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JIMMA INSTITUTE OF TECHNOLOGY

SCHOOL OF GRADUATE STUDIES

FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING

CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR

ASSESSMENT ON THE EFFECTS OF SUSTAINABLE FACILITY MANAGEMENT PERFORMANCE OF PUBLIC BUILDING CONSTRUCTION: IN THE CASE OF JIMMA TOWN

A Thesis submitted to School of Graduate Studies, Jimma University, Jimma Institute of Technology, Faculty of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree Master of Science in Construction Engineering and Management

By

Mulugeta Mamo G/Maryam

September, 2021 G.C

Jimma, Ethiopia

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Advisor: DR. GETACHEW KEBEDE W. _____ _____

NAME SIGNATURE DATE

Co-Advisor: Engr. SAMSON YOHANNES _____ _____

NAME SIGNATURE DATE

DECLARATION

I declare that this research entitled "Assessment On The Effects of Sustainable Facility Management Performance of Public Building Construction: In The Case of Jimma Town" is my original work and has not been submitted as a requirement for the award of any degree in Jimma University or elsewhere.

Mulugeta Mamo G/Maryam _____ _____

CANDIDATE SIGNATURE DATE

As research Adviser, I hereby certify that I have read and evaluated this thesis paper prepared under my guidance, by Mulugeta Mamo "Assessment On The Effects of Sustainable Facility Management Performance of Public Building Construction: In The Case of Jimma Town" and recommend and would be accepted as a fulfilling requirement for the Degree Master of Science in Construction Engineering and Management.

Advisor DR. GETACHEW KEBEDE W. _____ _____

NAME SIGNATURE DATE

Co-Advisor Engr. SAMSON YOHANNES _____ _____

NAME SIGNATURE DATE

ABSTRACT

In construction industry the implementation of sustainability practices within the built environment has taken over the world in construction projects; to develop both economic and social aspects of developed and developing countries. However, construction industry has an impact on the economy, workers, end users of construction facilities and the community. Also, in the construction industry incorporating sustainability with facility management practices is less as compared to other industries. Therefore, implementing sustainable facilities management is very important to improve performance and enhance the quality of life of peoples to live in a healthy environment of building construction. Then, implementation of sustainable facility management includes maintaining, improving, and adapting buildings in construction projects for effective and efficient time, quality, and cost performances to improve social and environmental conditions. Because, it is a continuous process that ensure the environmental protection and elevating quality of life for the present and future generations. The aim of this study was assessing effects sustainable facility management factors on the performances of public building construction in the case of Jimma Town. To achieve the objectives of this study purposive sampling technique and descriptive type of research design were used. Correspondingly, to collect data's within given period the study was use questionnaire survey, and interview from the respondents. Relative importance index (RII) was also used to rank the relevant information's provided by the respondents as per the prepared questionnaires. Then, the conducted and collected data was analyzed using Micro Soft Excel and Statistical Package for Social Science, also presented by table, graph, and charts. The study was identified totally 43 factors of sustainable facility management from different literatures; in five categories. These are related to; (1) Knowledge; (2) Design and Planning Stage; (3) Maintenance and Operation; (4) External Environment; and (5) Project Management Factors correspondingly. Also, the study were determined the significant factors of sustainable facility management that has highest effect on cost and social performance including with Ave. RII value. These are; Low concern to future maintenance (0.757), Poor materials selection (0.81), Absence of sustainable facility management in design phase (0.817),Lack of preventive maintenance method(0.777), Political instability(0.753), Market inflation(0.75), Lack of effective monitoring and control for sustainable facility management (0.743), and Lack of leadership (wrong people in the wrong position) (0.757),and Lack of knowledge about sustainable facility management in the company(0.783), Lack of understanding about sustainable facility management with design and construction(0.86), Lack of support from top management about sustainable facility management (0.773), Lack of training and skills of maintenance crew (0.77); were determined as major factors that affect cost and social performance of public building construction in Jimma Town. The study concludes that; there are many major factors that affect sustainable facility management to implement in building construction project and this again influence cost and social performance of public building construction Jimma Town. Therefore, awareness, skill gap training, adequate fund raise, inspire facility managers and workers, incorporating sustainability with facility management and team work; are necessary to minimize the effects of the determined factors in building construction projects.

Keywords: *Building, Cost, Facility Management, Social Performance, Sustainability,*

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ACRONYM

CBFM	Community-based facilities management
CI	Construction Industry
3Cs	Clients, Consultants, and Contractors
DP	Design Phase
EE	External Environment
D&PS	Design and Planning Stage
FM	Facility Management
GDP	Gross Domestic Product
GTP	Growth Transformation Program
IFMA	International Facility Management Association
M&O	Maintenance and Operation
SD	Sustainable Development
SFM	Sustainable Facility Management
SPSS	Statistical Package for Social Science

CHAPTER ONE

INTRODUCTION

1.1 Background

In building construction industry the implementation of sustainable practices within the built environment has taken over the world of a construction project (Akinshipe et al., 2019). Accordingly, within the increasing of environmental change, implementation of sustainable facility management practices are also quickly growing and an increasingly significant issue that FM experts must take into account about the surrounding environment (Asbollah et al., 2016). In the same way, the industry has a history of negative impact on the environment such as being responsible for the consumption of major amounts of energy, water and land usage, yet it has a vital contribution towards achieving sustainable development (Olayinka and Andrew, 2017). Also, in a developing country; the construction industry play a vital role for economic and social developments (Boadu et al., 2020). Consequently, sustainability is a broad and complex concept, which has grown to be one of the major issues in the public building construction (Akadiri et al., 2012). Because, building construction are the main physical assets of any nation; they are created for providing shelter and enhancing people's quality of life (Olaniyi, 2014). Therefore, facility management is essential for an effective and efficient functioning of Construction Company. Subsequently, it is responsible for coordinating the services needed for buildings, system, equipment or furniture that can benefitted the companies to compete in a rapidly changing world (Hashim, 2016). Hence, SFM system are vital and necessary intended for building construction to enhance the operational and maintenance services for better life of the occupants. It involves several aspects such as communication, emergency preparedness, and business continuity, environmental stewardship and sustainability, finance and business, human factor, leadership, strategy, operation and maintenance, project management, quality, real estate, and property management and technology (Nafrizon et al., 2020).

Assessing sustainability of facilities management (SFM) is vital to consider; since it has been identified as a combined approach in maintaining, improving and adjusting the built environment in order to create an environment that strongly supports the core business of an organization (Jayasena et al., 2019). And, it is a tool to measure the level of sustainability in FM in an organization for engaging people within organizations for achieving sustainable development goals (Jayasena et al., 2019).

Sustainable facility management is often an unseen industry that operates in the background to ensure buildings and services operate safely and effectively. This allows employees to do their work without having to worry about how their business facility functions promptly, productively, and in a safe environment (Formaneck, 2019). It is a multi-disciplinary role involves activities within the built environment, which includes maintaining, improving and adapting buildings and assets through efficient and effective time and cost mostly related to all types public buildings (Olayinka and Andrew, 2017). With the adaptation of businesses to sustainable approaches, facility manager's role has been expanded to be responsible for the sustainable performance in building construction (Halabya and El-Rayes, 2020).

Still, there is no enough study in Ethiopia on the effect's sustainable facility management on the performances of public building construction. Therefore, a careful attention is desirable for SFM application to enhance and sustain functional use of public building construction services. Then, the environmental, social and economic impact of the construction industry will be minimized. For this reason, the researcher interested to assesses the effects of sustainable facility management on the performances of public building construction in a case of Jimma Town.

1.2 Statement of the Problem

Consumption of natural resources in construction industry is much higher than other organizations. The industry is accountable for many negative impacts happened on the environmental, social and ecological stability (Shan *et al.*, 2020). And, in the 21st century sustainable development represents a major challenge in developing nations (Gunduz and Yahya, 2018). But, these challenges have further created the need for sustainable development and energy-efficient applications to be adopted in public building construction (Formaneck, 2019).

