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ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY

GRADUATE PROGRAM IN MBA CONSTRUCTION MANAGEMENT

FACTORS AFFECTING SUSTAINABLE BUILDING PROJECTS: THE CASE OF ADDIS KETEMA SUB CITY

BY: Kiflom Haile

Advisor: Reta Megersa (Ph.D)

A Thesis submitted to the School of Graduate Studies of Addis Ababa Science & Technology University in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration (MBA) in Construction Management

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June 2022

Addis Ababa

Declaration

I declare that this thesis entitled "**ASSESSMENT OF FACTORS AFFECTING SUSTAINABLE BUILDING PROJECTS: THE CASE OF ADDIS KETEMA SUB CITY**" is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged.

Candidate:

Name: Kiflom Haile

Signature: _____

Acknowledgement

First of all I would like to thank the Almighty God, who gave me the commitment and tolerance to pass various obstacles and come up to the accomplishment of this thesis.
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consultants and clients (project owners) who sacrificed their time in filling the questionnaires.

Abstract

The objective of this research was to investigate factors affecting the development of sustainable building projects in Addis Ababa focusing on Addis Ketema Sub-city. To achieve this purpose, descriptive and explanatory research method were applied. In terms of approach, the study has utilized quantitative and qualitative research approach. Out of the total 328 (consisting of client, Addis Ketema Sub-city staffs, contractor and consultant) 180 of them were using purposive sampling technique. Accordingly, primary data was collected from 156(90.2%) respondents through questionnaires and interview with key informants. Data were also collected from secondary sources. Then the collected data was analyzed using quantitative and qualitative methods of analysis. The findings of the study discover, the adoption and implementation of sustainable building in the study area are influenced by political and socio-economic barriers, financial and economic factors, technological barriers, material factors and environmental related factors. The finding of the study also verified that the adoption of sustainable building could brought about Cost efficiency, sociocultural benefit, Safety and human adaptation, and environmental benefits. Finally this study recommend that, creating awareness of stakeholders concerning the benefit of sustainable building. Besides the government, it is suggested that other private financial institutions should provide financial incentives to promote companies interested in sustainable building construction and to minimize higher investment costs, the construction of sustainable buildings can be achieved by using locally available innovative materials. Ministry of construction is also recommended to formulate appropriate strategies that stimulate the construction of sustainable buildings. The organization of an independent institution is suggested that recognizes and certify sustainable buildings, and finally the adoption of green building certificate is also another recommended strategy to be implemented

Key Word: Sustainable/green building, political, social, financial, economic, technological, material barriers and environmental factors

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Acronyms

CSA Central Statistical Agency

GABC Global Alliance for Buildings and Construction

OECD Organization for Economic Co-operation and Development

UNU-WEH United Nations University Institute for Water, Environment and Health

SPSS Statistical Package for Social Science

HAPTER ONE

Introduction

This chapter covers the background of the study and research problem, statement of the problem, objectives of the study, research questions, significance and scope as well as organization of the study

1.1 Background of the Study

The construction industry is vital for the development of any nation. In many ways, the pace of the economic growth of any nation can be measured by the development of physical infrastructures, such as buildings, roads and bridges. According to Smith (2012), Construction project development involves numerous parties, various processes, different phases and stages of work and a great deal of input from both the public and private sectors, with the major aim being to bring the project to a successful conclusion.

According to Global Alliance for Buildings and Construction (GABC) reports of 2020, buildings on their own account for one sixth of world's fresh water withdrawals, one quarter of its wood harvest and two thirds of its material and energy flows. Their structures impacts on areas beyond their immediate locations affecting water sheds, air quality, transport patterns of communication among other things (GABC, 2020). In response to these impacts, there is growing consensus among organizations committed to environmental performance targets that appropriate strategies are needed to make building activities more sustainable (Kibert, C.J., 2016). There is an increasing recognition that buildings cannot be designed without consideration for their social impact on the environment (John et al., 2005).

The idea of sustainability involves enhancing the quality of life, thus allowing people to live in a healthy environment, with improved social, economic and environmental conditions (Ortiz, O.et.al. 2009). Sustainable buildings are Green buildings that are marketed as economical, resource efficient and environmentally friendly compared to

the convectional buildings. Kibert, C.J., (2016), defined a green building as a high performance property that reduces its impact on the environment and humans throughout its life cycle. It also refer to a structure using a process that is environmentally responsible and resource efficient throughout a building's life-cycle from sitting to design, construction, operation, maintenance, renovation, and demolition.

In Ethiopia and particularly in Addis Ababa just like any other African city, intense development pressure and rapid urbanization has led to exponential growth of building operations. However, globalization has influenced the characters of Addis Ababa's buildings. Most of the buildings characterize the designers view rather than what the site demands and what the society needs (Solomon, B., 2013). This unnecessary usage of glass has caused glare and entrapment of unneeded heat. Therefore, this call for the delivery of sustainable building which is as a result of the concern that the ever rising population poses tremendous threat to the limited resources in the country.

The municipality of Addis Ababa also urged that, buildings that followed the main road strictly to have four and greater floors with mixed functions. However, the more buildings with global context are being built, the more the environment is exploited due to lack of consideration to sustainable building principles. Taking Addis Ketema Sub-city where Merkato (the largest open market in Ethiopia), is located as an example, most of the buildings that have been built in are served mostly for commercial purpose but lack the basic components of sustainable building principles.

Therefore, it is crucial to identify the critical bottle necks challenging the development of sustainable building principles in order to develop a proper approach for successfully promoting and implementing its practices. Thus, this paper has intended to assess the major factors affecting sustainable buildings projects in Addis Ababa, focusing on Addis Ketema Sub-city.

1.2. Statement of the Problem

Sustainable buildings have been actively spreading as a solution for sustainability issues of the construction industry. The 2030 Agenda for Sustainable Development Goal 11 aims to make cities and human settlements inclusive, safe, resilient, and sustainable (United Nations Environmental Programme, (2011). As green building practices unfold in developing countries, the need of identifying factors that both hinder and drive its spread rises.

Multiple studies reveal a general inconsistency among results in different parts of the world, caused by each country's environmental, economic, and social conditions. Globally, policymakers are addressing issues of urbanization and unplanned urban growth. Whereas advantages of adopting green construction exist, the concept is not being adopted by construction industry practitioners and developers at the rate that would have been expected (Darko, A, et.al.2017)

Addis Ababa city is experiencing a rapid population growth. With this rapid population growth, there is an increase in density of built spaces, expansion of housing, infrastructure development, and restructuring of industrial areas in the peripheral part of the city (Abeje 2007; Fetene and Worku 2013). In addition, in Addis Ababa, buildings are being constructed in noticeable and swift speed; however, the role of green buildings to address these challenges is still largely unknown. For example, planning document for the city of Addis Ababa propose development of a green infrastructure based on principles such as integration and multi-functionality; but, the proposal is rarely implemented (Herslund et al., 2017).

Several studies on the challenges of sustainable building in different countries around the world has emerged. For instance, Ugwu, O. et al. 2006); Hankinson & Breytenbach (2012); Jacobs (2011); Weber, C. (2005); Darko, A.et al., (2017); Reed, R. G. and Wilkinson, S. J. (2005) and Chein, I. (2002). These studies revealed a general inconsistency among results in different parts of the world, caused by each

country's environmental, economic, and social conditions. In addition, these studies reviled that barriers that prevent the adoption and spread of green building vary from country to country. Therefore, it is crucial to identify the challenges and opportunities of sustainable building to develop a proper approach for successfully promoting practices.

However, literature on sustainable construction/green building green infrastructure planning in Ethiopia is quite scarce. Available literature (Abeje 2007; Fetene and Worku 2013; Solomon, B., 2013; Abebe and Megento (2016); Teferi (2017) and Girma Y, et. al, 2019) is focused on issues such as sustainable development of green area, environmental pollution, green space planning practices, sustainable building facilities management and the adaptation to climate change and green economy. Nevertheless, the results of previous studies did not fully address how the current sustainable construction practices considered the main principles of green building issues.

The above study results also reviled that, factors that are more important in one place can be less critical in a different place due to country's specific characteristics such as demography, culture, economy, and location. As a result, recommendations for cities in developed countries may not necessarily be valid for such rapidly urbanizing cities. Thus, more additional studies are needed in terms of the existing context in our country and it is the target of the current study to fill this knowledge gap by taking the practices of sustainable building in Addis Ketema sub-city as a case. Hence, this study is intended to contribute to the existing knowledge by analyzing the major factors affecting the implementation and adoption of sustainable building comprehensively.

This study therefore seek to investigate the challenges of sustainable building projects in the city of Addis Ababa focusing on Addis Ketema Sub-city. Hence, by taking the facts from the available literatures, the researcher has categorized the most significant challenges or barriers of sustainable building in to four factors classified in terms of the Sociocultural and Political, Economic/financial, Technology and material, and

Environmental related factors. Hence by doing so, it is possible to identify the critical challenging factors affecting the development of sustainable construction for successfully promoting and implementing its practices in the study area.

1.3 Basic Research Questions

This study was tried to address the following research questions:

1. How do sociocultural and political factors affect sustainable building projects in Addis Ketema Sub-city?
2. What reason do financial related factors affect sustainable building projects in Addis Ketema Sub-city?
3. What are the economic related factors affect sustainable building projects in Addis Ketema Sub-city?
4. What extent do technology related factors affect sustainable building projects in Addis Ketema Sub-city?
5. How do environmental and material related factors affect sustainable building projects in Addis Ketema Sub-city?

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of the study was to investigate factors affecting the implementation and development of sustainable building projects in Addis Ababa focusing on Addis Ketema Sub-city.

1.4.2 Specific Objectives

To achieve the above objective, the study outlined the following specific objectives.

1. To identify the effect of social and political factors on the development of sustainable building projects in the study area.
2. To verify financial related factors on the development of sustainable building projects in the study area.
3. To determine the effect of economic related factors on the development of sustainable building projects in the study area.

4. To test the effect of technological related factors on the development of sustainable building projects in the study area.
5. To analyze the effect of environmental and material related factors on the development of sustainable building projects in the study area

1.5 Significance of the Study

The findings of this study could contribute to the existing body of knowledge regarding

Sustainable and green building drivers and challenges. More importantly the study will try to figure out the difference between the previous trends of building and designing in Addis Ababa against the contemporary principles of Green and sustainable Buildings which is also outlined with in the MDG (Millennium Development Goal) of Ethiopia towards sustainable development. Therefore, the finding of the study could be an evident to the city planners, policy makers, and strategist who are in charge of formulating the construction roan map of the city.

In addition, the finding of this study will, benefit and create more awareness among stakeholders of the building and construction industry which includes developers, government, contractors, project managers and other organization. The findings of this study will also be used as a reference point by other researchers for further research on the same field. They can also use the findings as a secondary source of information.

1.6 Scope of the Study

The geographic or spatial scope of the research paper was confided within the Addis Ababa city focusing in Addis Ketema Sub-city . The thematic scope of this study was delineated to assessment of the challenges affecting the implementation and development of green building in the stated area, where by doing so the critical factors affecting the adoption and implementation of sustainable building principles were addressed in Addis Ketam Sub-city.

Temporally, the study was tried to analyses the situation under study with buildings that are currently under construction and those buildings constructed/completed within the 5 years i.e 2017-up to now). Most importantly mass demolition and urban renewal projects including Merkato, have been carried out under these periods. Hence was is assumed that much information could be gathered for comparative analysis of the case under study.

1.7 Limitation of the Study

One of the limitations of the research is the shortage of adequate research regarding sustainable or green building and associated empirical studies in Ethiopia. Hence, sound research could have been conducted if adequate studies were available sources regarding sustainable building within the Ethiopian context. Additionally, due to financial and time constraints, the study was conducted in Addis Ababa with a particular reference to Addis Ketema Sub-city. It would have been better and allows further generalizations if the case was conducted by including other Sub-cities, bigger towns of the nations and more importantly those privately owned buildings were assessed in terms of the challenges with sustainable building projects in their contexts. In addition some of the respondents were failed to respond back the dispatched questionnaires on time that obliged the researcher to wait for longer days till they delivers the questioners.

1.8 Definition of terms

Sustainable Building Sustainable buildings are also called green building projects which are designed, built, renovated, operated or reused in an ecological and resource efficient manner.

Political Factors: This are factors related to governmental support, promotion, compensation structures. In terms of affecting the development of sustainable building, political issues is associated with lack of public involvement, delays in obtaining certification inefficient decision making process and lack of common understanding about sustainability.

Sociocultural factors: are social issues and community acceptance or understanding of and/or resistance towards to new ideas and awareness about the issues sustainable building construction building.

Economic factors: - for this study economic factors are the condition of demand and supply, inflation, cost factors and market values of sustainable building materials and technologies.

Financial Factors: are those issues associated with initial investment, cos, information, and financial and economic benefits regarding green/sustainable buildings.

Technology and material related factors: - are issues related to Capacity, exposures and experience on sustainable building projects. In addition the drawbacks associated with inappropriate design, lack of professional knowledge and skills, lack of contemporary construction technology, methodologies, extended construction period, inefficient utilization of local resources.

Environmental related factors:- this is about the issue of minimizing polluting emissions; Preventing nuisance from noise and dust by good site, waste minimization and elimination; preventing pollution incidents and breaches of environmental requirements; environmental improvement and urban green area development

1.9 Organization of the Paper

The study is going to be organized into five chapters. The first chapter covers the introduction, statement of the problem, objectives, justification and significance, the scope and the organization of the thesis. The second chapter deals with the review of related literature. Accordingly the theoretical literature review, empirical evidences and conceptual framework of the study were addressed. The third chapter describes the research methodologies. In the fourth chapter the collected information is described and analyzed and interpreted. The conclusion and recommendation part is presented in the fifth chapter. At last, references, appendix and data gathering tools were annexed.

CHAPTER TWO

2. LITERATURE REVIEW

Introduction

The objective of this chapter is to discuss a literature review and theoretical framework under which the assumption of this study is based

2.1 Theoretical Literature Review

2.1.1 The Aspects of Sustainable Building Construction

As sustainable development hinges on three pillars, the same holds for sustainable construction. The three aspects of sustainable construction are environment, social and economic aspects respectively.

2.1.1.1 Environmental Aspect

The built environment should be environmentally friendly by reducing negative impacts on the environment. The construction industry causes a detrimental effect on the environment both locally and globally. Local impacts of construction include air pollution, noise pollution, construction wastes, urban heat islands, and land clearance (Pero, M. et. al (2017). Global impacts of the building consist of Global warming, Resource usage, and Ozone layer depletion.

To curb this harmful practices, environmentally sustainable practices involve minimizing resource consumption, use of renewable and recyclable resources and materials, protection of agricultural lands, enhancing air quality by minimizing emissions of harmful gases, use of local construction materials, and energy efficiency (Dosumu and Aigbavboa, 2019; Pero et al, 2017).

2.1.1.2 Social Aspect

Though much emphasis is given for environmental and economic dimensions, little research is undertaken regarding social sustainability in construction. The concept of

social sustainability depends on the perception of people, which makes it difficult to define (Farzanehrafat et al, 2017). A study was conducted on how various clients define and which social sustainability aspect is considered most crucial within the scope of construction (Miree, 2016). The result showed that the perception of one client differs from the other.

Respect for human rights, Carrying out construction activities with different stakeholders based on ethics and moral obligations, and provision of safety and security were some of the definitions outlined by respondents (Miree, 2016). Hence, social sustainability within the realm of construction has a different meaning for different people.

Despite the difficulty to define social sustainability, some attempts have been made to define social sustainability. Social sustainability in construction refers to "the engagement among employees, local communities, clients, and the supply chain to ensure meeting the needs of current and future populations and communities" (Vasquez and Klotz, 2013). Social sustainability is also defined as full filling the necessity of present and future generations in a manner that protects the health of the community (Farzanehrafat, et al., 2015).

Another issue about social sustainability is which indicators to use as a guideline. Studies have been conducted to establish a social sustainability framework. A framework was devised for integrating and evaluating social aspects in the planning and design phases of construction projects (Vasquez, 2011). Based on the framework, the social sustainability framework consists of community involvement, corporate social responsibility, safety through design, and social design.

But, the framework didn't encompass the whole construction cycle but focused on the planning and design phases. In contrast, a comprehensive list of social sustainability indicators, for use in different phases of a construction project's life cycle which was

evaluated by construction professionals and scholars was proposed (Farzanehrafat et al, 2017).

Despite different interpretations of social sustainability, generally social sustainability in construction focuses on the positive impact of construction on people (Dillard et al. 2009 cited in Vasquez, 2011). Giving equal opportunities to work, Provision of Education and Training for employees, protection of cultural heritages during construction, involving the community during the decision process, and satisfying the expectation of clients for the money spent are some features of social sustainability in the construction industry (Dosumu and Aigbavboa, 2019). It is suggested that to have a broad understanding of social sustainability, considering the effect of construction on people throughout the lifecycle is vital (Vasquez, 2011).

2.1.1.3 Economic Aspect

The construction industry has a huge potential to contribute to the development of a nation. Especially in developing countries since most work is done through manual labor, the industry creates job opportunities for a large number of people. Thus, creating an opportunity to improve the standard of living and minimize poverty. Moreover, the construction industry can be the backbone for socio-economic development by providing housing and infrastructure (Durdyev et al, 2012)..

But, the performance of the construction industry is crucial in attaining economic development. Usually, Performance is measured based on Quality, cost, schedule, and safety. For example, although it is difficult to finish construction projects within the exact timeframe, minimizing delay is necessary. Because delay results in additional cost, it reduces profit to be earned by companies.

