60 condominium project. On the subject of natural resource extraction, the condominium project was deemed to have taken insufficient steps to decrease natural resource extraction. It was also discovered that the water usage and conservation system in existence was insufficient, as there was no water management system in place to maximize sustainable water use and conservation. Another important topic that the researcher wanted to learn more about was waste minimization. The findings demonstrated that the project's staff lacked sufficient waste management knowledge. Workers have not been given any training in terms of cost-cutting methods. The findings on worker happiness and overall social health and safety suggest that the project has not taken proactive steps to lower accident, occupational disease, and death rates among its employees. This could also be the reason why a large portion of the public is unaware of the project.

As a result, the project was considered to have taken no steps to protect its personnel from occupational hazards. Overall, the project was deemed to not be designed to promote environmental sustainability since it lacked a planned and actively implemented environmental sustainability criteria. Employees, investors, regulators, the local community, and other environmental sustainability interest groups were all poorly informed on the company's environmental sustainability message. This proves that Project was never meant to make a meaningful contribution to the fight against climate change.

The goal of this study was to determine what barriers exist in the implementation of sound environmental practices on construction sites. The lack of commitment on the part of management was identified by the majority of responders as a difficult aspect. Inadequate worker training on effective environmental sustainability processes has also been recognized as a barrier to the implementation of environmental sustainability practices. Another issue raised was the lack of cooperation from local authorities, as well as corruption and the perception of increasing building costs. To identify obstacles to environmental practice compliance with statutes, rules, and

regulations. It was discovered that the government's insufficient punitive measures were a barrier to compliance with environmental norms and regulations.

5.3. Conclusion

The following were the main conclusions and recommendations of the study.

Natural resource extraction is taken for granted, according to environmental management procedures at the condominium project site. Workers believe that natural resources such as lumber, cement, gravel, soil, and water are plentiful and will not be depleted in the near future. The management, on the other hand, was perceived to be environmentally conscious. The contractors appear to be environmentally conscious as well. This is based on observations made on the ground, which revealed some of the site's sustainability initiatives. However, the project did not aggressively promote worker(s) health and safety, as well as societal health and safety in general.

The study also found that implementing sound environmental practices was hampered by a number of obstacles. Lack of management commitment, insufficient worker training on effective environmental sustainability measures, and insufficient backing from local authorities are just a few of the issues. A fundamental obstacle that prevented successful implementation of sound environmental practices was the perception of increasing building costs.

The study also showed that environmental practices posed problems in terms of complying with statutes, rules, and regulations. One of the issues is the government's lack of punitive measures to ensure compliance with environmental rules and regulations. The actions, according to the respondents, were not harsh enough to increase compliance.

5.4. Recommendation

The following are recommendations of the study:

To Contractors, - On-site implementation of the following environmental sustainability initiatives is recommended. To avoid pileups, make every effort to recycle and reuse construction waste as much as possible, and make sure that all non-recyclable garbage is removed from the site as soon as possible and properly disposed of in permitted disposal areas. Hiring a waste collector is one way to accomplish this. Contractors should make sure that building material requirements are properly assessed to avoid waste from leftovers. To reduce the need for replacement, materials should be long-lasting. To reduce wasting in building activities, there should be measures in place to instruct personnel on how to use water efficiently.

Energy conservation and utilization should be emphasized on the job site by maintaining equipment and machinery according to manufacturer specifications and ensuring that it is serviced on a regular basis. Ascertain that staff are well-versed in environmentally sustainable procedures.

Workers should have regular meetings before and after work to remind them of the importance of environmental sustainability at all phases of their jobs.

Contractors should aim to comply with all other relevant regulations governing health and safety at work in terms of health, safety, and environmental responsibility. A well-developed and implemented site-specific Emergency Response Plan should be in place, and all staff on site should be familiar with its processes. To limit noise generation, hooding should be used to shield the equipment and as much as practicable, equipment should be equipped with noise abatement devices. Contractors should go even farther to verify that rated equipment is used in welding and related tasks to reduce noise on the job site.

Project Management/Proponent - Management and contractors should ensure that a rainwater harvesting system is in place, with enough storage tanks and retention facilities for household and construction usage, in order to reduce water consumption and conserve water. Information on energy conservation should be carefully conveyed from top management and contractors to workers to ensure low idling of machinery and little waste burning on site. It is important that management commit to environmental sustainability practices in order for them to be implemented effectively. Commitment can be demonstrated by enlisting the help of trained professionals such as environmental experts.