However, integrating sustainability with FM practices on the construction industry are particularly less than in other organization (Abu Talib *et al.*, 2019). Hence, it is necessary to incorporate FM with sustainability in construction industry, because it is used to minimize the challenges that are altering environments and climate changes presented in public building construction. But, according to Nafrizon et al., (2020), sustainable facility management in public building construction has faced numerous problems related to the practice in developing country. Due to this, the projects are complex and difficult to understand easily because their performance is problematic (Islam et al., 2019). Then, maintenance cost is an actual problem and a major issue in public building construction

projects. And, it increases a significant part of the total facilities management (FM) cost (Islam et al., 2019). But, the purpose of sustainable development in construction project, the economic returns or cost always may not be basis: while the overall satisfaction of other human needs such as community benefits is an important concern (Doloi, 2012). Moreover, the adverse effect on cost and social performances public building construction is required SFM (Tam, et al., 2018).

However, almost all of public building construction have not studied the importance and implementation of sustainable facility management practice for creating contented and well-organized working environment for the successful goal of building construction projects in Ethiopia (Nibret and Dinku, 2015). Therefore, the researcher is interested to assess effects of sustainable facility management on the performance of public building construction in the case of Jimma Town.

1.3 Research Questions

1. What are the factors that affect sustainable facility management in public building construction in Jimma Town?
2. How do factors of sustainable facility management affect cost performance of public building construction in the Jimma Town?
3. How do factors of sustainable facility management affect social performance of public building construction in the Jimma Town?

1.4 Objectives

1.4.1 General Objective

The main objective of this study is to assess effects of sustainable facility management factors on the performance of public building construction in the case of Jimma Town.

1.4.2 Specific Objectives

1. To identify factors that affect sustainable facility management in public building construction of Jimma Town.
2. To determine the effects of sustainable facility management factors on cost performance of public building construction in Jimma Town.
3. To determine the effects of sustainable facility management factors on social performance of public building construction in Jimma Town.

1.5 Scope and Limitation of the Study

This research was focused only on the effects of sustainable facility management factors only on the cost and social performances of public building construction in case of Jimma Town. But, the study was not considering time and quality performances of building construction.

The research mainly emphasized identifying, and determining the effects of sustainable facility management on cost and social performances of completed public building construction (i.e., Hospital, Higher Education, Tele Communication construction projects and municipal building construction projects). The study also focused on more active grade of contractors in Jimma Town.

1.6 Significance of the Study

This research was significant for stakeholders to have well-planned and well-organized SFM and maintenance system of public building construction. It inspires day-to-day implementation of sustainable facility management practices in public building construction for facility managers.

Furthermore, it helps the parties that are involved in public building construction to give high attention on the sustainable facility management to have continuous building functions throughout its operational life and give the occupants happiness. Also, it enables a cost-effective working process and improves the efficiency of services for clients, contractors and end users.

CHAPTER TWO

LITERATURE REVIEW

2.1 General Overview

Construction industry (CI) is important to develop the economic and social growth of the country (Boadu et al., 2020). In developing countries, construction industry is one of a significant contributor for the development of new infrastructure and buildings, also in developed countries this industry is more focused on the provision of professional services, repair, and maintenance of the construction (Liu *et al.*, 2020). Therefore, in a quick improvement of technologies and increasing of competitors in modern economies affect the construction industry to create an efficient supportive facilities to achieve long-term building functionality and successful construction building operation (Islam et al., 2019). Also, the sector has a dynamic role to support the efforts for the achievement of sustainable development in the world. Because, it contribute a numeral intimidation on the environment and an enormous global climate change (Mekonen, 2019). Therefore, sustainability is becoming a significant condition; because of delivering the construction projects with maintainable environment, economy, and social dimension for construction industry (Opoku and Fortune, 2015). Moreover, according to AlSanad et al., (2015) in developing nation for the growth and development of sustainable construction; the construction industry should have a positive actions to improve the awareness and encourage the sustainable construction practice.

The same to other developing countries; Ethiopia construction industry is very important for growth and it is a structural change for GTP II. From the outstanding influence of the country growth; construction is one of the major contributor of the nation economic development (Zeray, 2017). And, it is rapidly growing sector next to agricultural industry. Though, the significance of the construction industry for national economy, construction activities sadly pose serious risks on environments, workers' health and safety, users of construction facilities and the community (Boadu et al., 2020). Likewise, a study by Zeray, (2017) stated that the growth of our country construction industry brings unavoidable changes on the environmental, social and economic influences. These effects are obvious during the life cycle of building project. So, to mitigate the effects of the sector implement the sustainable facility management is very important for the construction industry to the carbon footprint (Mekonen, 2019). With these perspectives, at present-day embedding of sustainability into Facility Management practice is not a strange context and it is supportive to deliver more effectiveness and competent strategy

for construction industry. Due to this, presently FM has recognized as the fastest emerging and most significant sector in construction industry (Abu Talib *et al.*, 2019). Then, the concept of sustainable facilities management [SFM] recently its relevance is increased. Accordingly, the sector is attempt to integrate FM functions with sustainability (Baaki et al., 2016). Because, FM typically seen in the operational sense of cleaning, care-taking, repairs and maintenance; today FM covers different management sectors. These are real estate management, financial management, change management, human resources management, health and safety, contract management, supplementary to building and engineering services maintenance, domestic services and utilities supplies (Abu Talib *et al.*, 2019). Therefore, sustainable facility management (SFM) has a constructive effect on the three core pillars of sustainable construction buildings: economical, environmental, and social benefits, due to this it add the value of companies, organizations, and governments that integrate SFM into their vision (Alfalah and Zayed, 2020). But, much more attention has not given for social performance in construction projects. Hence, for construction project success and social sustainability social performance is critical. Because, it refer that the extent of construction projects to meet the needs of current and future generations. Evaluation of social performance construction projects defined as improvement of social performance by providing information about achievement of social aspects, it permits for decision makers to determine its ongoing performance in achieving social criteria; to decrease social impacts, avoid social risks, advance the overall performance of the project, and lastly contribute social sustainability (Xiahou *et al.*, 2018). Social performance increased due to organizational commitment; it significantly established through health and safety, training and development, and labor union (Adu-Gyamfi *et al.*, 2021).

And, many scholars highlighted that; cost performance is one of the most significant indicators for building construction project. So, considering the importance of cost in determining the effects of SFM factor in the public building project, there is a need to focus on factors related to increases in the operation and maintenance cost in the construction process (Islam et al., 2019). Therefore, it is essential to identify effects of SFM factors that affect the public building construction performances. Because performance is a serious concern and the success of public building construction projects encounter numerous challenges during project delivery (Gunduz and Almuajebh, 2020).

2.2 Definitions

2.2.1 Facility Management

Facility management is an umbrella term which incorporate extensive range of issues for the advantages of the organization with successful efficiency and effectiveness at an optimal combination of cost, quality and time (Ogungbile and Oke, 2015).

"FM" is responsible for coordinating all efforts related to planning, designing and managing buildings and their systems, equipment and furniture to enhance the organization's ability to successfully compete in a rapidly changing world (Odediran et al.,2015). It is a term which is closely associated with building management (Potkany et al., 2015).

According to Potkany et al., (2015) the definition facility management is characterized by the interconnection of the three following areas area relating to employees, i.e. human resources and sociological aspects, area of work activities, i.e. area of achievements and financing, area of work environment, i.e. architecture and engineering.

The term facilities management encompasses an extensive variety of services, real estate, contract, change, human resource, financial, health and safety managements. And also, it covers building maintenance, national services and utility supplies (Isa *et al.*, 2017).

According to Sari (2018), facility managements is an asset management form that integrate whole component of the built environment incorporate people, process, place and technology to make sure that the built environment system works optimally.