Similarly, inferior quality structures led to high maintenance cost since the built structures are unable to meet their service life. Hence, a sustainable economy can be

achieved through minimizing construction costs, reducing completion time, improving productivity, satisfying the needs of the client, ensuring job satisfaction, proper distribution of resources, etc.

2.1.2 The concept of Sustainable Buildings

A sustainable building is defined as a building with minimum negative impacts on the natural surroundings, materials and resources. This kind of building does not deny human needs because it considers human existence to be part of nature; rather, it is constructed in line with the idea that humanity can exist, multiply, build, and prosper with nature and the earth's natural processes without damaging the long term habitability of the planet (Chein, I. 2002). In order for a building to be considered as a sustainable building, it must display certain characteristics and probably needs to be assessed under a rating framework.

Sustainable buildings reduce the destruction of natural areas, habitats, and biodiversity, air pollution, water pollution, solid waste and they lower operating, maintenance, and environmental costs. The use of natural resources is minimized because renewable energy sources are used instead of non-renewable natural resources. This kind of building minimizes negative outdoor environmental impacts such as greenhouse gases, global warming and acid rain as well as maximizing the quality of the indoor environment and thermal comfort. A sustainable building also generates better long-term economic value and greater human satisfaction and productivity (Graveline, S. P., 2005).

As the product of construction industry, building is an essential thing for every people's life especially residential building, which can not only provide a shelter for people to live in, but also recently, is treated as a work place, such as SOHO small office home office, which means work at home (Kilbert 2012). When it is adapted to sustainable development of residential buildings, the definition can be translated as

"design of sustainable residences has to satisfy the needs of the present without compromising the ability of future generations to meet their needs of having a good living condition."

The definition of sustainable development set in 1987 plays an important role. By using the adapted definition, the sustainable development of residential building can be guided to a positive direction. Moreover, the number of resident ial building is large and special for living, which is the corner stone of people's happiness. And the sustainable residences will definitely push the whole sustainable development forward and the whole society to a higher and comfortable living condition (Chein, I. 2002).

There are many terms for and interpretations of what constitutes sustainable building practice. Rather than providing a definition, the OECD sustainable building project identifies five objectives for sustainable buildings: resource efficiency; energy efficiency (including greenhouse gas emissions reduction); pollution prevention (including indoor air quality and noise abatement); harmonization with environment; and integrated and systemic approaches (John et al., 2005). Sustainable construction is in effect 'a series of sustainable or 'best practice' decisions, which start well before construction (in the planning and design stages) and continue long after the construction team have left the site: a process that takes in the design, construction and ongoing maintenance of what is being referred to as a 'green' building' (Hayles & Holdsworth,

2005, p. 2).

2.1.3 Sustainable Building Principles

It is estimated that by 2056, global economic activity will have increased fivefold, global population will have increased by over 50%, global energy consumption will have increased nearly threefold, and global manufacturing activity will have increased at least threefold (Ilha, M.S.et.al, 2009). Globally, the building sector is arguably one of the most resource-intensive industries. Compared with other industries, the

building industry rapidly growing world energy use and the use of finite fossil fuel resources has already raised concerns over supply difficulties, exhaustion of energy resources and heavy environmental impacts—ozone layer depletion, carbon dioxide emissions, global warming, climate change (Ilha, M.S.et.al, 2009). Building material production consumes energy, the construction phase consumes energy, and operating a completed building consumes energy for heating, lighting, power and ventilation. In addition to energy consumption, the building industry is considered as a major contributor to environmental pollution, a major consumption of raw materials, with 3 billion tons consume annually or 40% of global use and produces an enormous amount of waste (Yahya, K.; Boussabaine, H., 2010).

Sustainable building approach is considered as a way for the building industry to move towards achieving sustainable development taking into account environmental, socio and economic issues, as shown in Table 2.1. It is also a way to portray the industry's responsibility towards protecting the environment (Burgan, B.A.; Sansom, M.R,.2006). The practice of sustainable building refers to various methods in the process of implementing building projects that involve less harm to the environment—i.e., prevention of waste production increased reuse of waste in the production of building material i.e., waste management, beneficial to the society, and profitable to the company(Shen, et, al., 2010).

Hill and Bowen (2007) state that sustainable building starts at the planning stage of a building and continues throughout its life to its eventual deconstruction and recycling of resources to reduce the waste stream associated with demolition. The authors then describe sustainable building as consisting of four principles: social, economic, biophysical and technical. Amongst the published work relating to the principles of sustainable building are collated in Table 2. .

Table 2.1. Principles of sustainable development

Authors	Proposed principles for sustainable building
Halliday,S. (2008)	***Economy:*** Good project management is a vital overarching aspect in delivering sustainable projects, both in the short and long term. ***Using Resources Effectively:*** Buildings should not use a disproportionate amount of resources, including money, energy, water, materials and land during construction, use or disposal. ***Supporting Communities:*** Projects should clearly identify and seek to meet the real needs, requirements and aspirations of communities and stakeholders while involving them in key decisions. ***Creating Healthy Environments:*** Projects should enhance living, leisure and work environments; and not endanger the health of the builders, users, or others, through exposure to pollutants or other toxic materials. ***Enhancing biodiversity:*** Projects should not use materials from threatened species or environments and should seek to improve natural habitats where possible through appropriate planting and water use and avoidance of chemicals. ***Minimizing pollution:*** Projects should create minimum dependence on polluting materials, treatments, fuels, management practices, energy and transport.
DETR (2010)	Profitability and competitiveness, customers and clients satisfaction and best value, respect and treat stakeholders fairly, enhance and protect the natural environment, and minimize impact on energy consumption and natural resources.
Hill and Bowen (2007)	***Social pillar:*** improve the quality of life, provision for social self-determination and cultural diversity, protect and promote human health through a healthy and safe working environment and etc. ***Economic pillar:*** ensure financial affordability, employment creation, adopt full cost accounting, and enhance competitiveness, sustainable supply chain management. ***Biophysical pillar:*** waste management, prudent use of the four generic construction resources (water, energy, material and land), avoid environmental pollution and etc. ***Technical pillar:*** construct durable, functional, quality structure etc. These four principles are contained within a set of over-arching, process-oriented principles (e.g., prior impact assessment of activities).
Miyatake (2006)	Minimization of resource consumption, maximization of resources reuse, use of renewable and recyclable resources, protection of the natural environment, create a healthy and non-toxic environment, and pursue quality in creating the built environment
Cole and Larsson (2009)	Reduction in resource consumption (energy, land, water, materials), environmental loadings (airborne emissions, solid waste, liquid waste) and improvement in indoor environmental quality (air, thermal, visual and acoustic quality)

In general, there is a consensus that the breadth of the principle of sustainable

building mirrors those of sustainable development, which is about synergistic relationships between economic, social and environmental aspects of sustainability.

Table 2.2 Environmental, social, and economic benefits of sustainable construction.

Benefits	Indicators
Environmental Benefits	Protecting air, water, and land ecosystems; Conserving Natural Resources; Preserving animal and genetic diversity, Protecting the Biosphere; Using renewable natural resources; Minimizing Waste Production or Disposal; Minimizing CO2 Emissions; Pursuing active recycling; Maintaining the integrity of the environment; Preventing global warming
Social Benefits	Improving the quality of life for individuals and society as a whole; Alleviating poverty; Satisfying human needs; Optimizing social benefits; Improving health, comfort, and well-being; Minimizing cultural disruption; Providing education services; Promoting harmony among human beings and between humanity and nature
Economic Benefits	Improving economic growth; Reducing energy consumption and costs ; Raising Real Income; Improving productivity; Lowering infrastructure costs; Decreasing environmental damage costs; Reducing water consumption and costs; Decreasing health costs; Decreasing absenteeism in organizations; and Improving Return on Investments (ROI)

It is important to note that sustainable development has limitations. According to Kukadia, V. et. al., (2004), the three pillars of sustainability (environmental, economic, and social) cannot be utilized to their full potential concurrently. The meaning of development must overcome a series of continuous trade-offs, such as the trade-off between increased productivity and the degradation of the environment (ibid). Further, the trade-offs are regularly changing due to the intense nature of development and the various ecological, economic, and social conditions (ibid). Therefore, sustainable development demands have different levels of importance in other places; they are never constant and change over time. This difference directly applies to the concept of

sustainable building as part of sustainable development. Therefore, there is no guarantee that successful practices in one of the ecological, economic, and social dimensions will be similarly effective in other dimensions.

2.1.5 Challenges of Sustainable Buildings

It is convenient to better use the PESTLE method to understand the factors affecting the development of sustainable buildings, distributing various aspects according to political, economic, sociocultural, technological, legal, and environmental categories (PESTLE). Moreover, the PESTLE method provides a bird's eye view and an organized look at the factors (World watch Institute State of the World, 2013).

There are no negative impacts on the environment caused by factors related to sustainable buildings, as the concept of sustainable building is based on minimizing the negative effects on the environment. Therefore, barriers affecting the spread of sustainable buildings can be distributed only among political, economic, sociocultural, technological, and legal categories. Furthermore, the factors that affect the spread of green buildings are very interrelated. Some elements can correlate with several PESTLE categories, such as "lack of market demand", identified as one of the fundamental barriers by (Holton, et al. (2008) which can be underlined in the economic category and partly in the sociocultural category. Market demand can arise from sociocultural circumstances, even mainly being an economic factor. However, factors were classified according to their primary attributes, not their origin, to avoid uncertainties in this study.

2.1.5.1 Political barriers.

Lack of governmental support and promotion can be classified as political factors. Chan et al. (2018), a Ghanaian professional surveyor, identified the lack of government incentives as one of the top three most critical barriers to the development of green construction, highlighting the role of government as a crucial part. The promotion of sustainable construction resulted in the advancement of low carbon technologies that reduce the impact on the environment in the construction

phase; as pointed out in a study carried out on existing green buildings by Eichholtz et al. (2010), a lack of promotion is the cause of the slow spread of green practices.

Inadequate or conflicting government regulation (Milne, 2012) coupled with the difficulty in gaining green certification is the main barrier to implementing green building features. Empirical evidence suggests that revision of many building codes impede and delay the process of implementing green building. For instance, the process of reaching agreement on the vision and goals of a design requires lots of public review meetings, working with community and building code officials to agree on a design (Garman et al., 2011).

2.1.5.2 Economic barriers.

In many studies, the cost is the most critical barrier to green construction, as it requires more initial investment than traditional buildings (Cole, R.et al., 2009). Perception of higher costs causes the market to withdraw from green projects, as noted by Ahn & Pierce (2007). However, studies in the US and UAE show that cost is not the most crucial barrier (Eichholtz, et al., 2010).

An extended payback period is another substantial factor in the economic category, delaying the spread of sustainable buildings, and is often ranked as the second most important barrier after cost. According to Milne, N., (2012), the additional time required for project is a crucial factor affecting stakeholders' decisions on par with higher costs. Darko et al. (2017) also pointed out other barriers such as lack of market demand and risks and uncertainties involved in the implementation of new technologies as crucial factors in the study conducted in the USA. Under Economic challenges we can trace the challenges associated with demand and supply of sustainable building materials and the capital cost.

Limited range of green products and materials

Reliability of information from product suppliers and manufacturers is a major concern as well, "for instance, product suppliers and manufacturers are developing

and marketing products that are environmentally responsible. However, without certifications ensuring that a product is indeed environmentally responsible, designers find it hard to decipher what is authentic from that which is not." (Hankinson & Breytenbach, 2012). According to Tam, Hao & Zeng (2012), if the design team members do not have sufficient time and funding to search for new green products, components and technologies, green building designs cannot be implemented. Therefore, a limited range of green products and materials may restrict the opportunities to create cost efficient designs.

Capital cost;

The general industry view is that sustainable buildings come at a premium, with a minimal connection made between the up-front (capital) costs of construction and the operating costs, once the building is completed. Indeed, there is a widespread perception that sustainable buildings are higher in cost than the marketplace is will pay for; even when they are not (Zerkin, 2006). This is believed to be due to the lack of accurate, thorough, and quantifiable information regarding the financial and economic impacts of high performance buildings. Kukadia, V.; et al., (2004) suggests that office buildings are not the best place to test new green technologies and designs, as developers and investors are not willing to carry the risk.

2.1.5.3 Sociocultural barriers

The literature represents lack of knowledge and awareness as a critical barrier to consider, as some studies suggest resolving it might solve multiple issues at once (Shen, et al, 2010). However, it might require much effort to raise awareness among stakeholders as it is directly tied to government incentives and educational programs. Darko et al. (2017) identified resistance to change as the most critical barrier in their study, followed by a lack of the benefits of knowledge and awareness of sustainable construction benefits. Further, the study stated that resistance to change could determine the success of green buildings in the US.

As a result, Djokoto et al. (2014) contend that the industry presents itself as a sector

which is traditionally very difficult to change especially with respect to construction methods practiced and building materials used. Besides, firms follow the consumption patterns of clients who normally worship modernity and the development model of developed countries with its vices and problems. Furthermore, the construction sector in developing countries such as South Africa is dominated by firms that are not interested in technology changes that involve risks and extra costs (Du Plessis et al., 2002). Construction in South Africa favors the use of 'brick and mortar' and discourages any other alternative to these building materials and services. As a result, communities, clients, and stakeholders do not demand innovative building solutions, relying instead on conventional methods Milne, N., (2012).

2.1.5.4 Material and Technological barriers.

The challenges described above are all impacted on by materials and technology selection. Sustainable building practices can make a huge difference to global environmental sustainability, particularly through a drastic reduction in the use of natural resource consumption and energy intensive materials like cement, steel, aggregates and aluminum (du Plessis, 2002). The process of transporting materials via road, sea or air can leave a trail of pollution in its wake, making it more sustainable to use local products.

An extended construction period is another factor related to time, similar to more extended payback periods that affect the spread of green buildings. However, the underdevelopment of technologies in the area is the leading cause of longer construction periods (Yahya, K.et al., (2010), which puts it in this category. Halliday, S. (2008), emphasized that the extended construction period is due to soft costs (additional planning and design). Furthermore, Darko et al. (2017) highlighted other significant factors: a lack of experienced staff, educational programs, databases, and information. Under material and technological challenges we can also list other related barriers: challenges regarding to Lack of Information, The Design Process

4.1.1 Lack of Information

It is not always possible to predict whether a building will perform as predicted, whether the green costs are affordable or indeed whether the technology reliable (Edwards, 2008).There is a lack of research on the performance of green building. There is also concern that the complexity of some green designs (technological high performance) may bring about obsolescence earlier than conventional design (Abeje W 2007).

4.1.2 The Design Process

There appears to be limited understanding of available green options by design professionals. This includes: insufficient knowledge to produce specifications; a lack of available high performance materials; difficulties in gaining approval of new technologies for building codes; uncertainty about approvals; regulatory barriers to adoption of technologies and labour issues due to potential labor-saving measures; all providing further challenges to sustainable design (Zerkin, 2006). In order for sustainable building techniques and materials to be adopted they must be specified by the designer. However, there is no standard assessment criterion for products that allows them to be directly evaluated, and therefore design professionals must invest a lot of time in assessing potential materials and technology (Weber, 2005).

2.1.5. 5 Legal barriers

Aktas & Ozorhon (2013), emphasized the importance of sustainable building regulation in their study carried out in Turkey. It was one of the factors that affected the decision-making of owners and the top management support. Additionally, Ahn, Y.H.; et al., 2007) pointed out difficulties in adapting legislation and laws regarding green construction in Turkey. Green labeling is another critical factor, as the lack of green building rating certifications can cause difficulties in adopting green projects (Aktas, B.; Ozorhon, B. 2013).

2.1.6 Drivers of Sustainable Building

Drivers of sustainable building s are classified similarly to barriers according to the PESTLE method.

(1) Political drivers. As lack of government support can be a critical factor affecting the spread of sustainable buildings (Chan et al., 2018), contrary government incentives towards adopting green buildings can be a determining factor. Darko et al., 2017) suggested that government support could compensate stakeholders for the additional cost of building green, promoting green construction. Similarly, Eichholtz et al. (2010) had drawn the same conclusion examining factors in Kuwait. Several studies have stated the importance of company image and reputation when choosing green projects.

(2) Economic drivers. The common perception that although green buildings have higher implementation costs, they also possess lower operational costs, reducing overall lifecycle expenses, has driven the market long (Shen, et al, 2010). Studies in Australia and New Zealand revealed the reduced lifecycle cost of sustainable buildings as the most critical driver. A similar study presented this factor in Ghana in the list of top five most influential factors. Love et al., examining an office building in Australia, pointed out several critical drivers, including the attraction of premium clients and high rental returns. High rental returns, reduced operational costs, & turnover lead to improved building value, which is itself a significant driver of green buildings (Darko et al. (2017)

3 Sociocultural drivers. In addition to environmental benefits, sustainable buildings improve the health, comfort, and satisfaction of occupants compared to traditional buildings Ewa U. E., (2013). It was also rated the second most important factor in Ghana (Chan, et al., 2018). Moreover, an improved environment for the occupants can attract quality employees by itself, the attraction of quality employees is an influential driver of green buildings (Aktas, B.; Ozorhon, B. 2013). Unlike lack of awareness being a critical barrier to the spread of sustainable buildings, increased understanding

can be a determining driver. Regulations, policies, and educational programs toward sustainable buildings can improve the level of awareness (Abeje W (2007).

(4) Technological drivers. Green building practices advance conventional technologies, improving the efficiency of construction processes and management practices. Although Darko et al. (2017) revealed the low impact of improved construction efficiency as a driver, it is worth considering the improvements green practices provide. In addition, green projects require more technology, and participants are more likely to be in an integrated work environment, which brings construction management processes to another level.