Government lead agencies- Municipal authorities should assist construction sites in implementing environmentally sustainable methods. The government is being urged to provide adequate resources to the main agencies in order for them to conduct frequent inspections. The general public, as well as developers in particular, should be made aware that efforts to adopt environmental sustainability are worthwhile and helpful to all, and that this is something that should not be neglected. Despite the added cost, the green rating will benefit the developers. This usually has a cascade effect, increasing property preference among potential buyers and so increasing the property's value. It is recommended that laws breakers and government officials who are found corrupt be punished in order to encourage compliance with environmental regulations.

Neighborhood Community- Residents should ensure that construction projects adhere to and apply sustainable environmental standards in order to improve societal health and safety. People in the neighborhood should be aware that bad environmental practices on building sites might have a negative impact on them or put them in danger.

5.5. Further Research

For several areas of natural resource extraction, pollution, and emissions, a more competent expert judgment is required. The perceptions of study participants were more important in the investigation. A competent opinion based on considerable statistics should be utilized to establish the real amount of natural resources taken and consumed at a specific construction site. By doing

this, we can establish how much pollution and emissions are actually being discharged from construction sites.

References

- Abdul-Rahman, H. et al. (2016). Integrating and Ranking Sustainability Criteria for Housing. *Engineering Sustainability*
- Adetunji, I., Price, A., Fleming, P. and Kemp, P. (2003), Sustainability and the UK construction industry: a Review, Proceedings of the Institute of Civil Engineers, *Engineering Sustainability*
- Araujo, I. P. S., Costa, D. B. and Moraes, R. J. B. (2014). Identification and Characterization of Particulate Matter Concentrations at Construction Jobsites. *Sustainability*
- Berge, B. (2009). *The Ecology of Building Materials*. (2nd. ed.). Oxford: Architectural Press.
- Bernard, H. R., & Bernard, H. R. (2012). Social research methods: Qualitative and Quantitative. Oxford University Press
- Building Research Establishment Environmental Assessment Method, (2019). A Supplementary Dictionary of Renewable Energy and Sustainability. Oxford University Press
- Catherine, M. B. T., Douglas, M. O., & Were, M. E. (2017), *Relationship between Human Resource Management Practices and Performance of Private Security Firms in Kenya: A case of Private Security Firms in Kitui County*.
- Chinese University of HongKong (2013). Environmental Guidelines for Construction Sites. University press
- Cooper, D. R., & Schindler, P. S. (2011). *Business Research Methods*. (11th ed). NeYork: McGraw Hill International Edition.
- Evans, J. R. & Lindsay, W. M. (2011). *The Management and Control of Quality*. Canada, South Western Cengage Learning.
- Garzone2006). A Methodology for Predicting the Severity of Environmental impacts Related to the Construction Process of Residential Buildings. *Building and*
- Gangoells, M. et al. (2011). Assessing Concerns of Interested Parties When Predicting the Significance of Environmental Impacts Related to the Construction Process of Residential Buildings. *Building and Environment*,.
- Gangoells, M. et al. (2013). Model for Enhancing Integrated Identification, Assessment and Operational Control of On-Site Environmental Impacts and Health and Safety Risks in Construction Firms. *Journal of Construction Engineering and Management*,
- Gangoells, M. et al. (2014). Analysis of the Implementation of Effective Waste Management Practices in Construction Projects and Sites. *Resources, Conservation and Recycling*, 93(12), 99-111.