The notion of facility management (FM) is a mixture of non-core organization services concerning mainly the maintenance of buildings. The presence of this facility management is anticipated to assist and help the main business of an organization (Zakaria et al., 2018).

The scope of facilities management characteristically anxieties on buildings, property, and infrastructure, under the sponsorships of a single owner: either an organization or an individual. Facilities management for individual building encompasses management of property and services, making a decision for the building operation, and strategically plan for upcoming use and adaptation. For many owners FM may include management of a multiple buildings' profiles along with their sites, whether they be closely located or dispersed across multiple locations. Such as management of campuses of facilities located together for incorporated purpose, like universities, military bases, medical or corporate campuses, and privately owned developments, may also comprise the management and

operation of bodily infrastructure such as water, wastewater, power, information technology, and others along with the buildings on campus (Pearce, 2017).

Facilities management (FM) is based on the evidence that any organizational efficiency is connected to the physical environment in which it works and that the environment in which it works can be improved to increase efficiency (Nafrizon et al., 2020).

2.2.2 Sustainable Facility Management

Sustainability continues to grow in importance and prominence worldwide. Sustainable building is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition (AlSanad, 2015).

Sustainable construction is the application of sustainable development principles in the construction industry (Opoku and Fortune, 2015).

Sustainability is important for the construction industry because to minimize the impact of construction activities and products on the environment (Opoku and Fortune, 2015).

According to Nazeer et al., (2019), Sustainable Facility Management (SFM) is defined as "distribution of sustainability within Facility Management". The overall concept of SFM is to connect sustainability practices with the operations of facility management. Therefore, sustainability is "a final continuous process of ensuring the environmental protection and elevating the quality of life for the present and future generations" (Radebe and Ozumba, 2021).

Sustainable facility management (SFM) is a sole procedure that provides an authority for a facility manager to make structural, architectural, and operational changes to diminish the adverse impact of buildings on their occupants and the environment. SFM includes numerous guidelines, containing energy and water efficiency, waste management, ecological design, use of sustainable materials, user perspective, indoor air quality assurance, appropriate landscaping, enhanced quality of life, financial aspects, and strategic maintenance (Alfalah and Zayed, 2020). It is ability of managing, implementing and delivering non-core business services of the organization's for the improvement of economic, social, and physical environment, and, in turn for great sustainable environment of an organization's core business objectives (Radebe and Ozumba, 2021).

2.2.3 Building Performance and Measurements

Building performance is a character of product in use. Also, it can be used to symbolize the physical performance features of a building as a whole and of its parts. This is important for inter-building and intra-building ideas (Islam et al., 2019).

Performance of a building means it is an ability to work at maximum efficiency, satisfying its function throughout its life cycle. To deliver this maximum operation and to increase its efficiency, regular and continuous evaluation of building performance, called building performance evaluation (BPE), is important (Sotsek et al., 2018). Due to this, it is measured at several stages such as industry, firm, activity and, in project-based industries, project level. At the industry level, productivity is one of the most common measures of performance. Productivity has been defined as "a ratio of volume measure of output to a volume measure of input use" (Sezer, 2016).

Performance measurement is a vital for management activities, various studies of performance measurement can be originated from academics and practitioners in the construction domain. Then, performance measurement in the construction industry, and classified them into those with overall performance measurement and those with partial performance measurement. Partial performance studies verify one aspect of performance; such as safety performance, profitability, or schedule performance, and therefore are unable to show a whole view of performance (Hu and Liu, 2018). Also, according to Fathi and Stevovic (2016), performance is associated with various issues and causes such as time, cost, quality, client satisfaction; productivity and safety.

The construction industry wants an active six (6) performance measurement method to shorten the project during any stage preferred. Building construction industry performance would be succeeded better; if the key constituent parts are correctly divided. These are users, construction firms, practitioners, products, the material suppliers, consumers/the publics and the other stakeholders of each component, applying specific indicators of measurement for controlling and assessing to achieve a precise purpose of interest. Consequently, the performance and improvement of the building industry will be the combination of the performance of its constituents (Ayele, 2019).

2.3 Sustainable Facility Management in Public Building

Sustainability enhances a new measurement to the challenges of facilities management that requires an extended time-based perspective and an appreciation for the influences of localized decisions outside the boundary of immediate stakeholders. Since public buildings and infrastructure are important means by which publics contribute to problems such as depletion of resources, damage to ecosystems, and climate change. Then, FM has a vital role to play in enhancement of the sustainability for the human enterprise by upgrading the sustainability of the facilities for which they are responsible (Pearce, 2017).

Public buildings are one type of construction projects which design for efficiency, cost effective operation and maintenance from the starting up to completion period (Isa *et al.*, 2017). They are constructed with the aim of offering the human being with an enjoyable and conducive working environment, and safeguarded against climatic extreme meteorological conditions. However, any building construction is the outcome of a project and planning constructed and managed based on a precise standards established by governments, professionals and specialists who must meet not only the current technical requirements of each country, but also the outlooks and established goals by the employees (Sotsek et al., 2018).

Then, sustainable facility management is a term that has a close relationship with building management. More broadly, it should not only be understood as general building management linked with everyday building operation; but it must be also including long term planning and focus on its users. The main part of operation costs and effectiveness of facility management processes is well-defined at project of building (Potkany et al., 2015). It is the scope of management of buildings and facilities." This will be effective with systematic involvement of the administrations, finance, operation and maintenance of the building, while priority is given to the maintenance and functionality of the building. Because to ensure that each part of the building and facilities are provided at optimum functionality based on the routine maintenance schedule drawn up (Asbollah et al., 2016).

Zakaria et al., (2018) stated that, the procedure and practices of sustainable facilities management are indistinct and immature. Therefore, to make an exact dimension on sustainability to integrate with facilities management must form a basic structure of Sustainable Facility Management which is called SFM-Model (Figure 2.1). The primary processes, space and infrastructure, people and organization are encompassed by the category.

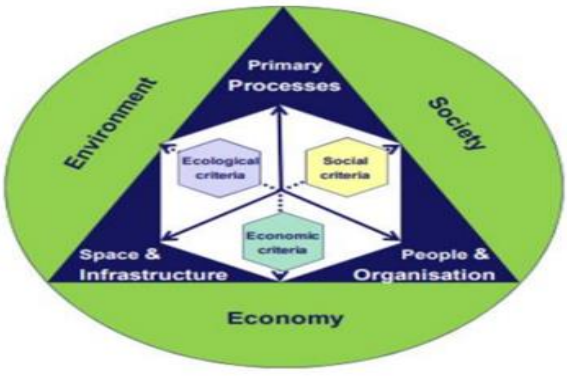


Figure 2.1 SFM-Model (Zakaria et al., 2018)

2.4 Sustainable Facility Management Practice in Public Building Construction

Sustainable construction is conceptualized as having three broad dimensions; social equity, environmental protection, and economic growth as a reflection of those issues in relation to sustainable development (Opoku and Fortune, 2011).

Sustainable Facility Management (SFM) as a practice has grown from what was traditionally perceived to be the mere managing of buildings or maintenance unit of an organization to the holistic reality of being woven into the core and support services of organizations (Price and Pitt, 2011).

Many construction organizations are now producing building designs that use minimum energy and water resources, produce minimum waste, and prevent pollution as well as preserving and enhancing the local ecological biodiversity. Such sustainable facility management practices will therefore minimize the overall environmental impact of the built asset throughout its whole life (Opoku and Fortune, 2015).

Organizational institute buildings are central to the country capaTown to connect with the new international technology, knowledge system, and this is will achieve with the arena of an effective and operative sustainable facility management (SFM) practice (Odediran et al., 2015). And also, it is key due to building construction consume more resources which will, generate large amounts of waste and it has a negative impact on the environment (Asbollah et al., 2016).