(5) Legal drivers: - Burgan, B.A.;et al., 2006) noted that the number of governmental regulations and urban policies is constantly increasing and is expected to increase in the future. Such steps are essential in promoting green practice. Another crucial factor that affects the spread of green buildings is the rating systems, such as LEED or BREEAM. The findings show that in addition to affecting the decision making of stakeholders, the green design of the project undergoes changes depending on the requirements of the rating system Ewa U. E., (2013)

(6) Environmental drivers. Based on an international survey of green building experts carried out by Darko et al. (2017), energy and water efficiency were the second and third most important factors driving the adoption of sustainable buildings, respectively. Furthermore, Green Leigh, N et al., 2006) revealed the importance of Turkey's energy infrastructure and efficiency, ecological sustainability, and waste management. Gathering the environmental benefits of the green concept is tremendous and influential to its spread.

Building is designed to minimize its harm to the environment, efficiently using water and energy resources, and considering human health and comfort (Edwards, B, 2008) additionally, green practices encourage reducing construction and demolishing wastes. Green buildings are known to have 5 major distinguishing characteristics using LEED

method of certification those are ES site development, promote efficient use of water resources, conservation of energy and renewable energy use, conserve building materials and reduce construction waste, and protect and enhance indoor environmental quality (Fetene A, W., 2013). US EPA adds to those listed above recycling and optimization of operational and maintenance practices under components of ESBs. (Green Leigh, N et al., 2006).

2.1.7 Methods of Implementing Sustainable Building

In order to achieve a sustainable future in the building industry, Aktas.et al., (2015) suggest adoption of multi-disciplinary approach covering a number of features such as: energy saving, improved use of materials, material waste minimization, pollution and emissions control etc.

There are many ways in which the current nature of building activity can be controlled and improved to make it less environmentally damaging, without reducing the useful output of building activities. To create a competitive advantage using environment-friendly construction practices, the whole life-cycle of buildings should, therefore, be the context under which these practices are carried out.

A review of literature has identified three general objectives which should shape the framework for implementing sustainable building design and construction, while keeping in mind the principles of sustainability issues (social, environmental and economic) identified previously. These objectives are:

1. Resource conservation
2. Cost efficiency and
3. Design for Human adaptation

2.2 Empirical Literature Review

By virtue of its size, construction is one of the largest users of energy, material resources, and water, and it is a formidable polluter. In response to these impacts, there is growing consensus among organizations committed to environmental

performance targets that appropriate strategies and actions are needed to make building activities more sustainable (GABC, 2020). With respect to such significant influence of the building industry, the sustainable building approach has a high potential to make a valuable contribution to sustainable development. While current sustainability initiatives, strategies and processes focus on wider global aspirations and strategic objectives, they are noticeably weak in addressing micro-level (project specific level) integrated decision-making (Ugwu, O. et al. 2006).

Hankinson & Breytenbach (2012) contend that the industry is hampered by a lack of technical expertise to actually develop and implement green practices. Hankinson & Breytenbach report that professionals within the built environment are not yet fully trained in green construction principles and thus lack education and experience to properly carry out such practices.

A study conducted by Jacobs (2011) also identifies lack of knowledge about green practices, lack of knowledge about the effects of non-green practices on the environment, lack of training and education as the main barriers to the implementation of green building. This is further reiterated by Häkkinen & Belloni (2011) that green building practices can be hindered by ignorance or a lack of common understanding about sustainability.

Weber, C. (2005) argue that not only are professionals supposed to be knowledgeable, professionals need to form an integrated team from conception to inception comprising of the developer / owner, project manager, contractor, architect, services engineer, structural engineer, civil engineer, environmental engineer, landscape consultant, cost planner, and building surveyor.

Darko, A.et al., (2017) contend that motivational factors and grounds of expectations derived during the forethought process will influence stakeholders in the construction industry to commit and decide to venture into new practice such as green construction.

Therefore, understanding of what can initiate the commitment of 'first-time' developers or to maintain the interest of 'experience' developers for green construction can generate further recommendations to create a viable environment to induce wider acceptance on the practice.

The lack of attention to the costs associated with green construction seems to be a global phenomenon. Choi (2009) states that one of the major barriers is the need for reliable cost information for green features, without this information, it is difficult for the market to justify the occasionally higher up-front costs for a green development project. Reed, R. G. and Wilkinson, S. J. (2005) reveal that there is still little published data about actual cost premiums for green buildings.

While there has been a plethora of research seeking to determine the direct or tangible costs of green building, the indirect or intangible costs remain unexplored in construction. Love (2002) argues that this is because it is difficult, if not impossible to quantify such costs in purely monetary terms. As a result, Chein, I. (2002) emphasizes the need to look at the indirect costs as well when determining the total costs of green construction.

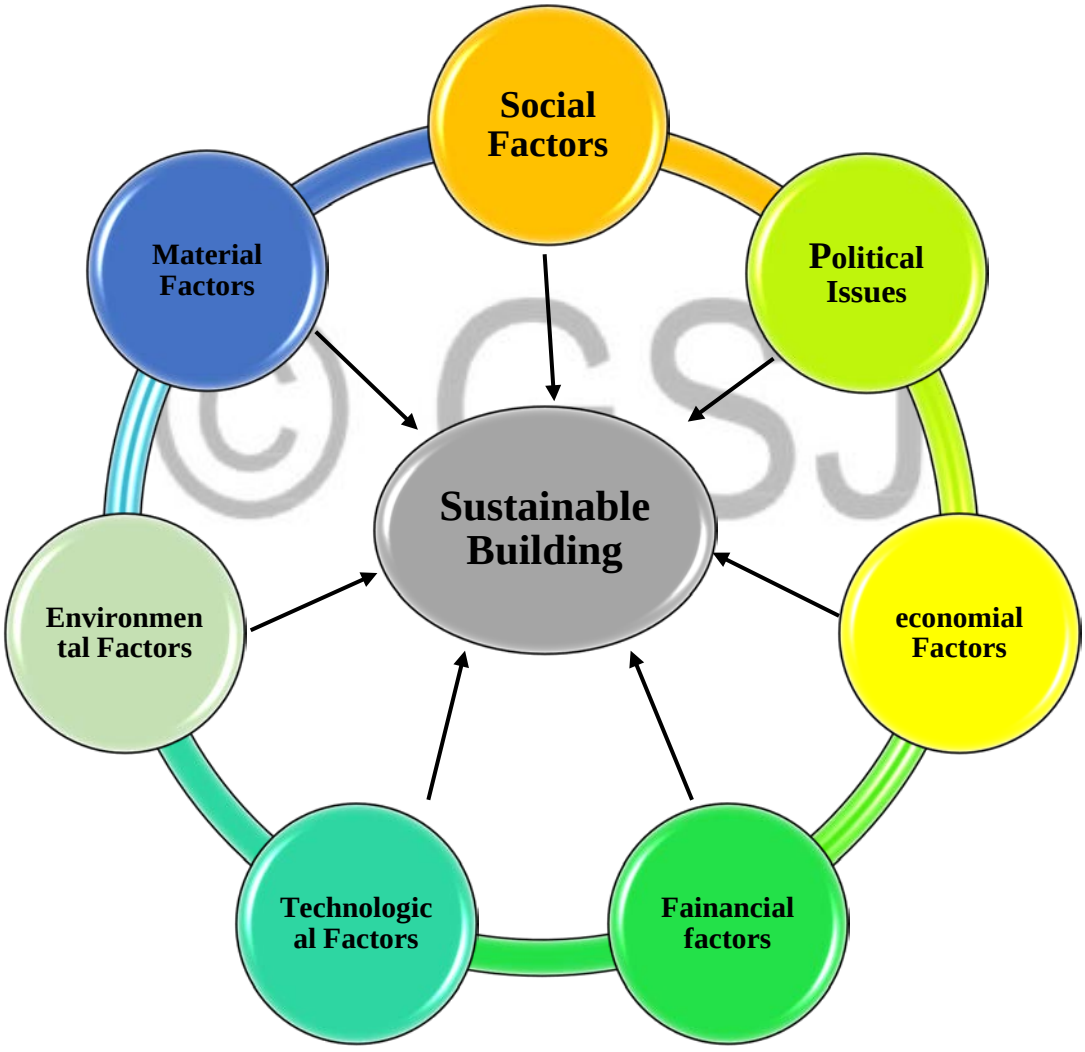
2.3. Conceptual frame work

Conceptual framework is a hypothesized model identifying the concepts under the study and their relationships. Conceptual frame work is to show conceptual distinctions, processes or thoughts and organize the ideas in the study. Strong conceptual frameworks should capture the concepts in the study in a way that is real and easy to remember and apply (Tobin, J., Brainard, W. (1998).Conceptual frame work is to show conceptual distinctions, processes or thoughts and organize the ideas in the study.

As described on the predefining sections, the dependent variable in this study is Sustainable building projects or green constructions while the independent variables

are those challenges affecting the adoption and implementation of sustainable buildings. And as described in the literature these can be divided into four distinct categories, namely political and social factors, economic and financial, technological and material, and environmental related factors. Accordingly, the Conceptual framework of the study adopted from literatures and modified by the researcher is illustrated on figure 2.1 as follows.

Fig: 2.1 Conceptual Framework of the study



Source: Developed from the reviewed literatures (2022)

CHAPTER THREE

3. RESEARCH METHODOLOGY

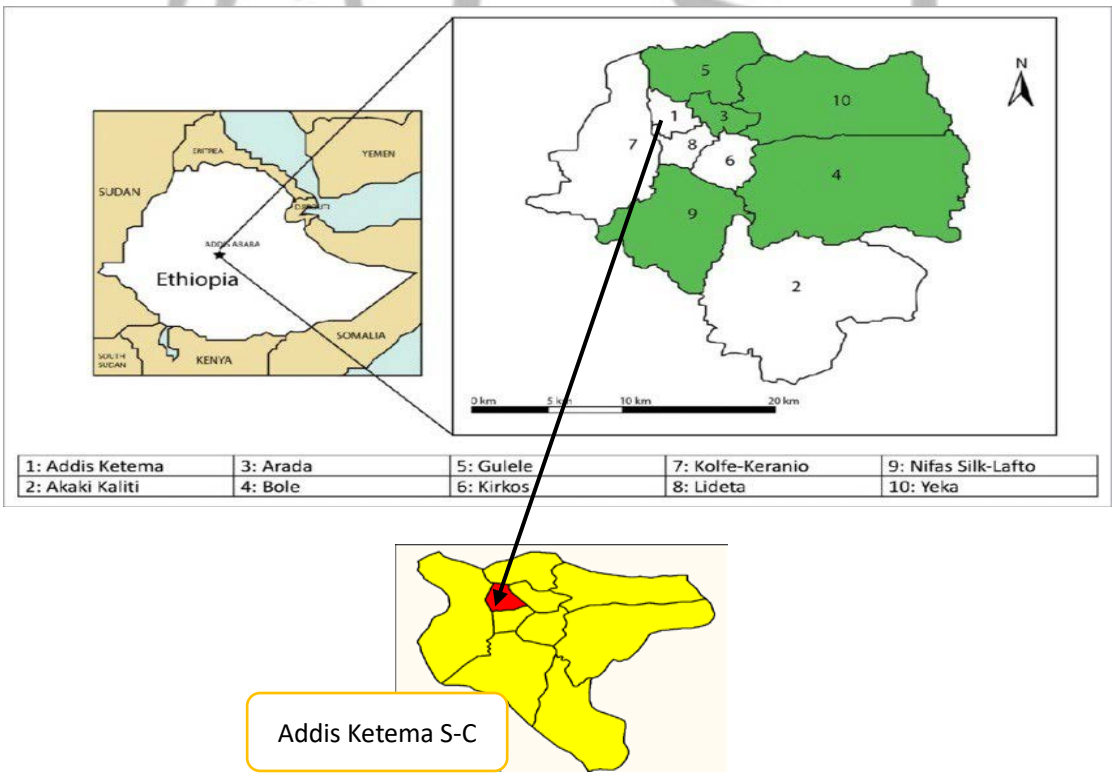
Introduction

This chapter outlines the research methodology and identifies the tools and techniques employed in a systematic data collection exercise. Hence under this chapter detail discussions about the research design and methodology is made.

3.1 Description of the Study Area

This study is conducted in Addis Ketema Sub-city, one of the sub-cities of Addis Ababa. Addis Ababa is a chartered city having three layers of government: one municipality, ten sub-cities and 116 districts/Woredas. Addis Ketema Sub city astronomically located $9^0$2'2.22" N Latitude and and 38^0 43'.22"E Longitude (CSA, 2021).

Fig. 3.1 Map of the Study Area



Source: Addis Ketema Land administration office (2022)

Addis Ketema Sub-city is one of the ten Sub-cities that form Addis Ababa city

Administration which is found to North West of the city sharing a border with s with Kolfe Keranio Sub-city to the west; Gulele to the north and north East; Arada sub-city to the East; and Lideta Sub-city to the south. The total area of the city is 7.45 km square and its total population is estimated to be 271, 644 (CSA, 2021). The city serves as a social, economic and political center for the country. Merkato, which is the biggest open market in the in Africa is also located in this sub city.

3.2 Research Design

Regarding to the methods to be employed, this study used both descriptive and explanatory research designs. Descriptive methods set out to describe and interpret what is going on. Descriptive statistics are techniques that take raw scores and organize or summarize them in a form that is more manageable. Often the scores are organized in a frequency distribution table or a chart/graph so that it is possible to see the entire set of scores (Kothari C.R. (2004). The advantage of descriptive survey research methods as defined by Kothari C.R. (2004), is that it employs large amount of data from relatively wider area and allows high degree of interaction with respondents.

Whereas in order to explain the causal relationship between the challenges affecting the implementation of sustainable building projects the researcher also employed explanatory research design. Explanatory research design is used to explain the causal relationship between independent and dependent variables. It reinforces descriptive statistics by taking it beyond description. This, it does through predictions of the future and generalizations about a population by studying a smaller sample. Justifications for the utilization of explanatory research design is; because the research basically focuses on practical projects to realize the barriers affecting sustainable building or green building by identifying the overall effects of multiple factors on the adoption and implementation of sustainable building in the study area.

3.3 Research Approach

The choice of methodology for a study is mostly based on the purpose of the study and the research question. In this regard, this study employed mixed approach research paradigm (both quantitative and qualitative). As confirmed by Creswell (2009), mixed method helps to triangulate qualitative and quantitative data sources and provides a better, more substantive picture about the topic understudy. Moreover, stressing the advantage of mixed approach, he also stated that using this approach allows a researcher to obtain a variety of information on the same issue, use the strength of each approach to overcome the deficiencies of others, and achieve a higher degree of validity and reliability

3.4 Data Source

This study has based on both primary and secondary sources. Accordingly, this study gathered both qualitative and quantitative data for investigation. Hence, to collect those qualitative and quantitative data the study used primary and secondary source of data, primary source of data was collected from questionnaires, observation, and interview. The secondary source comprises the literature review, which includes Addis Ababa City construction office documents, annual reports, corresponding sub-city offices reports, government documents, books, journals, published and/or unpublished research paper dealing with challenges and opportunities of sustainable building projects/constructions.

3.5 Sampling Methods

3.5.1 Target Population

According to Hair et al. (2010), target population is said to be a specified group of people or object for which questions can be asked or observed made to develop required data structures and information. According to Zikmund (2003), population contains those group or individuals who are in a position to answer the questions and to whom results of the survey apply. Accordingly, the population targeted to be surveyed were those who were directly or indirectly involved in the planning, design,

construction and supervisor and overall decision making process of the construction activities in the stated sub city. In general there were about a total 328 representative sample size was being drawn.

Hence clients (including owners of the buildings), contractors and consultants who were registered in the sub city building permit authority office; construction stakeholders of the Sub-city and Wereda office including construction managers and team leaders; employees/ technical experts that consists of civil/construction engineers, architects, designers, financial analyst, quantity surveyors, Mechanical engineering and Sanitary engineer were taken as the target population of the study and

3.5.2 Sampling Frame

According to Creswell, (2009), a researcher should not take the whole population because the results of good and representative samples have the same characteristics as the population as a whole. It is in light of this suggestion that representative samples were chosen from the study population. As mentioned above the target population of the study include in this study were those construction industry stakeholders from the Sub-city i.e. registered contractors, consultant and building owners as well as representatives from construction office of the Addis Ketema sub-city including officials and employees were purposively targeted on the bases of their technical understanding, experience and exposures to the case under study.

There were a total of 182 (27 employees from the sub city and 155 employees from respective wored construction offices of Addis Ketema Sub-city). In addition depending on the projects sizing about 58 contractors and 56 consultants were working currently on the Addis Ketema Sub-city who were registered obtained their construction permit from the stated sub-city. In addition, for the physical analogy of the case under study the researcher considered sample buildings that constitute completed commercial buildings in the Addis Ketema Sub-city.

There were about 92 commercial buildings that have constructed and completed between the year 2017 to 2021 (Addis Ketema Sub-city construction and supervision office, 2022). Hence a sample of 23(50%) from the owners of these buildings were also randomly selected. Accordingly the sty has a total of 328 target populations who were purposively includes in this study. The sample was framed form clients (public or private building owner), contractors, consultants, the sub-city and woreda construction and supervision office engineers and official. The total number and proportion of the target population of the study are portrayed on table 3.1 below.