- Gichamba, S. & Kithinji, C. (2019). Influence of environmental regulations in the performance of construction projects in Nairobi County, Kenya. *International Academic Journal of Information Sciences and Project Management*, 3(4), 184- 209.
- Hassan, S.A., (2012). *Health, safety and environmental practices in the construction sector of Pakistan*. Master's Thesis, Uppsala University, Sweden.
- Huang L, Krigsvoll G, Johansen F, Liu Y, Zhang X (2017) Carbon emission of global construction sector. *Renew Sustain Energy Rev*. doi: 10.1016/j.rser.2017.06.001
- Junnila and Horvath (2003), Management of Safety for Quality Construction. *Journal of Sustainable Development*.
- Irizarry, J. *et al.* (2012). The Development of Sustainable: construction planning system. *Journal of Information Technology in Construction*
- Ivaskova, M. *et al.* (2015). Air pollution as an important factor in construction materials deterioration in Slovak Republic, *Procedia Engineering* 108 131 – 138
- Kemei, R.K., Kaluli, J.W., & Kabubo, C.K. (2015). Assessment of Occupational Safety and Health in Construction Sites in Nairobi County, Kenya. *Sustainable Materials Research and Technology Centre, JKUAT*
- Kilbert, C. J. (2012). *Sustainable Construction: Green Building Design and Deliver*. London: John Wiley and Sons.
- Kim, S. S. *et al.* (2005). Development of a Housing Performance Evaluation Model for Multi-Family Residential Buildings in Korea. *Building and Environment*, 40(8), 1103-1116.
- Kukadia, V.; Upton, S. and Hall, D. (2003). Control of Dust from Construction and Demolition Activities. London: BRE, DTI, UK.
- Lamet, P. T. I. *et al.* (2009). Factors affecting the implementation of green specifications in construction. *Journal of Environmental Management* 91(3), 654-61
- Leiper, Q., Fagan, N., Engstrom, S. and Fenn, G (2003), A strategy for sustainability, *Proceedings of the Institution of Civil Engineers, Engineering Sustainability* 156, Issue ES1, pp. 59–66.
- Lyndsay, S. (2013). *Phillip Crosby: Zero Defects and Right First Time*. Retrieved from <http://www.agiledevelopment.org/agile-talk/zero-defects-in-software-development>
- Mahamadu, A., Baffour Awuah, K. and Booth, C. (2016). Principles of sustainability and life-cycle-analysis. In: Khatib, J. (Ed) *Sustainability of construction materials* (2nd Edn.). Elsevier.

Menard, S., (2012). An examination on the waste management practices in the local construction site..

Njoroge, P. C. (2013). *A Study of Effectiveness of Regulatory Framework in Construction Industry in Promoting Sustainability: A Case Study of Nairobi County*. Unpublished Research Thesis, University of Nairobi, Kenya.

Occupational Safety and Health Administration (2005). OSHA Pocket Guide
Occupational Safety and Health Administration.

Opoku, A. and Fortune, C. (2013), *The International Journal of Sustainability Policy and Practice: Implementation of sustainable practices in UK construction organizations: drivers and challenges*. Common Ground Publishing. University of Illinois Research Park

Press, 2006) Sustainable Construction Sites in Tanzania: Contractors' Practices and

Their Perspectives. School of Architecture, Construction Economics and Management, Ardhi University, Dar es Salaam, Tanzania. Scientific & Academic Publishing

Pitt, M., Tucker, M., Riley, M. and Longden, J. (2009), Towards Sustainable Construction: Promotion and best Practice. *Construction Innovation*, 9 (2), 201– 224.

Probert, A. J. *et al.* (2010). Accounting for the Life Cycle Carbon Emissions of New Dwellings in the UK. In: International Conference on Non-Conventional Materials and Technologies, 12., Cairo, 2010. *Proceedings...* Cairo.

Pulaski, M. H. (2004). Field Guide for Sustainable Construction. Washington: Pentagon Renovation and Construction Program Office. Quantitative approaches. Sage.

Parseal (2009). *Construction health and safety in South Africa: Status and recommendations*. CIDB report.

Sodagar, B. and Fieldson, R. (2008), Towards a sustainable construction practice. *Construction Information Quarterly*, 10, 101–108.

Towers 2005 Environmental Performance Measurement Indicators in Construction. *Building and Environment*, v. 41, n. 2, p. 164-173.

Thomas, H.R., Smithe, G.R., Mellot, R.E., (1994). *Interpretation of construction contracts*.

Thomas, N. I. R and Costa, D. B, (2017). Adoption of Environmental Practices on Construction Sites. *Ambient. Construction*. vol.17 no.4 Porto Alegre Oct.

Wudneh, 2009 *Declaration on Environment and Development*, Rio De Janeiro Brazil

United States Green Building Council (2009). *Leadership in Energy and Environmental Design for New Buildings and Major Renovations Rating System*. San Francisco.

Watson, G. H. (2005). Timeless Wisdom from Crosby. *Quality Progress*. June, 64 – 67.