2.5 Benefits of Sustainable Facility Management for Public Building Construction

The primary function of SFM is to handle and manage support services to meet the needs of the organization or building construction, it is core for operations and employees. Also, structured and organized SFM has the potential to improve the physical performance and appearance of a building and its system, as well as increase the users' level of satisfaction, and to improve the efficiency with which the building is maintained and operated (Odediran et al., 2015).

More than transportation, mining industry, or any other type of industry it is primarily the area of building industry and building administration that led to better management of narrow resources as well as to the reduction of greenhouse gases emissions. In this area sustainable facility management also plays an important role (Potkany et al., 2015).

The objectives of sustainable facility management for building construction is to reduce the environmental impact of a building over its entire lifespan, providing safety and comfort to its occupants and at the same time enhancing its economic viability (Opoku and Fortune, 2015).

According to Radebe and Ozumba (2021), the practice of sustainable facilities management has a wide range of benefits that can provide for building construction such as efficient resource consumption in buildings i.e. energy and water, minimization of operating and maintenance costs, value for money, reduction of greenhouse gas emissions, improving health and safety in the built environment, improving human comfort in buildings, and minimizing sick building syndrome.

Sustainable facility management allow all peoples to meet their basic needs by representing the process and outline for redefining social progress and redirecting our economies to improve the living standard, while ensuring that the natural systems, resources and diversity upon which they depend are maintained and improved, both for future generations and their benefits (Støre-Valen and Buser, 2019). Therefore, it is very important in supporting the societies to become more sustainable due to a large number of square meters possessed by the existing building stock and infrastructure relative to new buildings. This indicates the importance of sustainable facilities management practice in organizational institutions building services because of the extensive infrastructure and building stocks that exist in these institutions (Radebe and Ozumba, 2021). And integration of sustainability into building construction can produce significant social, economic, and environmental benefits (Opoku and Fortune, 2015).

Community-based facilities management (CbFM) is a principles and practices of sustainable facilities management for the challenges of delivering services on community scale, with the involvement and teamwork of both public agencies and the private sector. Therefore, main contributions of FM to the community development are (Pearce, 2017):-

- Service management; to encounter wants of the community facilities are provided that can deliver locally responsive competences and services.
- Social inclusion; incorporating identifying and local community values as part of decision-making to authorize and to participate in the community.
- Strategic development; during earliest stages of planning FMs are participates to ensure that decisions reflect proactive long-range thinking.
- Environmental sustainability; this include making and operating facilities with well-organized resources and eco-friendly, which are responsive to local and environmental issues.
- Economic sustainability; a new opportunity is created to stimulate local business and entrepreneurialism for feasible and affordable economic of community facilities and services.

2.6 Challenges of Sustainable Facility Management

Sustainable development (SD) is one of the main challenges faced by the construction industry, which has acquired global attention. These factors are classified in relation to the project life cycle phases; inception phase, design phase, construction phase, operation phase, and demolition phase. A total of 53 sustainable factors (economic, social, and environmental sustainable factors) were identified (Enshassi et al., 2016).

Sustainability is seen as a far-reaching issue now, and one which the facilities management [FM] profession cannot overlook. In a 2007 IFMA report, sustainability was identified as one of the key areas FM professionals need to develop their competencies in order to face the demands, challenges and opportunities of sustainable development and practices (Baaki et al., 2016)

Lack of clarity of the concept itself is a factor of SFM because it causes by it being subject to many definitions encompassing different dimensions, and applications strategies, which may slow its promotion. According to previous study, it seems hard for FM practitioners to orient themselves in the complexity of sustainability and to make acceptable decisions (Støre et al., 2019). According to Ganisen et al., (2015), finance, environment, and project development are the critical factors that are an obstacle to achieve the energy efficiency features of sustainable facility management on building construction.

2.7 Factors of Sustainable Facility Management on Public Building Construction

According to Zakaria et al., (2018) factors are "those few key areas where things must go right for a business to grow or necessary for a manager to reach his/her goals". As per this definition, if the facilities management does not give a consideration to these areas the performance will not lead to sustainable.

Success of construction projects has direct effect on safety, health, environment and society. Hereafter, a careful attention is given to factors that may endanger the construction project success. Unawareness about the factors of SFM is one of the problems which lead to its failure. All construction projects have its own well-defined objective, therefore they could be termed as successful; if they are completed as per the planned scheduled time, cost and quality (Doulabi and Asnaashari, 2016).

Zakaria et al., (2018) identified most common factors of SFM from different literatures are strict legislation set by the government, organization's sustainability policy, the commitment and the perception of practicing facilities manager, the involvement of

senior management personnel and organizations should provide training and practical management tools for facilities managers.

2.8 Effects of Sustainable Facility Management on Public Building Construction Performance

The performance assessment of a facility is important for making future decisions. The process of performance measurement includes reviewing previous and current facilities performance and comparing them within and across similar organizations (Lavy et al., 2010). And assessing the performance of FM unit and the effectiveness of organization's FM policies require some performance measurement activities (Oladokun and Ajayi, 2018). The performance of SFM practice is measured, the true position of facilities were visible (Oladokun and Ajayi, 2018).

The importance of implementing sustainability factors is that it can affect the project sustainability performance. Sustainability factors also facilitate stakeholders, owners and engineers measuring the progress towards sustainable development by comparing the performance achieved with the intended performance (Amiril *et al.*, 2018). Hence, sustainable facility management is important in organizational institutes to minimize disturbance or service interrupted when involved in government building. Failure to achieve SFM in public buildings can give bad performance and image to a government agency (Omar et al., 2016).

Before starting a construction project, proper planning of SFM is needed to bring out the construction activities in a sequential manner. Even though it was clear that internal and external difficulties will affect the actual accomplishment of the SFM services (Vidhyasri and Sivagamasundari, 2017). And lowest price of the procurement rather than best value is negatively affecting the performance of building construction in terms of cost, time, and quality (Opoku and Fortune, 2015).

Also, the performance and operation of public building constructions are affected by numerous factors. These are age, surrounding of the buildings, invested resources for managerial and sources of labour for execution of maintenance with in-house provision or outsourcing (Omar, Ibrahim and Wan Omar, 2016). Public building performance assessment has become a matter of particular interest to governments around the world for delivering better institutional services. Because the governments are seek to maximize the effectiveness of organizational institution provision and increase value for money (Odediran, Gbadegesin and Babalola, 2015). Therefore, sustainable facility management

is an instrument for continuous and sustainable improvements especially in public building construction.

2.9 Effects of Sustainable Facility Management on Cost Performance of Public Building Construction

Sustainable facility management (SFM) is a form of asset management that include operation and maintenance phase of building construction or properties (Halim *et al.*, 2017). Therefore, cost performance of building construction are affected by lack of effective maintenance management (Omar et al., 2016).

Building construction project cost performance is important to indicate whether the project adhere with the planned budget or not. This is significant because to avoid cost overruns and scarcity of the construction resources (Egwunatum, 2017). So, truly to understand the performances of building construction are difficult due to its system are complex. In building construction projects cost of maintenance is the actual problem and a main issue, and sustainable facilities management (SFM) is a significant part for the cost performance (Islam et al., 2019).

Insufficient functioning of SFM facilities results cost inefficiency, inadequacy and unavailability of facilities for the future generation. These are indicators of sustainable facility management (SFM) has a great effects on the efficiency or performance of building construction projects (Oladokun and Ajayi, 2018).

Islam et al., (2019) determines that significantly affect the SFM cost performance of building construction projects are design errors, lack of maintenance plan, lack of understanding of FM, underestimating the impacts of FM, and lower maintenance quality.

2.10 Challenges of Sustainable Facility Management in Public Building Construction Project

The building construction industry plays an important role for the economic growth of develop and developing nations. Though, during their operation and maintenance phases the sector continuously face serious challenges such as time overrun, waste generation, and cost overrun (Halim *et al.*, 2017).