Table 3.1 Distribution of the Target Population or Units of Analysis of the study

S/N	Name of Departments		No of population	Proportion in the population
1	Sub-city and woreda Construction and Supervision office	Officials	11	3.3
		Experts/engineers and Technicians	182	55.4
2	Clients and owners of the buildings		23	7.0
3	Consultants		58	17.7
4	Contractors		56	16.4
	Total		328	100.00

Source: Own computation (2022)

3.5.3 Sample size and Sampling Technique

This study used non probability sampling technique because it is impossible to address all of the population because of time and resource constraint .From non –probability sampling the study used Purposive sampling technique, the reason for using these method is it can help to select the sample based on the objective of the study. To achieve this, purpose sample size was determined based on Taro Yamane (1967), sample selection method with a probability of 5% free error with 95% confidence level. Accordingly. a total of 180 samples were drawn using purposive sampling technique from the total target population of 328 by using the following formula.

$$n = \frac{N}{1+N(e)^2}$$

Where, n =is the required sample size

N= is the population size and

e= is the level of precision (5%)

Hence, by applying the above formula, the result is:

n = 328/1+328(0.05)^2, which give us **180** respondents

Therefore out of the total 328 representative target population of the study, it was possible to draw a sample size of 180. The following table illustrates the proportional distribution of the sample respondents.

Table 3.2 Sample size determination and Sampling techniques

S/N	Name of Departments		No of Respondents	Proportion in the population	sample size	Sampling Technique
1	Sub-city Construction office	Officials/ managers/Team leaders	11	3.35	**180*3.3%=6**	Purposive
		Employees/ Experts	182	55.49	**180*55.5%=100**	Purposive
2	Clients and owners of the buildings		23	7.01	**180*7.0%=12**	Purposive
3	Consultants		58	17.68	**180*17.9%=32**	Purposive
4	Contractors		54	16.46	**180*16.46%=29**	Purposive
	Total		328	100.00	**180**	

Source: Own computation (2022)

As illustrated on the above table, out of the total 328 target populations, 180 of them were selected using purposive sampling. The reason for using these method is it can help to select the sample based on the objective of the study. In addition, these sampled population were selected on the bases of their technical understanding, experience and exposures to the case under study.

3.6 Methods of Data Collection

As described above, relevant information were collected from both primary and secondary sources. Hence, to collect the required primary data the researcher used well-designed structure questionnaires. The design of the questionnaire was prepared in simple and clear language. The questionnaire involved both closed ended and open

ended question. Beyond close and open end question the study used structured personal interview to collect data from the key informants from the client, contractor, and consultant and from government officials. The review of literature and the research questions were used as a guideline for the development of the questionnaire, and some questions will also be taken from other sources.

3.7 Methods of Data Analysis

Both qualitative and quantitative data analysis techniques were employed because data are to be collected have quantitative and qualitative nature. Hence the data was analyzed by using SPSS version 20. The statistical tools wase assumed to align with the objectives of the research.

3.7.1 Quantitative Data Analysis

Quantitative data was analyzed through descriptive and inferential statistical ways. Accordingly after editing, coding and filtering errors, the quantitative data was first entered in to SPSS program (version 20) to facilitate descriptive and inferential statistics analysis. Depending on the nature of the research questions, the Relative Importance Index (RII) was used to rank the different barriers as well as strategies outlined based on the responses of professionals which was analyzed. RII is computed by summing the frequency of responses per each value on the Likert scale by the value assigned to the scale divided by the product of the maximum value on the scale by the sum of the scale values.

$$\mathbf{RII}=\frac{\boldsymbol{\Sigma w}}{(\boldsymbol{A}*\boldsymbol{N})}$$

Where:

RII = relative importance index

W = weighting given to each factor by respondents (ranging from 1 to 5)

A = highest weight (i.e., 5 in this case); and

N = total number of respondents.

The RII values have a range of 0 to 1 (0 not inclusive); the higher the RII, the more

important the challenging the adoption of sustainable building principles. The RIIs is ranked, and the results are shown by using tables with associated frequency and percentage of the given responses to each items

Moreover, to analyses the casual relationship between independent variables and dependents variable, inferential statistics was conducted. Therefore, Pearson's correlation was conducted so as to show the relationship between dependent and independent variable and the strength/degree as well as direction of associations between variables. In addition, to develop functional relationship among the independent variables and dependent variable Multivariate (Multiple) regression model was employed.

Regression Analysis Model

The Multiple regression analysis model was selected because the study was intended to investigate more than one independent variables and predict its effects on a dependent variable. Multiple Regression equation for the study is expressed as follows:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 4X5 + \varepsilon$$

Where:

Y = dependent variable (sustainable building)

β **0** = Constant (value of Y when X1, X2, X3, X4 and X5= 0) or the interception point of the regression line and the y-axis

β 1, β 2…. β 5= the coefficients of the independent variables that are determined.

***X1*=** Political and social factors (PSF)

*X2***=** Economic factors (EF)

X3=Financial factors (FF)

***X4*=** Technology and Material Factors (TMF)

***X5*=** Environmental Related Factors (ERF)

ε **=** error term

3.7.3 Qualitative Data Analysis

The data that are to be collected through interview and open-ended questionnaire were analyzed qualitatively using narrative and thematic form in correspondence to the main research questions. As Best, W. (2003) stated analysis of qualitative study basically involves word argumentations as numerical explanations and the multiple meanings of individual experiences meanings socially and historically constructed perspectives are addressed. Qualitative analysis was used for all data that was not be quantified. This was done thematically in a systematic way in order to triangulate the finding that were obtained from quantitative sources.

3.8 Operationalization Framework

The operationalization framework of the research was all about measurement of phenomena, which answers the research objectives and show concepts, variables, methods of data collection and analysis. Therefore, the researcher clearly indicated the operationalization framework of the research on table 3.3 below as follows

Table 3.3 Summary of the research methodology

o.	Research questions	Data type and source	Methods of data collection	Methods of sampling	Methods of data analysis
	How do sociocultural and political factors affect sustainable building projects in Addis Ketema Sub-city?	Quantitative and Qualitative data from primary and secondary sources	Survey-questionnaire Key informant-interview	Purposive sampling	Descriptive and inferential analysis
	How do economic factors affect sustainable building projects in Addis Ketema Sub-city?	Quantitative and Qualitative data from primary and secondary sources	Survey-questionnaire Key informant-interview	Purposive sampling	Descriptive and inferential analysis
	How do financial related factors affect sustainable building projects in Addis Ketema Sub-city?	Quantitative and Qualitative data from primary and secondary sources	Survey-questionnaire Key informant-interview	Purposive sampling	Descriptive and inferential analysis
	How do technology and material related factors affect sustainable building projects in Addis Ketema Sub-city?	Quantitative and Qualitative data from primary and secondary sources	Survey-questionnaire Key informant-interview	Purposive sampling	Descriptive and inferential analysis
	How do environmental related factors affect sustainable building projects in Addis Ketema Sub-city?	Quantitative and Qualitative data from primary and secondary sources a	Survey-questionnaire Key informant-interview	Purposive sampling	Descriptive and inferential analysis

Source: Own Computation

3.9 Validity and Reliability of the Research Instrument

3.9.1 Validity of the Research Instrument

Creswell (2009) asserts that, the accuracy of data to be collected largely depend on the data collection instruments in terms of validity and reliability. This was achieved by pre-testing the instrument to be used to identify and change any ambiguous, awkward or offensive questions and technique. In addition the research instruments were also given to the advisor and expert for their insight review and verification. Therefore, based on the feedback, issues which were suggested to be improved were re-phrased

and others are omitted from the list of items as suggested by the experts.

3.10.1 Reliability of the Research Instrument

Reliability indicates the extents to which a variables or set of variables are consistent in what it is intended to measure" (2009: 190-92). According to Best. J.W. et.al (2003), reliability analysis is concerned with the internal consistency of the research instrument. Creswell (2009: 190-92) considers the reliability of the instruments as the degree of consistency that the instruments or procedure demonstrates. Typically, a Cronbach alpha value of above 0.7 is usually considered to offer reasonable reliability for research purposes (Kothari, 2014). In this regard, the Cronbach's alpha test was utilized to ensure reliability of the research instruments. Reliability could be improved by writing items clearly, making test instructions easily understood, and training the raters effectively by making the rules for scoring as explicit as possible.

3.101.1 Reliability Pre-test

As discussed above, the Cronbach's alpha value of 0.67 and above is recommended to be acceptable to ensure reliability of an instrument. Accordingly the reliability pre-test result of the pilot collected data is presented in the following table 3.4 below.

Table.3.4 Cronbach Alpha pretest

Indicators	**Number of items**	**Cronbach Alpha**
Political and Socio-cultural Factors	7	.921
Financial Factors	6	.721
Economic Factors	6	.872
Technological Factors	6	.897
Material and Environmental Factors	10	.718
The Effects of Sustainable Building/Green Building projects	8	.846
Overall Results	**43**	**.820**

Source: Survey Result 2022

As we can see from the above table 3.5, the overall Cronbach alpha test result of the pilot distributed questionnaires is 0.820. Therefore it had very good reliability for the questioners so as to proceed data collection process.

3.11 Ethical consideration

All the research participants included in this study were appropriately informed about the purpose of the research and their willingness and consent was secured before the beginning of distributing questionnaire. Regarding the right to privacy of the respondents, the study maintained the confidentiality of the identity of each participant. Their privacy, identity and confidentiality shall be maintained by assigning them code numbers instead of names. The completed questionnaires were filed safely and e accessible only to the researcher and thesis advisor. In all cases, names were kept confidential thus collective names like “respondents, informants, and interviwee‟ were used.

CHAPTER FOUR

4. DATA ANALYSIS AND INTERPRETATION

Introduction

This chapter deals with the presentation, analysis and interpretation of the data. The results presented in this chapter seek to achieve objective of the study which was attempted to investigate factors affecting the development of sustainable building projects in Addis Ababa focusing on Addis Ketema Sub-city. Hence results and findings from both descriptive and inferential analysis of are thoroughly expressed as follows.

4.1 Response Rate

To make the analysis more comprehensive a total of 173 self-administered questionnaires were sent to respondents (sub-city experts, client (project owners, consultant, and contractor). Table 4.1 below shows the number of questionnaires distributed to client, contractors and consultant and the number of questionnaires returned from these stakeholders including the percentages of their response rate.

Table 4.1 Response rate of distributed questionnaires

Participants	Questionnaires distributed	Questionnaires Returned	
		No	%
Sub-city Experts	100	89	89.0
Clients/buildings owners	12	12	100.0
Consultant	32	28	87.5
Contractor	29	27	93.1
Grand Total	**173**	**156**	**90.2**

Source: Own Survey, (2022)

As it is portrayed on the above table out of the total distributed 173 questionnaires, 156(90.2%) questionnaires were filled and returned.

4.2 Demographic characteristics

The demographic profile of the sample respondents were presented and analyzed below.

The purpose of assessing respondents' age, sex and title is that, to determine whether the researcher considered heterogeneity of sample units. On the other hand assessing the work experience and education level of the respondents' is that, when the respondents are more experienced and educated they have better opportunity to understand the case and give better response than else.

4.2.1 Sex, Age, Academic Status of the Respondents

Table 4.2 Sex, age and academic status of the respondents

Demographic Variables	Items	Frequency	Percentage
Sex	male	102	65.38
	Female	54	34.62
	Total	**156**	**100**
Age	Below 25 years	0	0
	between 25-35 years	42	26.92
	between 36-45 years	82	52.56
	46 and above years	32	20.51
	Total	**156**	**100**
Academic status	College Diploma	0	0
	First Degree	82	52.56
	MA/MSc Degree	74	47.44
	Total	**156**	**100**

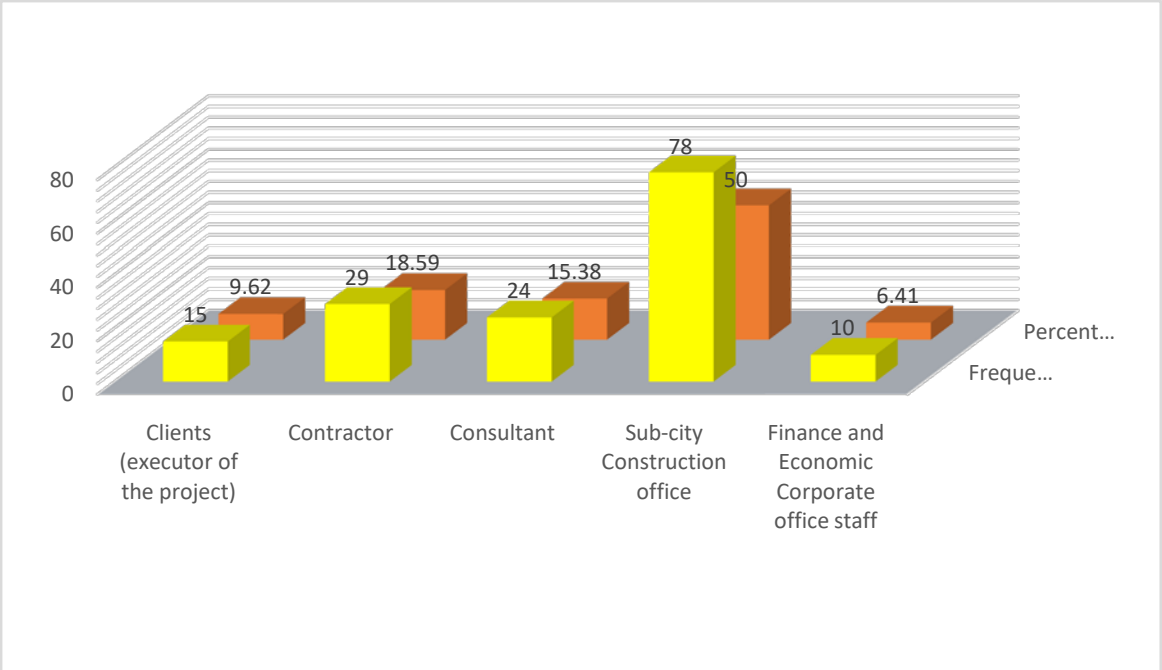
Source: Survey data, 2022

Looking at the demographic profile of the respondents, the majority 65.4% of the participants were male whereas 34/6% of them were females. Regarding the age category of the respondents 42(27%) of them were between 25 and 35, the majority 82(52.5%) were between 36-45, and the remaining 32(20.5%) were attained above 46 years during the time of data collection. Concerning to the educational background of the participants 82(52.56%) had first degree and the rest 74(47.44%) had MA/MSc degree. Hence most of the respondents were seen educated, assumed they are capable of conceptualizing and respond better on issues and practices of the case under study.

4.2.4 The Current Work Place and Job Status of the Respondents

Respondents were selected from varies work place as per the objectives of the study. Hence as we can see from fig 4.1 below, their current work place shows, 78(50%) from sub-city construction office, 28(19) contractors, 24(15.38%) consultant and the rest 15(9%) and 10(6%) were from executer of the projects (client) and finance and economic corporate office staff members respectively.

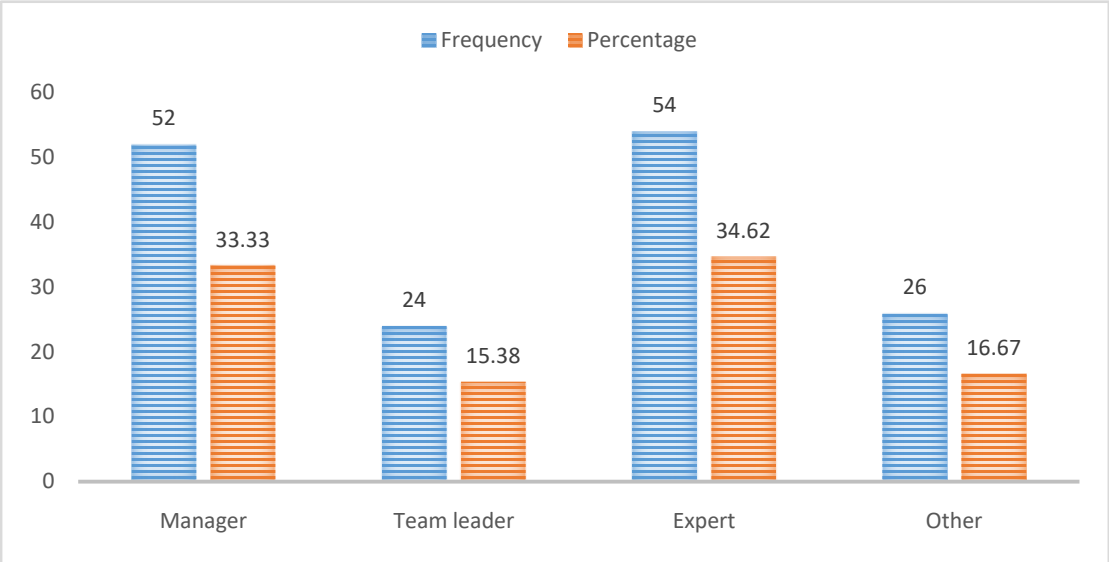
Fig 4.1 Current Work Place/Office of the Respondents



Source: Own Survey 2022

Fig 4.2 below describes the job position of the respondents. Accordingly the majority of the respondents were experts working in the sub city construction and finance office constituting 54(34.6%), followed by managers (mostly from consultant RE and Contractors office) constituting 33.3% of the total participants. The remaining 26(16.7%) of them had different position such as design officers and supervisors in the construction sector of the study area.