Waylen C, Thornback J and Garrett.J (2011). *WATER: An Action Plan for reducing water usage on construction sites*.UK Publisher

Yudelson) (2007).). Sustainable methods for waste management in construction, *Innovation information, process Management*

Vukotic (2010). Analysis of the Causality Links between the Growth of the Construction Industry and the Growth of the Nigerian Economy

Yuksel, I. (2018). Blast-furnace slag. *In Waste and Supplementary Cementitious Materials in Concrete*; Siddique, R., Cachim, P., Eds.; Elsevier Science:

Zhou, L. and Lowe D. J. (2003), Economic Challenges of Sustainable Construction, In: Proverbs, D. (Ed) *Proceedings of the RICS Foundation Construction and Building Research Conference (COBRA 2003)*, 1–2 September 2003, Wolverhampton-UK, The RICS Foundation

Appendix A
St. Mary's University
School of Graduate Studies
M.A in Project Management
Questionnaire Survey

**“Assessment of Environmental Sustainability Practices the case of 40/60
Condominium in Addis Ababa”.**

By Eyob Tesfaye

Greetings, this questionnaire is prepared to carry out a study in the partial fulfillment of a Master's Degree in Project management (MBA) program entitled with **“Assessment of Environmental Sustainability Practices the case of 40/60 Condominium in Addis Ababa”** of ST. MARY'S UNIVERSITY. The information collected through this questionnaire will be treated confidentially and used for educational purposes only. There is no need to write your name or address and the accuracy, genuineness and fairness of your response will have a great impact on the outcome of the research.

Thank you in advance for your participation in this endeavor.

If you have any question concerning the questionnaire, please contact me

Sincerely,

Eyob Tesfaye

eyob14897@gmail.com

+251911536368

Part I

Dear respondent, in this part of your questionnaire, you are only required to give information about your personal background.

General information

1. Age of respondent

Below 20 years _____ 20-30 years _____ 31- 40_____ Above 40 years_____

2. Indicate level of education reached

Diploma _____ Degree _____ Master’s Degree _____ PhD _____

3. What is your type of employment at this construction site? Permanent/Full-Time

Contractual _____ Other (specify) _____

4. What is your area of work specialization?

Skilled _____ Unskilled _____

Part II

Please rank the **Assessment of Environmental Sustainability Practices** below in what you consider to be encountered in a project based on the frequency of occurrence.

Please indicate on the boxes using the following criteria. **Strongly agree (5), Agree(4), Neutral(3), Disagree(2), Strongly disagree(1)**

	Assessment of Environmental Sustainability Practices related question	Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)	
1	Project is designed to promote environmental sustainability						
2	Project is designed to contribute significantly to fight climate change						
3	Project has designed and actively implemented environmental sustainability.						

4	Project actively Implement action to reduce rate of injuries occupational disease and work-related facilities among its workers						
5	Project is designed actively promote workers as well as general social health on safety						
6	Project waste and emission management system is designed to contribute minimal impact on the environment						
7	Project employee have been trained on waste minimization ice reduce, reuse or recycle waste.						
8	Project management system is designed to maximize on sustainable water use and conservation						
9	Project employee and manager have been trained on waiter efficiency and sustainable water use.						
10	Project employee have been trained on energy efficiency and sustainable energy						
11	Project uses green energy to power activates						
12	Project employee have been trained on reduction of noise emission						
13	Project takes constant steps to reduce natural resource extraction (stone, brick, sand timber ,roofing)						

14	Project have effectively communicated its sustainability message to all stakeholder including employee investor ,regulate or, community and other environmental sustainability interest						
15	Lack of commitment by management is a challenging factor in implementation of environmental sustainability practice						
16	Worker have regular training on implementation of environmental sustainability practice						
17	There is enough support from local authorities controlling to successful implementation of environmental sustainability practice						
18	In adequate punitive measure by the government is challenging factor to wards compliance to rule and regulation in environmental practice						
19	Project aims at leaving only a minor footprint on the environment						
20	project uses green energy to power activities						

Part III

Interview questions

1. How often do you conduct inspection / compliance audits in the construction sector?
2. What is the rate of compliance to construction regulations regarding environmental sustainability?
3. What are your penalties for non-compliance to laws and regulations?
4. What are your future proposals for an enhanced sustainable development of the construction industry?
5. Is there convergence of the different institution mandate towards achieving a common objective and unity of purpose for the betterment of the construction industry?
6. Were you given trainings or guidelines on how you conserve energy and resources before you started living in the condominium buildings?