The rapid improvement of technology and a higher competition in modern economies have forced the building industry to make efficient supporting services system for the achievement of long-term building functionality and fruitful building operation. The application of such efficient systems, provided by sustainable facilities management (SFM), is the key challenge (Islam, Nazifa and Mohamed, 2019).

And also, the key challenges of SFM implementation in developing nations are poor funding, lack of awareness, lack of proper regulation, (Odediran, Gbadegesin and Babalola, 2015), and lack of knowledge, lack of senior management commitment, and lack of capability " (Radebe and Ozumba, 2021).

2.11 Research Gaps

Sustainable building construction practices promote a balance among economic, social, and environmental performance in implementing construction projects. Accepting this, the relation between sustainable development and construction becomes clearly observed; because construction has high economic significance, strong impacts on environmental and social (Akadiri et al., 2012).

Hence, according to (Nielsen, et al., 2016); operating phase of building construction influenced by sustainable design. Also, numerous studies highlight the need for new frameworks and improved tools for integrating sustainability within building design and the construction industry. Also, sustainability has three main dimension these are; environmental, social and economic dimensions. But, most articles only focus on the environmental aspects of sustainability, and very few focus only on social sustainability. Therefore, in order to fill this research gap and to identify and determine factors of SFM that has effect on economic and social performance of building construction project. In order to transfer the construction buildings for future generation without compromising the quality: with good operational services and enhance life cycle of building construction by minimizing factors of SFM. So, this paper is very vital for the Jimma Town as well as for the construction stakeholders.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Area

The study was conducted in Jimma Town Oromia Regional State and South West Ethiopia. Arif Awol, et al., (2016), the town has a distance of 346 Km, far from Addis Ababa City. It is one of the ancient and largest Town in the country, and its geographical coordinates are approximately 7^0 41'N latitude and 36^o 50'E longitude. The Town is found in an area of average altitude about 5400ft (1780 m) above sea level, and its temperature ranges from 20^o-30^oC. The average annual rainfall of the town is between 800 to 2500mm[3].

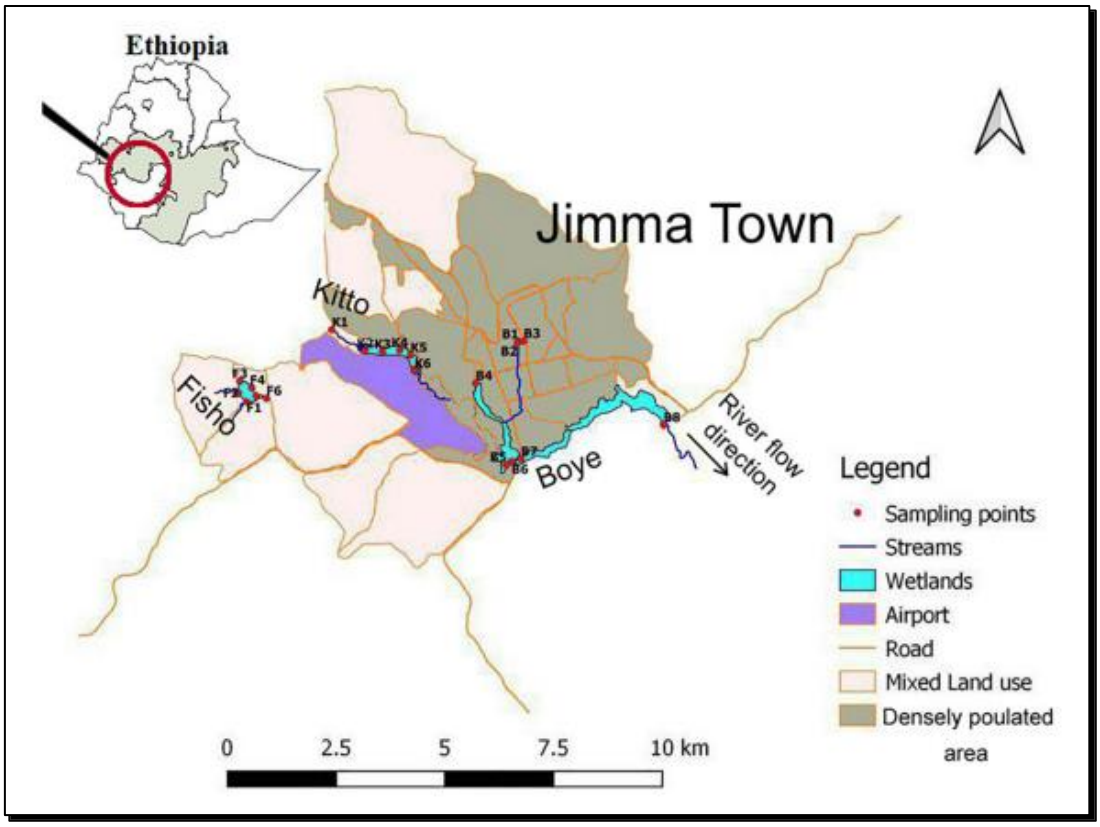


Figure 3.1 Map of Jimma Town *(Sileshi* et al., *2020)*

3.2 Research Design

The study used descriptive study design to identify the problems, select a representative sample from the population, and test the samples for an integral part of descriptive research. Also, mixed types of research methods were used; both qualitative and quantitative data are conducted, collect and analyze the data for determination of the effects sustainable facility management on the performances of public building construction projects.

3.3 Study Variables

3.3.1 Dependent Variable

- Sustainable Facility Management

3.3.2 Independent Variables

The following independent variables were influenced Sustainable Facility Management: -

- Budget
- Design
- Knowledge
- Experience
- Professional

3.4 Population and Sampling Method

The target populations for the study were public building construction projects, and the respondents were clients, contractors, and consultants' that are involved in the public building construction projects of Jimma Town. Respondents were purposively selected. The questionnaire was designed based on an extensive review of previous related studies. Also, by conducting interviews with experts (i.e., project managers, site engineers, office engineers, and facility managers) who have a large experience (average experience of 10 years) in the construction industry.

Therefore, the researcher used the purposive sampling technique to cover that all population of the study in Jimma Town.

Also, the sample size was 21 number of public building construction was considered as population; that were maintained and giving services for the community between the years of 2003 – 2013 E.C in Jimma town. For detail information, see Appendix D.

3.5 Sources of Data

The study's objectives were met by utilizing both primary and secondary data sources. Observation, semi-structured questionnaires, and interviews provided the primary data for this study. Secondary data was gathered through analyzing related literature, such as books, papers, and journals written by diverse writers.

3.6 Data Collection Procedure

Numerous data gathering approaches were used to accomplish the research objectives. Direct observation, interview, and a semi -structured questioners survey were used to collect data. Primary data sources were used to obtain firsthand information from construction projects, which aids in the provision of information for the specific purpose of addressing the issue at hand. Interviews with experts and critical observation were

conducted to obtain reliable information about the effects of SFM on the cost and social performance of public building construction. Secondary data were acquired by studying published sources and other relevant publications.

3.7 Data Presentation and Analysis

For data processing and analysis, ordinal scales were used for this research. The ordinal scale is a ranking or rating data that normally use integer in ascending or descending order. And Five-point Likert scale was used to indicate their judgment on the importance of each effect, by considering the following scales: (1) very low effect, (2) low effect, (3) moderate effect, (4) high effect and (5) very high effect.

The five-point Likert scale technique has also been practical for many construction management research (Islam et al., 2019). Respondents were also being encouraged to add effects of SFM on the performances of public building construction, which is not included in the original questionnaire. After successfully collecting data, the data was arranged according the context of the research, and analysis of the data was done using both in terms of qualitative and quantitative analytical techniques. In order to single out the relevant information supplying questions and notes, the main effects were executed.