Fig 4.2 Respondents by their Job Position

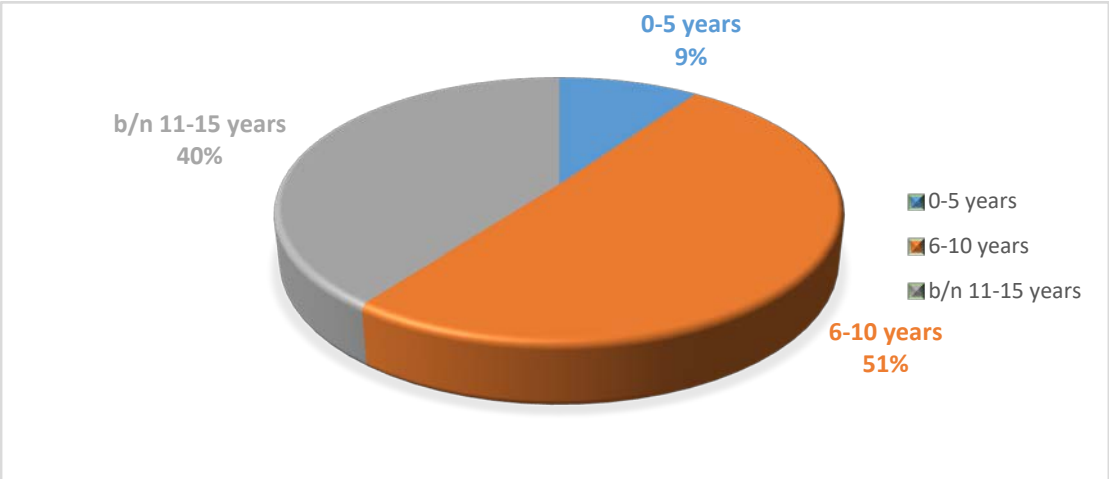


Source: Source: Own Survey 2022

4.2.4. Experience of Respondents

As fig 4.3, below shows the majority of the respondents 141(90%) have more than 6 years of work experience in their position so that they could provide as much information as possible for the study. More specifically, 79(51%) between 6-10 years, 62(40%) had worked between 11 to 15 years, and only few of them 5(10%) had below 5 years of work experience.

Fig 4.3 work experience of the Respondents



Source: Source: Own Survey 2022

Basing on the objectives of the study, the factors affecting sustainable building

projects in study area were categorized into five categories: political and socio-cultural factors, financial factors, economic factors, technological factors, and material and environmental factors. Then respondents were addressed so that they rate the different barriers found under each category using a five-point Likert scale. Finally, the top barriers were ranked using RII.

4.3.1 Political and Socio-cultural Factors

To know the political and socio-cultural factors to the application of sustainable buildings, professionals were given seven questions and were asked to rate them based on a Likert scale (From strongly disagree to strongly agree).

Table 4.3 Ranking of Political and Socio-cultural Factors

Hypothesized factors	Responses (Ranking)					ΣW	Mean ΣW/N	RII	Rank
	1	**2**	**3**	**4**	**5**				
Lack of governmental support, incentives and promotion for the adoption of SBP	12	25.	15	63	41	589	3.62	0.723	5th
difficulties in gaining approval of new technologies for building codes	19	13.	17	61	46	616	3.65	0.731	4th
Inadequate awareness among the public body about the concept and benefits of SB	10	21	31	56	38	588	3.58	0.717	6th
Lack of strict & enforceable government policies & urban land use planning on SB issues.	11	8	19	56	62	610	3.96	0.792	2nd
Lack of consensus and poor understanding of the SB project objectives and requirements	8	21	11	62	54	633	3.85	0.771	3rd
Resistance to change (on construction methods practiced and building materials used.	24	26	21	46	39	621	3.32	0.664	7th
shipping delays, and additional work delays (roads, infrastructure, and public services)	9	7	8	78	54	589	4.03	0.806	1st

Source: Survey outcome and own computation (2022)

Table 4.3 shows the relative importance index RII analysis for political and socio-cultural factors affecting the adoption and implementation of sustainable building in the study area. Accordingly shipping delays, and additional work delays

(roads, infrastructure, and public services) with RII of 0.81 was ranked as the most significant barrier. This tells us that delays and incomplete provision of infrastructures like road, power, fuel and necessary services that are expected from the public sectors like shipping, getting acute declaration etc. are affecting the implementation of Sustainable building projects.

The next significant facto ranked second was lack of strict & enforceable government policies & urban land use planning on sustainable building issues having RII value 0.792. The findings of the study imply that current building codes do not incorporate standards that label building as sustainable. Furthermore, current regulations are not enforcing and less effort is being made according to the study. But, in the new SB market, it is necessary to establish a regulation that will force companies to comply (Chan, 2017). Hence, the government should play an active role.

The third most significant political and socio-cultural factor was lack of consensus and poor understanding of the sustainable building project objectives and requirements with RII 0.771. The result of finding reveals that there is still gap and lack of common understanding about what sustainable building actually means among government bodies leading to poor understanding of the project objectives and requirements. The demand for sustainable buildings is increased if the client's awareness about the threat that current buildings pose on the environment and the benefits of environmentally sustainable buildings.

The forth ranked factors with RII 0.731 is difficulties in gaining approval of new technologies for building codes and uncertainty about approvals. The absence of a building certification system is true for many African countries where Ethiopia is no exception. Informants from the conducted interview with client confirmed that, *"A certification system is necessary to label a building as sustainable. Certification systems offer the possibility to measure and compare the sustainable performance of buildings by applying a set of quantifiable criteria."* Hence, without having a national building certificate it will be difficult to evaluate a building and give it rank.

The fifth ranked factor was lack of governmental support, incentives and promotion for the adoption of sustainable building principles with RII 0.723. This shows that there is a lack of government strategy and incentive to enforce the adoption of sustainable building principle within the building sector. Hence, the government is expected to play key role in the promotion of sustainable building using financial and non-financial incentives as discussed in the literature section.

The six ranked factor with RII 0.717 was inadequate awareness and knowledge among the public body about the concept and benefits of sustainable buildings, reviling that there is a gap in the conceiving what sustainable building mean with in the public bodies. The last and the seventh ranked political and social factor in the survey was resistance to change (on construction methods practiced and building materials used. With RII 0.664. This tells us that there are resistances to accept new ways of dealing with sustainable building principles change especially to construction methods practiced, building materials used and the overall advantage of sustainable construction.

Literatures also proved that, builder incentive is an issue to the construction industries to practice the green construction (Ametepey O, et al,2015). The construction industries will only implement the green practice in their project when they get incentive by government or private sector. However, there are few of institution and organization that provide builder incentive. This will bring the financial issue to the construction industry that concern about the profit and refuse to practice the sustainable construction.

Therefore, from the overall result, the government together with the relevant stakeholders found in the construction industry should play a major role by formulating an appropriate strategy to promote the uptake of sustainable building through setting policies and regulations. Social sustainability of construction projects are crucial element for sustainable development. The absence of an institution that

facilitates the adoption of sustainable buildings is seriously affecting the adoption of sustainable building in Ethiopia. Ethiopia is not a member of the green building council currently. Hence, establishing institutions is very crucial to address the barriers preventing the adoption of sustainable buildings.

4.3.2 Financial Factors Affecting Sustainable Building Projects

Table 4.4 Ranking of Financial Factors

Hypothesized factors	Responses (Ranking)					Mean	RII	Rank
	1	2	3	4	5			
lack of financial institutions and financial resources for sustainable buildings	13	27	10	49	57	3.70	0.741	2nd
Budget constraint for adopting contemporary sustainable construction technologies & materials	30	21	8	48	49	3.44	0.683	4th
lack of promoting green procurement and funding of SP through financial incentives	16	19	16	68	37	3.58	0.717	3rd
Perception of higher costs attached to SB as it requires more initial investment than others.	15	27	26	49	39	3.41	0.670	5th
Financial incompetence of domestic Contractor and Subcontractors to undertake SBP.	41	54	24	17	20	2.49	0.499	6th
lack of attention to the costs associated with green construction during procurement	14	11	9	69	53	3.87	0.774	1s

Source: Survey results and own computation (2022)

To know the major financial factors affecting the prevalence and implementation of sustainable building respondents were given six questions. Accordingly, lack of attention to the costs associated with green construction during procurement was considered as the most significant barrier by respondents with RII 0.77. The second ranked financial factor rated by the respondents was lack of financial institutions and financial resources for sustainable buildings with RII 0.74. This shows that the adoption and implementation of sustainable building is challenged by lack of financial

resources that hampers the shift to more green/ sustainable buildings.

The third factor with RII 0.717 was lack of promoting green procurement and funding of sustainable building through financial incentives. This reviles that there is lack of promoting green procurement and funding of sustainable project through financial incentives like tax, green loans. Developers also face a risk that the lending institutions may not understand high performance aspects and their value in the marketplace. The fourth ranked factor was budget constraint for adopting contemporary sustainable construction technologies & materials with RII 0.683 and mean value 0.68. Showing that the adoption of contemporary building technologies and associated building materials are not readily available due to budget constraints.

Then fifth significant factor ranked with RII 0.670 was perception of higher costs attached to sustainable building as it requires more initial investment than others. In line with this literatures also supported that, indeed, there is a widespread perception that sustainable buildings are higher in cost than the marketplace is will pay for; even when they are not (Zerkin, 2006). This is believed to be due to the lack of accurate, thorough, and quantifiable information regarding the financial and economic impacts of high performance buildings (Suttell, 2006).

The six ranked factor was financial incompetence of domestic Contractor and Subcontractors to undertake sustainable building with RII=0.499. However as we can see from the table, the mean value scored for this item was 2.49 which is below the average level. Even the RII=0.499 means the item is less significant to affect the stated variable. This shows that, domestic Contractor and Subcontractors are not financially incompetent of to construct and undertake sustainable building project, rather it was due to the above listed financial factors

In general, the construction industry has been relying on the government building codes to plan and execute most construction projects. Political factors are the internal

barriers that happened within the organization and these barriers are controllable though the manipulation of upper management team. Hence, Stakeholders at all levels require urgent and effective large scale capacity building and awareness program including technical knowledge needed to deliver solutions

4.3.3 Economic Factors

Table 4.5 Ranking of Economic Factors

Hypothesized factors	Responses (Ranking)					Mean (ΣW/N)	RII	Rank
	1	**2**	**3**	**4**	**5**			
lack of accurate, information regarding the economic impacts of high performance buildings	13	11	23	60	38	3.776	0.755	5
lack of market demand and uncertainties involved in the implementation of new technologies	14	17	8	71	46	3.949	0.790	3
Inefficient preparation of specification BOQs and reliable cost information for green construction	9	19	20	59	38	3.769	0.754	6
Fluctuation in price of imported material due to excessive reliance on imported inputs	7	13	15	73	47	3.910	0.782	4
Lack of fund to finance SBP due to lack of foreign currency.	6	26	9	59	38	4.058	0.812	1
Lack of standards price adjustments & market regulation for controlling SB materials	10	13	9	62	40	3.981	0.796	2

Source: *Survey outcome and own computation (2022)*

Again, for the analysis of the economic factors affecting the adoption of sustainable building projects in the study area, RII ranking of the stated factors is conducted. As we can see from the above table 4.5, the RII results is higher raging from RII=0.812 to 0.754 and mean score value for each item is above the average level ranged from 4.05 to 3.76. The higher value of the index of relative importance (RII) is the critical cause or impact component. This shows that the raised economic factors are highly significant in affecting the implementation of sustainable building principles in public construction projects in the study area.

Accordingly the first ranked item was Lack of fund to finance sustainable building

projects due to lack of foreign currency and lack of cash (hard currency, LC) with RII 0.81 and standard deviation 4.058. This shows that the completion of sustainable building projects are assumed to be affected by lack of foreign currency and exchange rates. The second ranking factor was Lack of standards price adjustments & market regulation for controlling sustainable materials having RII 0.796, and mean score 3.981. This finding reviled that the government is expected to set a standardized price adjustment mechanisms to control the supply of sustainable building materials particularly those which are imported from abroad.

Furthermore, lack of market demand and risks/uncertainties involved in the implementation of new technologies was ranked third significant economic factor affecting the adoption and implementation of sustainable building projects scoring mean and RII 3.949 and 0.790 respectively. The available literatures also confirmed that, Sustainable construction may not have economic benefits in the short-term, because of the increased initial cost. However, the economic benefits can increase in the long-term because building sustainably can reduce maintenance and operating costs during the building's lifecycle.

The fourth ranking significant factor was fluctuation in price of imported material due to excessive reliance on imported inputs with RII 0.782 and mean score 3.91. This shows that as most construction contractors relied heavily on imported materials, the fluctuation price and unpredictable pricing of imported materials are negatively affecting the realization of sustainable building projects.

The fifth ranked factor was lack of accurate, information regarding the economic impacts of high performance building with RII 0.755 and mean 3.776. This showed occurrence of poor information sharing at about the economic impacts or importance of sustainable building, its procurement and supply decision makers was one of the reason for failure to adopt sustainable building project principles. The six factor was inefficient preparation of specification BOQs and reliable cost information for green construction having RII 0.754 and mean score 3.769.

This finding tells us that, there is inefficient preparation of specification for sustainable construction bill of quantities and the need for reliable cost information for green construction. This all lead to miss information to the suppliers during purchase time, if it's already purchased it will cause loss of a of lot birr and if they try to return and change the material it will cause extra time, extra transportation. However, the high initial capital cost and lack of any visible market value is a deterrent to the practical implementation of economic sustainability.

4.3.4 Technological Factors Affecting Sustainable Building Projects

Table 4.6 Ranking of Technological Factors

Hypothesized factors	Responses (Ranking)					Mean	RII	Rank
	1	**2**	**3**	**4**	**5**			
Lack of technical know-how to use sustainable construction technologies and expected skills	13	13	23	52	54	3.76	0.75	**3**
directly copying the western construction designs and contexts without considering what the site demands and the society needs	7	7	0	68	72	4.21	0.84	**1**
Lack of experienced expertise, research institutes, and educational programs, i	11	11	18	58	57	3.88	0.77	**2**
lack of skilled labour to design, install and maintain new SC technologies	14	14	11	56	49	3.64	0.72	**4**
the construction sector is dominated by firms that are not interested in technology changes	21	21	10	60	48	3.62	0.72	**5**
lack of compliance to building requirements when de-signing and constructing	38	38	21	28	10	2.44	0.48	**7**
lack of competent contractors, consultant and enforcing agent with the required skill on SCP	12	12	24	48	44	3.53	0.78	**6**

Source: *Survey outcome and own computation (2022)*

To know the technological factors as to how they affect the application of sustainable buildings, professionals were given seven questions and were asked to rate them based on a Likert scale (From strongly disagree to strongly agree). As shown on table 4.6, with the exception of the seventh ranked factor which scored below the average,

the remaining six factors were found very significant technological factors affecting the application of sustainable building practices in the study area.

From the listed item, the first ranked factor was most buildings are constructed similarly to the westerners RII0.842. The mean value with 4.21also reviled the item is highly practiced in the study area . This shows that there is a practice of directly copying the western construction designs and contexts without considering what the site demands and the society needs. This finding is in line with studies, that there is a practical norm for the use of materials imported from abroad like steel and glass, instead of using locally found materials (Helawi and Zegeye, 2012). However, Glass tower buildings constructed by imitating foreign countries has resulted in high energy consumption.

The second, the third and the forth ranked technological factors were related to lack of skill and know how about sustainable technological issues. Hence, the second significant technological factor was lack of experienced expertise, research institutes, educational programs, and information to adopt/implement sustainable building principles with RII=0.777 and mean value 3.88, and the third factor was lack of technical know-how to use sustainable construction technologies and expected skills having mean value 3.76 and RII 0.754. The fourth ranked significant factor was lack of skilled labour to design, install and maintain new sustainable construction technologies having mean score 3.64 and RII rank with 0.728.

Barriers such as lack of professional knowledge and expertise, the lack of information, the high initial cost of SBs, and the lack of financing schemes can contribute to resistance for change in construction practices. The finding confirms that the necessary technologies are not available to implement sustainable building. Secondary sources also confirmed that, developing countries rely on developed nations to import technologies. Especially in our country since the tax imposed on an imported good is high, the cost of technologies will increase. If professionals are not acquainted with the necessary knowledge they will tend to continue with the usual mode of constructing buildings. Hence, construction professionals should be familiar with

Sustainable practices to promote the adoption of SB.

The next fifth significant factor with RII 0.724 was the scenario that construction sector is dominated by firms that are not interested in technology changes. This item also scored mean value above the average 3.62 showing the tendency such occurrence is higher in the study area. This finding confirmed that, the construction sector is dominated by firms that are not interested in technology changes which they think could involve risks and extra costs. Similarly the six ranked factor was lack of competent contractors.

The less significant factor having mean score 2.44 and ranked seventh was lack of compliance to building guidelines or requirements when de-signing and constructing with RII 0.488.

4.3.5 Ranking of Material and Environmental Factors

Respondents were requested provide their perception about the material and environmental challenging factors affecting the application and adoption of sustainable building principles in the study area. The ranking was separately done for the material and environmental factors from the result portrayed on table 4.7 below.

Table 4.7 Ranking of Material Factors

Material issues	Responses (Ranking)					mean	RII	Rank
	1	**2**	**3**	**4**	**5**			
inefficient provision of specification and use of available sustainable performance materials	12	15	11	69	49	3.885	0.777	**1**
Limited range of green products/materials which is restrict to create cost efficient designs.	51	69	8	21	7.1	2.130	0.426	**4**
Lack of adoption of Lean method of construction	14	12	16	60	54	3.821	0.764	**2**
Fail to consider renewable, recycled & local materials as requirement during material selection	16	14	18	61	47	3.699	0.740	**3**
Appropriate environmentally friendly product for a particular purpose is not available locally,	67	58	12	12	7	1.936	0.387	**5**

Source: *Survey outcome and own computation (2022)*

As we can see from the above table that, the first ranked material factor was inefficient provision of specification and use of available sustainable performance

materials with RII 0.77 and mean score 3.88, followed by Lack of adoption of Lean method of construction having RII 0.764 and mean score 3.82. Since the level of sustainable building practice is low in our country, it will be difficult to have a database about the type of material to use, method of construction, and others. Hence, unless the information is available and can be accessed, it will be difficult to shift from using the conventional method of construction.

The third ranked factor was failing to consider renewable, recycled & local materials as requirement during material selection with RII 0.74 and mean value 3.69. Similarly, other scholars assert that instead of importing materials from abroad and constructing tall buildings, it is possible to construct a city with "double-story" sustainable building through the collaboration of different professionals (Helawi and Zegeye, 2012).

The fourth and the fifth ranked factors were related to availability and utilization of green and renewable products, however these item were not seen significant. As we see the fourth ranked item with RII 0.426 was limited range of green products/materials which is restrict to create cost efficient designs had mean 2.13 which is below the average value, meaning this item was not as such significant. Similarly the firth item with RII 0.387 and mean 1.93 was appropriate &environmentally friendly product for a particular purpose is not available locally. This shows that these factor is not serious because the there is sufficient, appropriate &environmentally friendly product rather it is the way of utilizing it that makes a challenging for the adoption of green buildings.

In line with the above finding, a study has found that some attributes of a sustainable building can be implemented and applied in Addis Ababa if it is possible to take advantage of good climate conditions, make an appropriate selection of material, and giving attention to the social aspect (Nura, 2018). The study concludes attributes such as energy consumption and indoor air quality can be achieved consequently. Besides, another study concludes that energy efficiency, water efficiency, and the use of

Sustainable material and resource can be implemented (Fikeremariam, 2019).

Table 4.8 Ranking of Environmental Factors

Environmental Factors	Responses (Ranking)					Mean	RII	Rank
	1	**2**	**3**	**4**	**5**			
lack of utilizing environmental sustainability check lists during monitoring of projects	13	12	25	59	47	3.737	0.747	**3**
there is no standard assessment criterion for products that allows environmentally evaluated	17	31	54	37	17	3.038	0.608	**4**
Fail to encourage the use of renewable energy sources.	46	49	26	31	4	2.346	0.469	**5**
Destruction of all existing features of ecological value surrounding the construction zone.	19	14	13	46	64	3.782	0.756	**1**
Lack of considering the wellbeing of construction workers, building occupants during procurement.	9	13	25	67	42	3.769	0.754	**2**

Source: *Survey outcome and own computation (2022)*

As we can from the table, all the outlined factors have got RII result above the average score, showing that they have higher impact for the stated variable. The higher value of the index of relative importance (RII) is the critical cause or impact component (Reid, S. (2007).

Accordingly, the first ranking environmental factor was destruction of all existing features of ecological value surrounding the construction zone with RII 0.756, meaning that the destruction of many natural and environmental features before and during the construction phases of construction building projects discourages the adoption of sustainable building principles. The next significant factor was lack of considering the wellbeing of construction workers, building occupants during procurement having RII 0.754. This finding tells us that, there was lack of considering the comfort and wellbeing of construction workers and building occupants during procurement process.

The third significant factor was lack of utilizing environmental sustainability check

lists during monitoring of projects with RII 0.747, reviling that there is poor practice of utilizing environmental sustainability checklists which intern impedes the monitoring activities of sustainable building principles. Similarly, the fourth factors with RII 0.608 was there is no standard assessment criterion for products that allows environmentally evaluated. The fifth factor receiving RII 0.469 was lack of encouraging the use of renewable energy source, receiving below the average mean value i.e. 2.34, this item was not considered significant as compared to the other listed factors.

4.4 The Effects of Sustainable Building/Green Building projects

Table 4.9 The Effects of Sustainable Building/ projects

hypothesized effects	Mean (ΣW/N)	RII	Rank
Cost efficiency/effectiveness of construction projects	3.872	0.774	**7**
on Sociocultural benefits	4.256	0.851	**6**
Safety and human adaptation	4.365	0.873	**5**
Environmental Benefits	4.519	0.904	**3**
Improving the quality of life	4.821	0.964	**1**
Economic Benefits and wise use of resources	4.385	0.877	**4**
conservation of resource	4.603	0.921	**2**
Average Mean Value	**4.403**		

Source: *Source: Survey data, 2022*

Sustainable construction is, the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. In this part, respondents were requested to rate the effects of sustainable building if it is implemented under its prescribed principles.

Numerous researchers have shown how green building rating systems have various intrinsic advantages, and offers solutions to many environmental related problems, relative to the convectional practices. The various benefits that drive green building on the construction projects are summarized in Table 4.10. Respondents who participated in this study were asked to rank their level of agreement of green building

benefits in possible green construction projects.

Accordingly, the average mean value of 4.40 showed that adopting sustainable building has significant positive effects and the effects of the hypothesized factors will also be significantly increasing if it is adopted and implemented. Specifically, the hypothesized effects shows, improving the quality of life has the highest mean and RII 4.82 and 0.964 respectively, then, conservation of resource, environmental benefits, economic benefits and wise use of resources has each scored mean 4.603, 4.519, 4.385 and RII 0.921, 0.904 and 0.877 respectively.

Similarly Safety and human adaptation is also significantly increasing as the item scored mean 4.365 and RII 0.873. Sociocultural benefits and cost efficiency/effectiveness of construction projects were also observed significantly increased having mean 4.2, 3.87 and RII 0.851 and 0.774 respectively.

From the finding we can just conclude that the adoption and implementation of sustainable building principles on the public construction projects has a lots of benefits and among which is improving the quality of life, conservation of resource, increased environmental benefits, economic benefits and wise use of resources, improved safety and human adaptation, enhanced sociocultural benefits and improved the cost efficiency/effectiveness of construction projects.

In addition, Udechukwu and Johnson (2008) classify green building benefits into three areas: environmental, economic and social as supported by many literatures in sustainability. Chan et al (2009) laid emphasis on business case for green building development in Asian cites. The identified business reasons include lower operational costs and lower life-cycle costs. They advocated that investment in green building will not only benefit the buyers or consumers but also provides business opportunity for architects, developers, contractors and almost all stakeholders in the built environment. Similarly, enhanced day light and reduced toxicity in indoor environment increases employees productivity up to 16% and absenteeism.

In general, Green practices and strategies in public building construction development has been proved to bring obvious positive contribution to the environment while green building has been identified as the current trend in environmental protection. However, various benefits and impediments are attracting and holding developers to implement and practice green in their construction projects.

Literatures also supported that, one of the major problems that led to the concept of sustainability is the excessive consumption of resources. The first principle of sustainable building is about the wise use of available resources. For example in terms of reducing the consumption of energy. There are mechanisms to conserve energy such as a proper selection of materials and construction methods, insulating the building envelope, use of passive energy design (use of natural energy for heating and cooling), and designing for low energy-intensive transportation (Akadiri et al, 2012).

Construction of buildings consumes a large amount of raw material from nature. The problem is not with consumption alone but most of the materials used for construction are non-renewable. For example, steel, which is one of the most used construction materials is obtained from iron ore. Iron ore on other hand is non-renewable. There are several techniques to reduce the consumption of water. Some of the ways are treating and reclaiming wastewater for onsite use, Reclaim and reuse rainwater/gray water, use of low-flow plumbing fixtures, design for dual plumbing, and storm water management (Kibert 2016; Akadiri et al, 2012).

Reusing resources that have already been used for a certain purpose is also another way of minimizing pollution and waste. In addition, in urban areas, it is the water that runoff from the roads that pollute stream. But, detaining, retaining, and reusing storm water using various techniques not only minimize the consumption of potable water but also reduces contamination of water

4.5 Inferential Analysis

Under this section inferential analysis of the data collected is presented. As described above inferential analysis is conducted using correlation and regression analysis.

Accordingly, the researcher conducted a correlation and multiple regression analysis so as to test the relationship among independent variables and dependent variable. The regression analysis is conducted to know by how much the independent variable explains the dependent variable. Before going through the inferential analysis, it is better to test the assumptions of regression presented as follows.

4.5.1 Correlation Analysis

Correlations are the measure of the linear relationship between two variables. A correlation coefficient has a value ranging from -1 to 1. Values that are closer to the absolute value of 1 indicate that there is a strong positive relationship, closer to -1 strong negative correlation between the variables being correlated whereas values closer to 0 indicates that there is little or no linear relationship. As described by Andy (2006), the correlation is a commonly used measure of the size of an effect: values of ± 0.1 represent a small effect, ± 0.3 is a medium effect and ± 0.5 is a large effect.

Table 4.10: Correlation matrix between dependent and independent variables

Correlations							
		PSCF	FF	EF	TF	MEF	SBF
PSCF	Pearson Correlation	1	.415**	.412**	.396**	.176*	.488**
	Sig. (2-tailed)		.000	.000	.000	.022	.000
	N	156	156	156	156	156	156
FF	Pearson Correlation	.415**	1	.537**	.477**	196*	.532**
	Sig. (2-tailed)	.000		.000	.000	.011	.000
	N	156	156	156	156	156	156
EF	Pearson Correlation	.412**	.537**	1	.412**	.044	.381**
	Sig. (2-tailed)	.000	.000		.000	.575	.000
	N	156	156	156	156	156	156
TF	Pearson Correlation	.396**	.477**	.538**	1	.504**	.504**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	156	156	156	156	156	156
MEF	Pearson Correlation	.176*	-.196*	.044	.134	1	.376
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	168	168	168	168	168	168
SBF	Pearson Correlation	.488**	.532**	.381**	.504**	.376	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	156	156	156	156	156	156
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

In this correlational analysis the sustainable building is taken as dependent variable and as independent variables different factors affecting sustainable/green buildings (political and social factors, economic and financial, technological and material, and environmental related factors) are used. This provided correlation Coefficients which indicated the strength and direction of relationship. The p-value also indicated the probability of this relationship's significance. The correlation between each challenging factors and sustainable building was seen in the above table. Thus, the result of correlation matrix between each factors and adoption of sustainable building were analyzed as follow:

As it is indicated in the table above, all the resulting values has positive correlation with the dependent variable. Accordingly there was significant positive correlation between political and socio-cultural factors (PSF) with sustainable building Factors (SBF) with correlation coefficient of .488 (r=.488) and significance less than 0.001.

Pearson correlation test was also conducted for Financial Factor (FF) and sustainable building factors (SBF). The result indicates that, there is strong positive relationship between financial factor and sustainable building with a Pearson correlation coefficient of 0.532 (r=0.532) and significance value is less than 0.01. This significance tells that there is positive relationship between financial factor and sustainable building.

In addition, as it is shown in the table 4.9 above there is positive correlation between of economic factors and sustainable building with correlation coefficient of .381 (r=0.381) and significance value less than 0.01.

Similarly there is strong positive correlation between of technological factors and sustainable building with correlation coefficient of 0.504 (r=0.504) and significance value less than 0.01 Hence, technological factors and sustainable building are strongly correlated. Pearson correlation test was also conducted for material and environmental factor (MEF) and sustainable building factors (SBF). The result indicates that, there is strong positive relationship between material and environmental factors with sustainable building with a Pearson correlation coefficient of 0.376 (r=0.376) and significance value is less than 0.01. This significance tells that there is strong relationship between financial factor and sustainable building.

4.5.2 Regression Analysis

The collected data form the respondents were used to make the inferential analysis of the study. The researcher conducted a multiple regression analysis so as to test and

predict the impact of challenging factors of the independent variables on the dependent variable. This regression analysis is conducted to know by how much the independent variable explains the dependent variable.

The regression was conducted between factors affecting sustainable building (independents variables) i.e. political and social factors, economic and financial, technological and material, and environmental related factors and Sustainable building factors (SBF) which was the dependent variable

The model applied to show this influence is presented as follows;

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 4X5 + \varepsilon$$

Where: **Y** = dependent variable (sustainable building), β **0** = Constant, β 1, β 2…. 5= the coefficients of the independent variables that are determined, ***X1*****=** Political and social factors (PSF), *X2***=** Economic factors (EF), *X3*=Financial factors (FF), ***X4*****=** Technology and Material Factors (TMF), ***X5*****=** Environmental Related Factors (ERF) and ε = error term

Multiple Regression Assumptions

In order to get the reliable and dependable result of the analysis, all the assumptions of the multiple regression should be fulfilled before making the regression analysis interpretation. Therefore, the following pre regression assumptions and the assumption results are presented on the following topics of this research paper.

4.5.2.1 Reliability Analysis

Regarding the reliability of the questionnaire, the internal consistency was computed using Cronbach's Alpha reliability test since a Cronbach's Alpha measure of internal consistency indicates how closely related a set of items, such as survey questions.

Cronbach's Alpaha was calculated for the 43 ratable items with respect to each scale. The results were shown in the following table.

Table.4.11 Cronbach Alpha pretest

Indicators	**Number of items**	**Cronbach Alpha**
Political and Socio-cultural Factors	7	.821
Financial Factors	6	.821
Economic Factors	6	.872
Technological Factors	6	.897
Material and Environmental Factors	10	.918
The Effects of Sustainable Building/Green Building projects	8	.946
Overall Results	**43**	**.879**

Source: Survey Result 2022

As can be seen form SPSS generated data on Table 4.11, the overall calculated coefficient Cronbach's alpha for this study was found to be greater than 0.7 for all variables, which is confirming the variables to be internally consistent.

4.5.2.2 Assumptions of Multi-collinearity

The multi- collinearity test is a test to identify a strong correlation between two or more predictors in a regression model. This assumption can be assessed by examining tolerance and the variance inflation factor (VIF). Multicollinearity can affect any regression model with more than one predictor. It occurs when two or more predictor variables overlap so much in what they measure that their effects are indistinguishable.

Table: 4.12 Multi-Collinearity Test

model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Political and Socio-cultural Factors (PSF)	.683	1.464
Financial Factor (FF)	.402	1.490
Economic Factor (EF)	.366	1.735
Technological Factor (TF) (CMR)	.322	1.101
Material and Environmental Factors (MEF)	.375	1.668

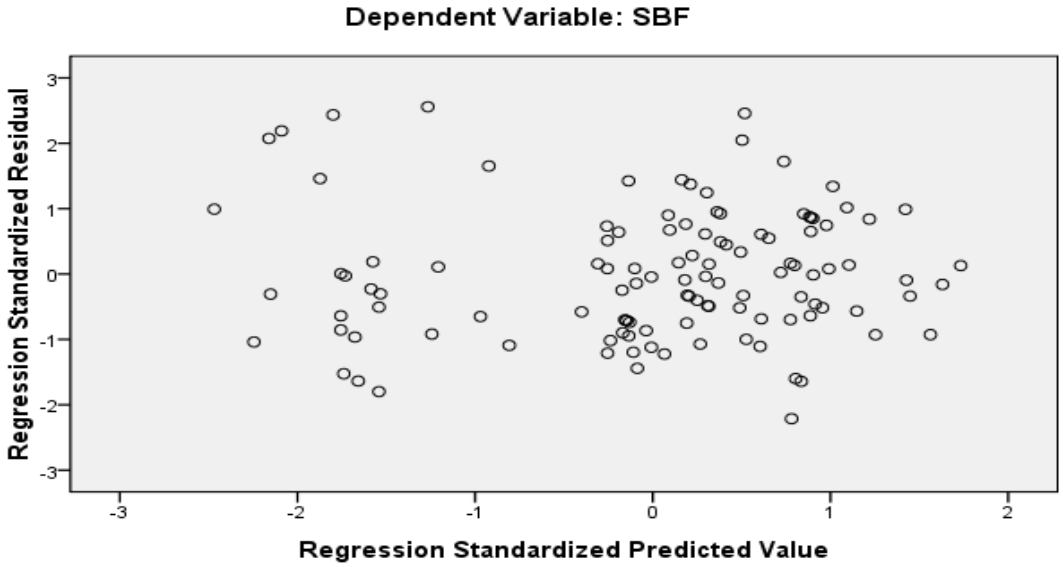
a. Dependent Variable: SBF

A good regression model must not have a strong correlation among its independent variables or must not have a multi-collinearity problem and that the value of variance inflation factor (VIF) must have a value between 1 and 10 and the tolerance level should be more than 0.2. The result in table 4.-- show that the collinearity between independent variables has no series problem Since the value of tolerance for all independent variable is greater than 0.1 and all VIF is less than ten (VIF<10).

4.5.2.3 Homoscedasticity

In Homoscedasticity assumption, the variance of error terms are similar across the independent variables. At each level of the predictor variable(s), the variance of the residual terms should be constant. This just means that the residuals at each level of the predictor(s) should have the same variance (homoscedasticity); when the variances are very unequal there is said to be heteroscedasticity (Field, 2009). For a basic analysis, we first plot *ZRESID (Y-axis) against *ZPRED (X-axis) on SPSS because this plot is useful to determine whether the assumptions of random errors and homoscedasticity have been met (Field, 2009). The graph of *ZRESID and *ZPRED should look like a random array of dots evenly dispersed around zero. (Ronelle M. Krieger, 2010).