The numerical score of each effects was transformed to measure relative importance index (RII) in order to assess the ranking by using the following formula [Eq. (1)]: (Raja *et al.*, 2018).

$$RII = \frac{\Sigma w}{A \times N} \quad \text{[Eq. (1)]}$$

Where:

RII; - is Relative Importance Index

W; - is the weight given to each effect by the respondents from 1, 2, 3, 4 and 5 for very low, low, moderate, high and very high, respectively;

A; - is the highest weight (i.e., 5 in this case), and;

N; - is the total number of respondents.

Based on the ranking RII value, the weighted average for the two groups will be determined. According to Akadiri et al., (2012), there are five important levels are transformed from RI values: Very High (VH) (0.8 - 1), High (H) (0.7 - 0.79), Medium (M) (0.6 - 0.69), Low (L) (0.5 - 0.59) and Very Low (VL) ($0.4 \leq 0.2$).

Sorting out the useful data was analyzed using Microsoft Word, Microsoft Excel sheet. All obtaining data were analyzed by utilizing Statistical Package for Social Science (SPSS 20) to get the frequency, percentage, and cumulative percentage. Likewise, this

analysis was conducted using percentage in order to determine the frequency of each category in the questions and then presented by table, graph, and charts.

3.8 Checking reliability of the responses by using Cronbach's alpha

Table 3.1 Value of Cronbach's alpha for each respondents

Cronbach's alpha statistics :for Clients Response	
Cronbach's alpha	Standardized Cronbach's Alpha
0.860	0.838

Cronbach's alpha statistics : for Consultants Response	
Cronbach's alpha	Standardized Cronbach's Alpha
0.769	0.767

Cronbach's alpha statistics : for Contractors Response	
Cronbach's alpha	Standardized Cronbach's Alpha
0.902	0.898

Therefore, based on Cronbach's alpha value the response and gathered data were acceptable and it has high internal consistency.

CHAPTER FOUR

RESULT AND DISCUSSION

The Discussion and Results sections highlight the study's accomplishments and serve as a basis for responding to the research's specific objectives. Additionally, they explain how the study's overall findings are used to forward conclusions and recommendations.

4.1 Response rate

During the survey period, 67 questionnaires were administered for the respondents, while 62 were retrieved. Sixty of them were finally used for analysis; because the remaining 2 of the retrieved instruments were not correctly and completely filled.

Table 4.1 Rate of Response

Questionnaire	Respondent			Frequency	Percentage
	Owner	Consultant	Contractor		
Distributed	23	15	29	67	100.00%
Responded	21	14	27	62	92.54%
Non response	2	1	2	5	7.46%
Not correctly filled		2			2.985%
Net Responded				**60**	**89.55%**

4.2 Factors That Affect SFM in Public Building Construction of Jimma Town

The practice of sustainable facility management in building construction was influenced by various factors that required global attention. These factors were categorized into five groups in this study: knowledge, design and planning stage, maintenance and operation, external environment, and project management; related factors. A total of 43 factors affecting Sustainable Facility Management have been identified. Table 4.2 illustrates these parameters clearly as follows:

Table 4.2 Identified factors of SFM from different literature

S.No	**Sustainable Facility Management Factors Related To**
1.	**Knowledge related factors**
	Lack of knowledge about Sustainable Facility Management in the company
	Knowledge gap between workers about Sustainable Facility Management in the company
	Lack of understanding of Sustainable Facility Management with design and construction
	Lack of capabilities/skills to practice Sustainable Facility Management

2.	**Design and Planning stage related factors**
	Lack of understanding about the physical and chemical properties of construction materials
	Missing to make allowance for the differing thermal and moisture movements of materials
	Poor materials selection, quality control & preventive method.
	Absence of SFM in design phase
	Unfamiliarity of the designer with local conditions and site conditions
	Low concern to future maintenance: (not considering maintenance analysis during design stage of building)
	Design Complexity:(Failure of the designer to allow enough clearance to get the tools in and out for maintenance in the structure)
	Faulty Design: (when designer ignores the spacing for contraction and expansion movement)
	Lack of Building Maintenance Manuals
	Lack of local material standard and specification
3.	**Related to maintenance and operation factors**
	Lack of preventive maintenance method
	Unqualified Maintenance Contractors selection
	Insufficient Financial Support for Maintenance Work (Initial and operational fund unavailability)
	Lack of understanding Importance of Maintenance Work by end users.
	Defective materials used for maintenance works
	Lack of training and skills of maintenance crew
	Lacking in maintaining the buildings with the schedule
	Non-availability to replacement parts and components
	Lack of communication between maintenance contractor, clients and users
	Unavailability of skilled appointed maintenance personnel
	Non response to maintenance request
	Lack of strict legislation set by the government
	Lack of building maintenance standard procedures.
	Lack of ability to brief the project objectives clearly
	Less involvement of the stakeholders in the project development

4.	**External environment related factors**
	Political instability (Violence, not peaceful demonstration)
	Economic instability (Market inflation)
	Social factors (Public acceptance toward project)
	Lack of advanced construction technology
5.	**Project management related factors**
	Lack of incentives to create routines on SFM issue
	Lack of effective monitoring and control for SFM
	Lack of leadership (wrong people in the wrong position)
	Unclear Policy systems, Strategy and Work Planning
	Lack of team work
	Poor Training and Education system or plan
	Increasing liability on facility managers
	Lack of ability to solve problems
	Lack of support from top management about SFM
	Unwillingness to implement SFM

4.3 Overall Responses of Owners, Consultants and Contractors on Factors of SFM and Their Effect on Cost Performance

4.3.1 Design and planning stage related factors

Figure 4.1 illustrate that; the RII value of identified factors of SFM related to design and planning stage factors and their effect on cost performance of public building construction replied by clients, consultants and contractors representatives.

As per the respondents evaluation factors of SFM that have very high and high effect on cost performance are show in the Figure 4.1.

Then, Poor materials selection, quality control & preventive method; with RII value of (0.85) was found to be the 1st ranked factor by client perspective. But, this factor was ranked as 5th and 4th factor of SFM that affect cost performance by contractors and consultants viewpoint with RII value of (0.73) and (0.80) respectively.

The 2nd determined factor by client outlook was; Absence of SFM in design phase with RII value of (0.82) and identified as very high effect on cost performance. However, by consultants and contractors perspective it determined as 1st ranked factor of SFM that affect cost performance with RII value of (0.78) and (0.85) correspondingly.

Missing to make allowance for the differing thermal and moisture movements of materials with RII value of (0.80) were identified as very high effect on cost performance and ranked as 3rd factor. While, by consultants and contractors point of view it was ranked as 6th and 9th factor of SFM that affect cost performance with RII value of (0.61) and (0.5) respectively.

The 4th ranked factor that as high effect on cost performance was; Design Complexity: (Failure of the designer to allow enough clearance to get the tools in and out for maintenance in the structure) with RII value of (0.77) by clients point of view. But, by consultants and contractors perspective; this factor was ranked as 8th and 2nd factor of SFM that affect cost performance with RII value of (0.50) and (0.81) correspondingly.

With respect to clients and contractors response; the 5th ranked factor that as high effect on cost performance was: Low concern to future maintenance: (not considering maintenance analysis during design stage of building) with RII value of (0.75). But, by consultant's outlook the factor was ranked as 3rd factor of SFM that affect cost performance with RII value of (0.75).

The 6th ranked factor that as high effect on cost performance was; Faulty Design: (when designer ignores the spacing for contraction and expansion movement) with RII value of (0.7) from viewpoint of clients. While, by outlook of consultants and contractors the factor were determined as 9th and 8th factor of SFM that affect cost performance with RII value of (0.47) and (0.60) respectively.

Also, in Figure 4.1 it perceives that; Lack of understanding about the physical and chemical properties of construction materials with RII value of (0.68) ranked as 7th factor from clients perspective. Whereas, by consultants and contractors perspective this factor was determined as 4th and 3rd ranked factor of SFM that affect cost performance with RII values of (0.74) and (0.801) respectively.