Figure 4.5 Scatterplot based on Residual



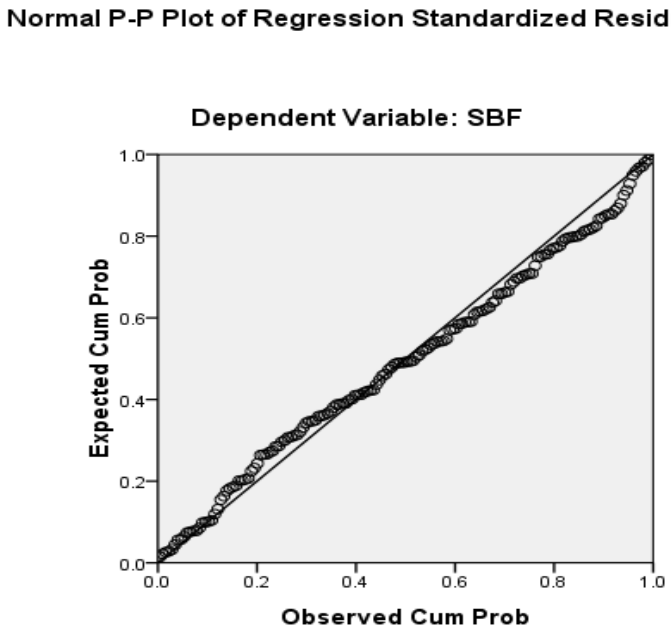
Source: Survey data, 2022

As can be seen in the scattered plot on fig 4.5 above, the residuals at each level of explanatory variables look like they are evenly dispersed and that the graph do not assume any type of shaped. Therefore, it is safe to say that this study has no heteroscedasticity problem.

4.5.2.3 Normally Distributed Error vs Normally Distributed Outcome Variables

The assumption of normally distributed error states that the residuals in the model are random, normally distributed variables with a mean of 0. In general, the normal distribution makes a straight diagonal line, and the plotted residuals are compared with the diagonal. If a distribution is normal, the residual line will closely follow the diagonal (Reid, S. (2007). Hence multiple linear regression analysis requires that the error between observed and predicted values (i.e., the residuals of the regression) should be normally distributed. This assumption can best be checked by plotting residual values on a histogram with a fitted normal curve or by reviewing a Q-Q-Plot.

Figure 4.6 P-P Plot of regression standardized residual



Source: Survey data, 2022

Figure 4.6 shows that the residuals have a sound normal distribution because the plotted residuals were around the diagonal straight line instead of making any other shape or curve.

4.5.6 Results of the Regression Analysis

4.5.6.1 Regression Analysis Model Summery

A multiple regression model R-squared is determined by pairwise correlations among all the variables, including correlations of the independent variables with each other as well as with the dependent variable. The multiple correlation coefficient (R) is a measure of the strength of the relationship between Y (in this case the Sustainable building) and the five predictor variables selected for inclusion in the equation as factors affecting the adoption and implementation of sustainable building i.e. PSF, FF, EF, TF and MEF. Large values of the multiple R represent a large correlation between the predicted and observed values of the outcome. A multiple R of 1 represents a situation in which the model perfectly predicts the observed data. (Field, 2009)

Adjusted R^2 is a measure of the loss of predictive power or shrinkage in regression. The adjusted R^2 tells us how much variance in the outcome would be accounted for if the model had been derived from the population from which the sample was taken .Adjusted R-squared is always smaller than R-squared, but the difference is usually very small unless you are trying to estimate too many coefficients from too small a sample in the presence of too much noise ((Field, 2009)

Table 4.13: Model Summary table

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890[a]	.793	.585	.355

a. Predictors: (Constant), PSF, FF, EF, TF, MEF

b. Dependent Variable: SBF

Source: Survey data, 2022

Based on SPSS generated data above, the adjusted R^2 (coefficient of determination) explain 58.5% of the factor affecting the sustainable building projects as represented by the five independent variables that were studied. Therefore, a further research should be conducted to investigate the other factors (41.5%) that affects the implementation of sustainable building projects.

4.5.6.2 ANOVA Table

The most important part of the table is the F-ratio, which is a test of the null hypothesis that the regression coefficients are all equal to zero. Because R^2 is not a test of statistical significance (it only measures explained variation in Y from the predictor Xs), the F-ratio is used to test whether or not R^2 could have occurred by chance alone. In short, the F-ratio found in the ANOVA table measures the probability of chance departure from a straight line.

Table 4.14 ANOVA Table

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	61.773	5	15.116	67.929	.000[b]
	Residual	16.148	162	22.564		
	Total	77.921	167			

a. Predictors: (Constant), PSF, FF, EF, TF, MEF

b. Dependent Variable: SBF

Source: Survey data, 2022

For this survey data shown on the table 4.12 above, F is 67.929, which is significant at $p < 0.001$ (because the value in the column labeled Sig. is less than 0.001). This result tells us that there is less than a 0.1% chance that an F-ratio this large would happen, if the null hypothesis proposed about F-ratio were true. Therefore, we can conclude that our regression model results in significantly better prediction factors for sustainable/ green buildings.

4.5.6.3 Coefficients of Regression Analysis

In order to know which of the predictors' i.e. PSF, FF, EF, TF, MEF has contributed significantly to our understanding of Y (Sustainable Building factors (SBF), the following table shows Coefficients when we explore each predictor's beta (i.e., standardized regression coefficient) and its level of significance.

Table 4.15: Coefficient Table for regression analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.209	2.222		4.782	.000
	PSF	.315	.159	.1250	2.572	.011
	FF	.316	.133	.226	3.561	.001
	EF	.266	.071	170	2.557	.012
	TF	.222	.072	.191	2.691	. .008
	MEF	.162	.084	.360	5.476	.000

a. Predictors: (Constant), PSF, FF, EF, TF, MEF

b. Dependent Variable: SBF

Source: Survey data, 2022

As stated earlier, the researcher conducted a multiple regression analysis so as to test the relationship among independent variables and dependent variable. This regression analysis is conducted to know by how much the independent variable explains the dependent variable. The model applied to show this influence is presented as follows;

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 4X5 + \varepsilon,$$

As per the SPSS output above, the equation (Y = β0 + *PSF*X1 + FFX2 + EFX3 +TF X4 + MEFX5 + ε) becomes:

Y =9.209+ 0. 315 X1 + 0. 316 X2 + 0. 266 X3 + 0. 222 X4+ 0. 162X5+ 0.355

The beta values above show the magnitude of relationship between variables, higher values being an indication of strong relationship. In this study, financial factor (FF) had highest Beta coefficient of 0.316. This result implies that financial factors had highest impact on sustainable building projects. Followed by political and socio-cultural factors (PSF) having Beta value 0.315.

Whereas, economic Factor (EF), is found to be the third most significant factor affecting sustainable building Beta value of 0.216 implying that this dimension is significantly related and strongly influences the adoption of sustainable building principles for public building projects. Then the influence followed by Technological factor (TF) with Beta value 0.222 showing that if the technological factors improved by 1%, on average, the implementation and adoption of sustainable building will be increased by 0. 222 %.

The final factor affecting sustainable building was Material and Environmental factor (MEF) with Beta value 0.162. So compared to a one percent increase in the material and environmental factors, we would expect the adoption of sustainable building will increase by 0. 316% having constant the other variables.

CHAPTER FIVE

5. SUMMERY, CONCLUSION AND RECOMMENDATION

Introduction

In this section, the summery conclusion of the research finding that have been analyzed and discussed in the previous chapter are briefly presented. Furthermore, based on the findings of this study possible recommendations are made.

5.1. Summary of the Findings

The general objective of this study was to investigate the challenges of sustainable building projects in the city of Addis Ababa focusing on Addis Ketema Sub-city. Hence to achieve the above objective, the study outlined four specific objectives. Therefore summary of the finding as per the stated objectives of the study is discussed

as follows.

The first objective of the study was identify the effect of social and political factors on the development of sustainable building projects in the study area. Accordingly: shipping delays, and additional work delays (roads, infrastructure, and public services); lack of strict & enforceable government policies & urban land use planning on sustainable building issues, lack of consensus and poor understanding of the sustainable building project objectives and requirements, difficulties in gaining approval of new technologies for building codes and uncertainty about approvals; lack of governmental support, incentives and promotion for the adoption of sustainable building principles; inadequate awareness and knowledge among the public body about the concept and benefits of sustainable buildings and resistance to change (on construction methods practiced and building materials used were the most significant political and social barriers ranked by respondents impeding the adoption and implementation of sustainable building projects in the study area.

The second objective of the study was to verify financial related factors on the development of sustainable building projects in the study area. Accordingly, the finding of the study reviles that: lack of attention to the costs associated with green construction during procurement; lack of financial institutions and financial resources for sustainable buildings; lack of promoting green procurement and funding of sustainable building through financial incentives; budget constraint for adopting contemporary sustainable construction technologies & materials; higher costs attached to sustainable building as sustainable building projects requires more initial investment were the most significant economic related barriers for the adoption and implementation of sustainable building projects. However most of the respondents didn’t took financial incompetence of domestic contractor and subcontractors to undertake sustainable building as significant economic barring factor.

The third objective of the study was determine the effect of economic related factors

on the development of sustainable building projects in the study area. the finding shows that: Lack of fund to finance sustainable building projects due to lack of foreign currency and lack of cash (hard currency, LC); Lack of standards price adjustments & market regulation for controlling sustainable materials; lack of market demand and risks/uncertainties involved in the implementation of new technologies; fluctuation in price of imported material due to excessive reliance on imported inputs; lack of accurate, information regarding the economic impacts of high performance building; inefficient preparation of specification BOQs and reliable cost information were the most significant economic related barriers that negatively affecting the realization of sustainable building projects.

The fourth objective of the study was to test the effect of technological and material related factors on the development of sustainable building projects in the study area. Therefore as the finding shows: directly copying the western construction designs and contexts without considering what the site demands and the society needs; lack of skill and know how about sustainable technological issues; lack of competent contractors, consultant and enforcing agent with the required skill on sustainable construction principles were the most significant technological and skill related barrios affecting the adoption of sustainable building projects in the study area.

The fifth objective of the study was to analyze the effect of environmental and material related factors on the development of sustainable building projects in the study area. Hence the finding reviles that: inefficient provision of specification and use of available sustainable performance materials; Lack of adoption of Lean method of construction, failing to consider renewable, recycled & local materials as requirement during material selection were the most significant material related barriers while; destruction of all existing features of ecological value surrounding the construction zone; lack of considering the wellbeing of construction workers, building occupants during procurement; lack of utilizing environmental sustainability check lists during monitoring of project were the ranked significant environmental factors

affecting constructing sustainable building projects

5.2 Conclusions

The construction of conventional buildings consumes a large number of resources as well as release a large number of harmful substances that affect the natural environment. To curb the negative impacts of conventional buildings, the adoption of sustainable buildings plays a significant role. Based on the results of the study obtained and summary of findings the following conclusions are given.

The researcher deduced that without a shift in mentality and habits, the advancements of green buildings in Addis Ababa will be a very difficult vision to achieve. Low investments and participation from the Government and private companies in the green building movement also creates a challenge to building practitioners to design and build more efficiently. In addition the Sub-city together with the municipality should treat the financial factor as their major barrier in practicing green building.

For the successful construction of sustainable buildings, first, the barriers to the application must be identified to overcome. Hence, the study analyzed and ranked different barriers and confirmed that Financial Factor, economic factors, technological factor, political and social factors and material and environmental factor are perceived to be the most significant factor for the successful adoption of sustainable building in the study area.

The correlation all the resulting values has positive correlation with the dependent variable. The correlation between political and socio-cultural factors (PSF) with sustainable building Factors was .488 (r=.488). In addition the correlation between Financial Factor (FF), economic factors, technological factors, and material and environmental factor (MEF) with sustainable building factors was significant and positive with Pearson correlation coefficient 0.381, 0.504, and 0.376 respectively.

In addition, the regression results shows, the adjusted R2 (coefficient of determination) explain 58.5% of the factor affecting the sustainable building projects as represented by the five independent variables that were studied.

5.3 Recommendation

The following recommendations were made for the adoption of sustainable building in the building sector based on the results of the finding:

- Creating awareness of stakeholders (clients, contractors, consultants, Addis Ketema Sub-city construction and housing management offices, land and building permit, suppliers, etc.) concerning the benefit of sustainable building. Hence, it is advisable to use exhibitions, traditional media, digital media, and other methods to enlighten relevant stakeholders about sustainable building.
- It is recommended to give training about the method of construction and overall life-cycle cost of sustainable building for the employees of construction companies through collaborating with other countries to promote the construction of a sustainable building.
- Besides the government, it is suggested that other private financial institutions should provide financial incentives to promote companies interested in sustainable building construction.
- To minimize higher investment costs, the construction of sustainable buildings can be achieved by using locally available innovative materials. Since the use of locally available materials can reduce foreign currency and reflect the culture of the nation, more research has to be conducted on materials that impose less impact on the environment, and that costs less.
- The concerned municipality construction agency and Ministries related to the construction industry are recommended to formulate appropriate strategies that stimulate the construction of sustainable buildings. They can reduce tax on sustainable technologies, formulate, and enforce environmental regulations, assist researchers financially, and upgrade current building codes to enhance

environmental and health performance. Also, recognizing and awarding companies that supply sustainable buildings will encourage companies to engage in sustainable projects.

- The organization of an independent institution is suggested that recognizes and certify sustainable buildings. The establishment of such type of organization will enhance the knowledge of professionals about sustainable building and promote a change in the building sector.
- Adopting a green building certificate is also another crucial strategy. Since the adoption of green building certificate help to establish standard providing the requirements that certify a building as sustainable, trained professionals can use it as a guideline to construct a sustainable building.
- In general, , to strategically prepare Addis Ababa's built environment for the infiltration of green/sustainable building, the government is advised to increase awareness, publicity and campaign for green buildings through active support and engagement of all stakeholders in the built sector. Support for legislative framework to enable strict compliance with a formidable green policy. Provisions of incentives to private clients, who build sustainably, education and training for professionals, provision of economically efficient alternative green products.

5.4 Direction for Further Study

The central aim of this study was to investigate the challenges of sustainable building projects in the city of Addis Ababa focusing on Addis Ketema Sub-city. Based on SPSS generated data above, the adjusted R2 (coefficient of determination) explain 58.5% of the factor affecting the sustainable building projects as represented by the five independent variables that were studied. Therefore, a further research should be conducted to investigate the other factors (41.5%) that affects the implementation of sustainable building projects.

With regards to future studies, there are several issues that need further research in the study area. First, this study did not take into account the characteristics and quality of

sustainable building by taking other practical measurements and technical procedures. For instance, generalized in terms of objective measurement, and the needs, preference, and perception of different population segments was not considered

Secondly, the context of sustainable building for privately owned building were not included in the study. It would have been better and allows generalizations if the case was conducted by including other Sub-cities, bigger towns of the nations and more importantly those privately owned buildings were assessed in terms of the challenges with sustainable building projects in their contexts.

Furthermore, one of the limitations of the research is the shortage of adequate research regarding sustainable or green building and associated empirical studies in Ethiopia. Hence, sound research could have been conducted if adequate studies were available sources regarding sustainable building within the Ethiopian context
Thus, future researches should analyze sustainable building information about the facilities, quality, and inculcating other physical measurements in terms of physical, cultural, financial and environmental conext by including both private and public building projects in Addis Ababa as well as by taking the pracits of other big regional cities like Adama, Bahirda, Hawasa, Mekele etc..

There is a lack of research on the performance of green building. There is also concern that the complexity of some green designs (technological high performance) may bring about obsolescence earlier than conventional design there is no standard assessment criterion for products that allows them to be directly evaluated, Thus, more additional studies are needed in terms of the existing context in our country, therefore design professionals must invest a lot of time in assessing potential materials and technology for the successful realization of sustainable or green buildings.

References

Abebe MT, Megento TL (2016). The city of Addis Ababa from 'Forest city' to 'Urban Heat Island'. *Assessment of urban green space dynamics.* J Urban Environ Eng.

Abeje W (2007). Which urban livelihood without adequate breathing space? A reflection on the green areas of Addis Ababa, Ethiopia: *Proceedings of the First Green Forum Conference held in Addis Ababa*, Ethiopia, 2–4.

Ahn, Y.H.; Pearce, A.R. (2007). *Green Construction:* Contractor Experiences, Expectations, and Perceptions. J. Green Build. 2, 106–122.

Aktas, B.; Ozorhon, B. (2013). *Green Building Certification Process of Existing Buildings in Developing Countries*: Cases from Turkey. J. Manag. Eng. 31,

Ametepey O, Aigbavboa C, Ansah K. (2015). Barriers to successful implementation of sustainable construction in the Ghanaian construction industry. Procedia Manufacturing. ;3:1682-9

Andy (2006). Identification of parameters for Inferential Analysis: a literature review. 42(8), 1238–1247.

Beata, J; Hans P. K; Anandasivakumar. E. & Grazyna,P. S. (2014). *Key competences of public sector project managers*. 27th IPMA World Congress.

Best, W. and Kahan, V., (2003). *Research in Education* 7th ed., New Delhi: Preltice. Hall of India Private Limmited.56p.

Burgan, B.A.; Sansom, M.R. (2006). S*ustainable steel construction.* J. Condtruct. Steel Res., 62, 1178–1183

Chan, A.P.C.; Darko, A.; Olanipekun, A.O.; Ameyaw, E.E. (2018). *Critical barriers to green building technologies adoption in developing countries:* The case of Ghana. J. Clean. Prod., 172, 1067–1079.

Chein, I. (2002). *An Introduction to Sampling*. In C. Selltiz, et al., Research Methods in Social Relations, (4th ed.). New York, Holt, Renehart and Winston.

Cole, R.; Larsson, K. GBC (2009). '98 and GB tool. *Build. Res. Inf.*, 27, 221–229

Creswell, J. W. (2009). Research Design (4th ed.). SAGE Publications, Inc.

CSA (2019). *Population and housing census annual report of Ethiopia*, Central

Statistic Authority of Ethiopia, Addis Ababa

Darko, A.; Chan, A.P.; Owusu-Manu, (2017). Drivers for implementing green building technologies: *An international survey of experts.* J. Clean. 2017, 145, 386–394.

DETR. (2010). Building a Better Quality of life: *Strategy for more Sustainable Construction*; Eland House:London, UK,

Dosumu, O. and Aigbavboa, C. (2019). Sustainable design and construction in Africa Routledge, New York, NY.

Du Plessis, C. (2002). A*genda 21 for Sustainable Construction in Developing Countries*. Report for CIB and UNEP-IETC. Pretoria, South Africa: CSIR Building and Construction Technology.

Durdyev, S.; Ismail, S. (2012). Role of the construction sector in the economic development of Turkmenistan. 29, 883–890.

Edwards, B (2008). *Green Buildings Pay*, E & FN Spon, London.

Eichholtz, P.; Kok, N.; Quigley, J.M. (2010). *Doing Well by Doing Good? Green Office Buildings*. Am. Econ. Rev100,

Ewa U. E., (2013). Root Causes of Project Abandonment in Tertiary Institutions in Nigeria, *International Business Research*, 6(11), 149 – 159.

Farzanehrafat, M., Akbarnezhad, A. & Ghoddousi, P., (2015). Analysis of Different Views towards Social Sustainability in Construction. Oulu, Finland, 32nd International Symposium on Automation and Robotics in Construction and Mining, 846-853.

Fetene A, Worku H (2013). *Planning for the conservation and sustainable use of urban forestry in Addis Ababa*, Ethiopia. Urban For Urban Green 12(3):367–379

Field, A., (2009). Discovering Statistics using SPSS. 3rd ed. London: SAGE Publication

Garman, J., Bowyer, J., Bratkovich, S., Frank, M., Fernholz, K. & Howe, J., (2011). *Building codes: barriers to green innovation*. Minneapolis: Dovetail Partners, Inc.

Girma Y, Terefe H, Pauleit S (2019). *Urban green spaces use and management in rapidly urbanizing countries: the case of emerging towns of Oromia Special Zone*

Surrounding. Finfinne, Available at https://doi.org/10.1016/j.ufug.2019.05.019

Global Alliance for Buildings and Construction, GABC (2019). Global Status Report for Buildings and Construction. *International Energy Agency and the United Nations Environment Programme*.

Graveline, S. P. (2005). *LCA's Role in the Manufacture of Construction Materials*, Building Design & Contraction, pp.36-40.

Green Leigh, N. L. & Patterson, L.M. (2006). Deconstructing to Redevelop, *Journal of the American Planning Association*, Vol. 71, No. 2, pp. 217-225

Guidry, K. (2004). *How Green Is Your Building?* An Appraiser's Guide to Sustainable Design, The Appraisal Journal,Winter, pp. 57-68.

Halliday, S. (2008). *Sustainable Construction*; Butterworth Heinemann: London, UK,

Hankinson, M. & Breytenbach, A., (2012). *Barriers that impact on the implementation of sustainable design,* In: Proceedings of Cumulus conference, hosted by Aalto University School of Art and Design, Helsinki, Finland, 24-26

Hayles, C. S. and Holdsworth, S. E. (2005) Constructing stimulus: teaching sustainability to engender change. *Fabricating Sustainability: 39th Annual Conference of the Architectural Science Association*, Victoria, New Zealand,

Herslund, A., Bottani, E., Bigliardi, B. (2017). Environmental Collaboration for Sustainability in the Construction Industry: An Exploratory Study in Italy, 9(1):

Hill, R.C.; Bowen, P.A, (2007) S*ustainable construction*: Principles and a framework for attainment. Construct. Manag. Econ., 15, 223–239.

Ilha, M.S.O.; Oliveira, L.H.; Gonçalves, O.M. (2009). *Environmental assessment of residential buildings with an emphasis on water conservation*. Build. Serv. Eng. Res.

Jacobs, E., (2011). *Sustainable Building awareness in the Free State Province, South Africa*. : Proceedings of 6th Built Environment Conference, Johannesburg, S

John, G., Clements-Croome, D. & Jeronimidis, G. (2005). *Sustainable building solutions: a review of lessons from the natural world*, Building and Environment,

Kibert, C.J. (2016). *Sustainable Construction: Green Building Design and Delivery*; John Wiley & Sons: Hoboken, NJ, USA,

Kothari C.R. (2004). *Research Methodology Methods and Techniques.* New Age International (P) Limited Publishers 4835/24.New Delhi.

Kukadia, V.; et al., (2004). *Improving Air Quality in Urban Environments*: Guidance for the Construction Industry; Building Research Establishment. London, UK,

Lockwood, C. (2006) Building the Green Way, Harvard Business Review, June, pp.129-137

Love, P.E.D., (2002). Auditing the indirect consequences of rework in construction: a case based approach, *Managerial Auditing Journal*, 17(3), 138–146.

Malhotra, N. K., & Peterson, M. (2006). Basic Research Marketing: A Decision-Making Approach (2nd ed.). Pearson Education Inc.

Milne, N., (2012). *The Reds and Sense of Green Building: Re-visited. Building the Business case for Green Commercial buildings in South Africa.* Green Building Council, Cape Town, South Africa.

Miree, I. and Toryalay, A. (2016). Operationalization of Social Sustainability in the Construction Industry from a Client Perspective (Master's Thesis), Chalmers University of Technology, Göteborg, Sweden.

Nelson, V.I., (2008). Sustainable Infrastructure Management, Coalition for Alternative Wastewater Treatment White Paper.

OECD (2016). *Organization for Economic Co-operation and Development,* Executive Summary: Environmentally Sustainable Buildings: Challenges and Policies, OECD, viewed 7 February 2022, http://www.oecd.org

Ortiz, O.; Castells, F.; Sonnemann, G. (2009. *Sustainability in the construction industry:* A review of recent developments based on LCA Consr. Build. Mater. 23, 28

Pero, M., Moretto, A., Bottani, E., Bigliardi, B. (2017). Environmental Collaboration for Sustainability in the Construction Industry: An Exploratory Study in Italy, 9(1): 1-25.

Reed, R. G. and Wilkinson, S. J. (2005). The increasing importance of sustainability for building ownership, *Journal of Corporate Real Estate*, Vol. 7, No. 4, pp. 339-35

Reid, S. (2007. Research Methods in Social Relations, (4th ed.). New York, Holt, Renehart and Winston.

Shen, L. (2010). *Project feasibility study*: The key to successful implementation of sustainable and socially responsible construction management practice.

Smith, M. (2012). *Survey of Green Growth/Environmental Sustainability*. Accounting and Indicators, Rotterdam.

Solomon, B. (2013). *On Site sanitation Options to reduce the impacts of poor Sanitation condition of 'Kochi Sefer' slum neighborhood along Jemare river*, AAU MA, Thesis

Teferi E, Abraha H (2017). *Urban heat Island effect of Addis Ababa City:* implications of urban green spaces for climate change adaptation. Climate change adaptation in Africa. Springer, Cham, pp 539–552

UNU-INWEH. (2010). Sanitation as a Key to Global Health. *United Nations University Institute for Water, Environment and Health.* (UNU-INWEH),NY.

Vasquez, R. (2011). Social sustainability consideration during planning and design: a framework of processes for construction projects (Ph.D.thesis) Clemson University, Clemson.

WBCSD (2008). Energy Efficiency in Buildings–Business Realities and Opportunitiest. Available online: http://www.wbcsd.org (accessed on 15 February 2022).

Weber, C. (2005). *The greenhouse effect*, Residential Architect, March 2005, pp. 51

World watch Institute State of the World (2013). *A World watch Institute Report on Progress toward a Sustainable Society.* World watch Institute: Washington, DC, USA. Available online: http://www.worldwatch.org/system/files/ESW03A.pdf.

Yahya, K.; Boussabaine, H. (2010). *Quantifying environmental impacts and eco-costs from brick waste*. J. Archit. Eng. Des. Manag., 6, 189–206.

Zerkin, A. J. (2006). *Mainstreaming high performance building in New York City*: A com

Annexe

Addis Ababa Science and Technology University

College of Natural & Social Sciences

Department of Business Management

MBA in Construction Management

Dear respondents, I am studying Master's degree program of Business Administration (MBA), specialization in **construction management**; which is conducted by Addis Ababa science and Technology University. The main purpose of this questionnaire survey is to collect information to ***"Investigate factors affecting the development of sustainable building projects in Addis Ababa focusing on Addis Ketema Sub-city."*** You are asked to answer the questions in the questionnaire based on your personal knowledge and experience regarding the research. Therefore, your genuine responses will help me to provide reliable and valuable suggestions and recommendations. Your response will be used only for academic purpose. Thus, you are kindly requested to provide your genuine response to the raised issues.

I would like to express my appreciation in advance for your time and consideration.

Thank you!

General Directions:

1. No need of writing your name
2. Mark " √ " tick in the box of your alternative answer(s)
3. Please give your short and precise response to the open-ended questions, without leaving any questions unanswered.

Part I: Demographic Background of the Respondents

Direction: Please provide your response by circling the letters from the given alternatives for closed ended questions.

1. Sex: a) Male b) Female
2. Age: a) Below 25 years b) 25-35 years
   c) 36-45 years d) 46 and above years
3. Your level of education/Academic status.
   1) College Diploma 2) First Degree 3) MA/MSc Degree 4) PhD
4. The office/Institution you come from
   1) Clients (executor of the project) 2) Contractor 3) Consultant
   4) Sub-city Construction office 5) Finance and Economic Corporate office staff
   5) Owner of the buildings 6. Any other position_____
5. Job status
   1) Manager 2) Team leader 3) Expert 4) Other_____
6. For how long have you been working in the stated position?
   1) 0-5 years 2) b/n 6-10 3) b/n 11-15 4) >16 years

Part II: Items for the Research Question

2.1 Political and Socio-cultural Factors

Below, there are lists of possible Socio-Political factors affecting sustainable building projects in the study area. Please rate your level of agreement using tick mark (√) in front of the items listed below on the base of rating scale where :1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree and 5= Strongly Agree

No	What is your opinion for the following Sociocultural and Political factors affecting sustainable building projects in the study area?	1	2	3	4	5
1	Lack of governmental support, incentives and promotion for the adoption and implementation of sustainable/green building principles					
2	difficulties in gaining approval of new technologies for building codes and uncertainty about approvals					
3	Inadequate awareness and knowledge among the public body about the concept and benefits of sustainable buildings					
4	Lack of provision of strict government policies and enforceable urban land use planning/policy, codes and regulation on sustainable building issues.					
5	Lack of consensus about what sustainable building actually means and					

	poor understanding of the project objectives and requirements					
6	Resistance to change especially to construction methods practiced, building materials used and the overall advantage of sustainable construction.					
7	shipping delays, and additional work to be fulfilled by government agencies (roads, infrastructure, and public services)					

8. What other Sociocultural and Political factors have you seen affecting sustainable building project in the study area? Please explain_____
_____

2.2 Financial Factors

Rank the following financial factors affecting the implementation sustainable building projects in terms of their occurrence in the study area by putting a tick in space provided under1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree and 5= Strongly Agree

No	Items	1	2	3	4	5
9	There is lack of financial institutions and financial resources that hampers the shift to more green/ sustainable buildings					
10	Budget constraint for adopting contemporary sustainable/green construction technologies and materials					
11	There is lack of promoting green procurement and funding of sustainable project through financial incentives like tax, green loans					
12	Perception of higher costs attached to green construction, as it requires more initial investment than traditional buildings.					
13	Financial incompetence of domestic Contractor and Subcontractors to construct and undertake sustainable building projects					
14	The lack of attention to the costs associated with green construction during procurement					

2.3 Economic Factors

Indicate your level of agreement for the items listed below about economic factors affecting sustainable building projects in the study area using the following rating scales.

1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree and 5= Strongly Agree

No	Items	1	2	3	4	5
15	lack of accurate, thorough, and quantifiable information regarding the economic impacts of high performance buildings					
16	lack of market demand and risks/uncertainties involved in the implementation of new technologies					
17	Inefficient preparation of specification for sustainable construction bill of quantities and the need for reliable cost information for green construction					
18	Fluctuation in price of imported material due to excessive reliance on imported construction inputs					
19	Lack of fund to finance sustainable building project completion due to lack of foreign currency and lack of cash (hard currency, LC).					
20	Lack of standards and price adjustments for sustainable building materials and lack of market regulation for controlling the quality/standards of materials					

21. What else could you add about economic and financial related factors affecting sustainable/green building projects in Addis Ketema Sub-city? _____

_____

_____

2.4 Technological Factors

Rate your level of agreement about the following technology and material related factors affect sustainable building projects in Addis Ketema Sub-city.

Where: 1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree and 5= Strongly Agree

No	Items	1	2	3	4	5
22	Lack of technical know-how to use sustainable construction technologies and expected skills by designers and professionals					
23	directly copying the western construction designs and contexts without considering what the site demands and the society needs					
24	Lack of experienced expertise, research institutes, educational programs, databases, and information to adopt and implement sustainable buildings principles					
25	lack of skilled labour to design, install and maintain new sustainable construction technologies					
26	the construction sector is dominated by firms that are not interested in technology changes which could involve risks and extra costs					
27	lack of compliance to building guidelines or requirements when de-signing and constructing					

28	lack of competent contractors, consultant and enforcing agent with the required skill/knowledge of sustainable construction projects					

29. What is your opinion about technological related the factors affecting the adoption and implementation of sustainable building construction projects in the study area?

_____

_____

2.5 Material and Environmental Factors

Rate your level of agreement about the following environmental related factors affecting sustainable building projects in Addis Ketema Sub-city?

Where: 1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree and 5= Strongly Agree

No	Items	1	2	3	4	5
	Material issues					
30	inefficient provision of specification and use of readily available sustainable and high performance materials					
31	Limited range of green products and materials which is restricting the opportunities to create cost efficient designs.					
32	Lack of adoption of Lean method of construction					
33	Fail to consider renewable/reused/salvaged/refurbished materials, recycled content, local/regional materials as a requirement during material selection process					
34	Appropriate and environmentally friendly product for a particular purpose is not available locally,					
	Environmental issues					
35	lack of the utilization of environmental sustainability check lists during monitoring of construction projects					
36	there is no standard assessment criterion for products that allows o be environmentally evaluated					
37	Fail to encourage the use of renewable energy sources.					
38	Destruction of all existing features of ecological value surrounding the construction zone.					
39	Lack of considering the comfort and wellbeing of construction workers and building occupants during procurement.					

40. Depending on your experience in the construction sector and your perceived

understanding, what else could you add about material and environmental factors that have been affecting the proper implementation of sustainable building in the study area? _____

_____

_____

2.5 The Effects of Sustainable Building/Green Building projects

Rate the Level of significance of following possible impacts of adopting Sustainable Building/Green principles for Construction projects for items their effect by putting a tick in space provided under:1=Significantly decreasing, 2=Decreasing, 3=No change

4. Increasing 5.Significantly increasing

No	What is the effects of implementing sustainable building on the following factors	1	2	3	4	5
41	the condition of resource conservation					
42	Cost efficiency/effectiveness of construction projects					
43	on Sociocultural benefits					
44	Safety and human adaptation					
45	Environmental Benefits					
46	Improving the quality of life					
47	Economic Benefits and wise use of resources					
48	conservation of resource					

ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY

College of Natural & Social Sciences

Department of Business Management

MBA in Construction Management

Interview Guide Prepared for Key Informant

Dear respondents, I am studying Master's degree program of Business Administration (MBA), specialization in **construction management**; which is conducted by Addis Ababa science and Technology University. The main purpose of this interview guide is to collect information to my research work titled "***factors affecting the development of sustainable building projects in Addis Ababa focusing on Addis Ketema Sub-city.***" Therefore, you are genuinely requested to provide as

much information as possible for the raised issues by considering your acting role and involvement in the implementation process of sustainable building practices in the study area. The interview guides include two parts. The first part is personal information of interviewee and the second part is the actual interview items for contractor, consultant and government administrative officials of the study area.

Researcher: Kiflom Haile

Tips:

Introduction (for data collector)

Self-introduction,

Explain purpose of the study

Explain some basic facts about sustainable building issues

Explain confidentiality and proceed to next steps

Part One: Personal Information

1. Sex: 1) Male 2) Female
2. Level of education attained
   1) Collage Diploma 3) BA/BE/BSC 4) MA and above
3. Your current position
   1) Clients (executor of the project) 2) Contractor 3) Consultant
   4) Government administrative official 5) Other_____
4. Experience in the current position
   1) Less than 3 years 2) 3 to 6 years 3) 7 to 10 years 4)> 10 years

Part Two: Semi Structured Interview Guide Questions

No.	Items	Probing Questions
1	What is sustainable building means to you and how it is being implemented in Addis Ababa (including the study area)?	know how about it, the benefits,
2	Is there conducive environment for the adoption and implementation of sustainable building construction projects in the current construction industry of the nation	existing polices, rules, legislations, management, integration
3	What is the support of stakeholders looks like? What are their contribution in assisting the implementation of sustainable	active actors of the construction sector (client, consultant,

	building construction project?	contractor, and end user)
4	Please briefly explain the major bottlenecks and challenges affecting the implementation of sustainable building principles in the construction sectors in Addis Ababa?	social, political, environmental, technological, financial and economic factors
5	In relation to the above question what are possible solution could you suggest to minimize the challenges and for the effective implementation of sustainable/green building construction projects?	