By client point of view; Unfamiliarity of the designer with local conditions and site conditions; with RII value of (0.62) was identified as medium effect on cost performance and ranked as 8th factor. But, this factor was ranked as 7th factor of SFM that affect cost performance both by consultants and contractors viewpoint: with RII values of (0.60) and (0.66) correspondingly.

As clients response; Lack of local material standard and specification with RII value of (0.5) was determined as 9th factor. But, with respect to consultants and contractors point of view; this factor was ranked as 2nd and 6th factor of SFM that affect cost performance of public building of Jimma Town with RII values of (0.77) and (0.69) respectively.

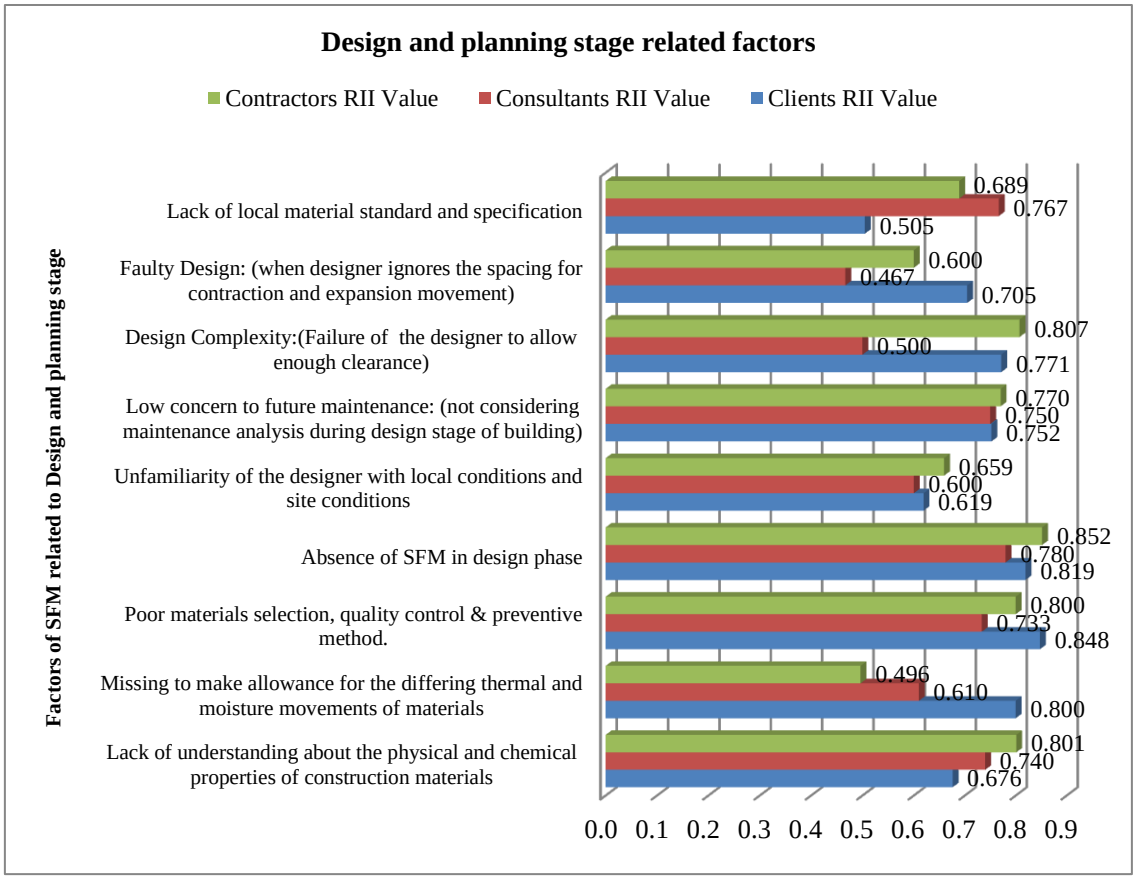


Figure 4.1 Response of Owners, Consultants and Contractors Representatives on D and PS related factors and their effect on cost performance

Then, based on overall Ave. RII value: the 1st ranked factor that has very high effect on cost performance of public building construction was; Absence of SFM in design phase ranked as 1st with Ave. RII value of 0.817.

Factor that has 2nd rank and high effect on cost performance of public building construction were determined as; Poor materials selection, quality control & preventive method with 0.81 Ave. RII value. This result confirm by Islam et al., (2019); and Dahal and Dahal (2020); both authors found that the material selection, use of low-quality materials were affect cost performance of building construction project.

Third factor that has highest effect on cost performance of public building construction with Ave. RII value of 0.757 and 3rd ranked factor was; Low concern to future maintenance: (not considering maintenance analysis during design stage of building).

The 4th determined factor that has high effect on cost performance of public building construction with Ave. RII value of 0.739 and ranked as 4th was; Lack of understanding about the physical and chemical properties of construction materials.

Design Complexity: (Failure of the designer to allow enough clearance to get the tools in and out for maintenance in the structure); was determined as 5th rank and medium effect on cost performance of public building construction with Ave. RII value of 0.693.

From mentioned factors of design and planning stage related factors: Lack of local material standard and specification, Missing to make allowance for the differing thermal and moisture movements of materials, Unfamiliarity of the designer with local conditions and site conditions, were determined as medium effect on cost performance of public building construction in Jimma Town with Ave. RII value of 0.654, 0.635, 0.626, and also ranked as 6th, 7th, and 8th respectively.

Only; Faulty Design: (when designer ignores the spacing for contraction and expansion movement) with Ave. RII value of 0.591 ranked as 9th factor and was determined factor that has low effect on cost performance of public building construction of Jimma Town. This result approve by Das and Chew (2011) and the author conclude that; defects arising from design error often exhibit a chain effect and hinder performance during the occupancy of buildings, that increase the amounts of maintenance cost almost by half.

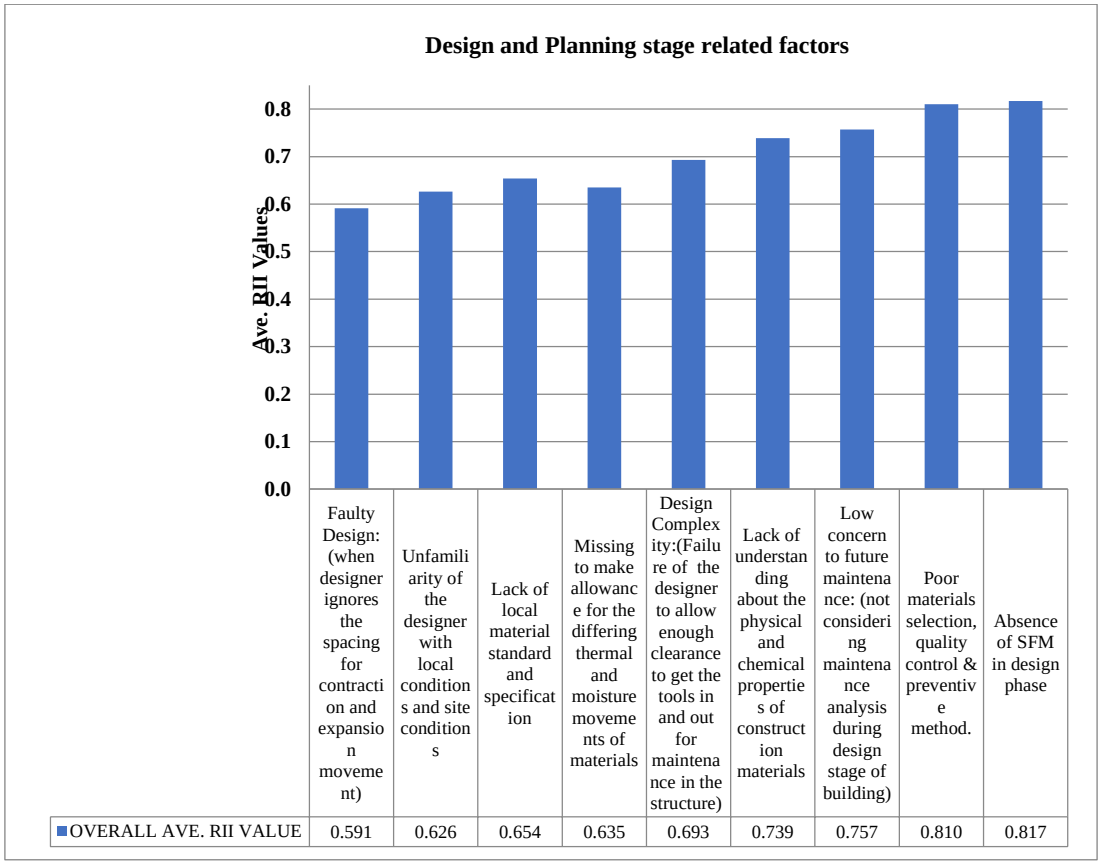


Figure 4.2 Overall Average Response of 3Cs on D and PS factors and their effect on cost performance

4.3.2 Maintenance and operation related factors

Maintenance and operation related factors are one category of identified factor of SFM; that had effect on cost performance of public building construction in Jimma Town. Each factor was evaluated based on their RII value in Table 4.3.

Table 4.3 obviously shows; from client's perspective: Lack of preventive maintenance method was determined as 1st ranked factor with RII value of (0.75) that has high effect on cost performance. But, based on the response of consultants and contractors point of view; it was ranked as 2nd and 4th factor of SFM that affect cost performance with RII value of (0.78) and (0.64) respectively.

The next determined factor by client's outlook was; Lack of training and skills of maintenance crew and ranked as 2nd factor with RII value of (0.72) that has high effect on cost performance. While, by consultants and contractors point of view; this factor was ranked as 3rd and 2nd with RII value of (0.73) and (0.71) respectively as factors of SFM that has high effect on cost performance.

Lack of maintaining the buildings with the schedule; was determined as 3rd ranked factor by clients perspective with RII value of (0.71). However, by consultants and contractors viewpoint it was 4th and 10th ranked factor of SFM that affect cost performance with RII value of (0.72) and (0.51) correspondingly.

Based on response of client's; Lack of strict legislation set by the government; with RII value of (0.701) was determined as 4th ranked factor of SFM that affect cost performance. But, by consultants and contractors perspective this factor was ranked as 8th and 5th factor of SFM that affect cost performance with RII value of (0.62) and (0.63) respectively.

By client point of view; Insufficient Financial Support for Maintenance Work (Initial and operational fund unavailability); was determined as 5th ranked factor with RII value of (0.69) that has effect on cost performance. However, based on consultants and contractors response this factor was ranked as 5th and 3rd factor of SFM that affect cost performance with RII value of (0.68) and (0.70) correspondingly.

As per the client's responses: Defective materials used for maintenance works; with RII value of 0.68 was ranked as 6th factor that has effect on cost performance. While, both with respect to consultants and contractors point of view it has 7th ranked factor of SFM that affect cost performance with RII value of (0.62) and (0.55) respectively.

Also, with outlook of client's: Unavailability of skilled appointed maintenance personnel; was determined as 7th ranked factor of SFM that affect cost performance with RII value of (0.66). But, as per consultants and contractors point of view; it was ranked as 6th and 9th

determined factor of SFM that affect cost performance with RII value of (0.67) and (0.52) correspondingly.

Non response to maintenance request with RII value of (0.64) was ranked as 8th factor by client's perspective. However, both by consultants and contractors viewpoint it was determined as 1st factor of SFM that affect cost performance with RII value of (0.80) and (0.77) respectively.

With respect to clients response; Lack of communication between maintenance contractor, clients (owners) and users with RII value of (0.60) was ranked as 9th factor that has effect on cost performance. While, it was ranked as 11th and 8th factor of SFM that affect cost performance with RII value of (0.47) and (0.52); by consultants and contractors perspective.

Both from clients and consultants point of view: Unqualified Maintenance Contractors selection with RII value of (0.52) and (0.53) correspondingly; was ranked as 10th factor that has effect on cost performance. But, it was determined as 11th ranked factor of SFM that affect cost performance with RII value of (0.43) only by contractor's perspective.

Lastly, less involvement of the stakeholders in the project development; with RII value of (0.53), was identified as 11th factor of SFM that affect cost performance by client's outlook. Nevertheless, by consultants and contractors viewpoint it was ranked as 9th and 6th factor of SFM that affect cost performance with RII value of (0.55) and (0.60) respectively.

Table 4.3M and O related factors and their effect on cost performance

Identified factors of SFM: related to maintenance and operation and their effect on cost	Clients RII Value	Consultants RII Value	Contractors RII Value
Defective materials used for maintenance works	0.68	0.62	0.55
Lack of communication between maintenance contractor, clients (owners) and users	0.60	0.47	0.52
Unqualified Maintenance Contractors selection	0.52	0.53	0.43
Lack of maintaining the buildings with the schedule	0.71	0.72	0.51
Less involvement of the stakeholders in the project development	0.53	0.55	0.60
Lack of strict legislation set by the government	0.701	0.72	0.63

Unavailability of skilled appointed maintenance personnel	0.66	0.67	0.52
Insufficient Financial Support for Maintenance Work (Initial and operational fund unavailability)	0.69	0.68	0.70
Lack of training and skills of maintenance crew	0.72	0.73	0.71
Non response to maintenance request	0.64	0.80	0.77
Lack of preventive maintenance method	0.75	0.78	0.64

The average RII value of the respondent's response on the cost performance effect in public building construction of Jimma town; due to maintenance and operation related factors are shown in Figure 4.3. It is clearly show that the determined factors that have high, medium, and low effects on cost performance of public building construction in Jimma Town. Then, determined factors that have high effect on cost performance of public building construction was; Non response to maintenance request; and determined as the 1st rank with high Ave. RII value of (0.737).

Lack of preventive maintenance method; has 2nd rank and high effect on cost performance of public building construction with Ave. RII value of (0.723). This result confirm on research conducted by Zawawi et al., (2016).

Lack of training and skills of maintenance crew ranked as 3rd and high effect on cost performance of public building construction with Ave. RII value of (0.72). The result found by Zakaria et al., (2018); and the authors confirm that training and practical management tools for facilities managers were as critical success factor of SFM.

The 4th ranked factor that has medium effect on cost performance of public building construction with Ave. RII value of (0.69) was; Insufficient Financial Support for Maintenance Work (Initial and operational fund unavailability). This result confirms on research conducted by Gundz and Almuajebh (2020); an author was support that inadequate allocation of funds for maintenance affects sustainable construction project performance.

The 5th ranked factor that has medium effect on cost performance of public building construction with Ave. RII value of (0.684) was Lack of strict legislation set by the government. This result also found on research done by Pham et al., (2020); as factor of sustainable construction project.

Lack of maintaining the buildings with the schedule; was ranked as 6th factor that has medium effect on cost performance of public building construction with Ave. RII value of (0.647). This result also supported on study conducted by Dahal and Dahal, (2020).

Both Unavailability of skilled appointed maintenance personnel and Defective materials used for maintenance works; were ranked as 7th factor that has medium effect on cost performance of public building construction with Ave. RII value of (0.617) individually.

Another; maintenance and operation related factors that has low effects on cost performance of public building construction illustrate in figure 4.31. These are; Less involvement of the stakeholders in the project development, Lack of communication between maintenance contractor, clients (owners) and users, and Unqualified Maintenance Contractors selection; these factors were determined as 9th, 10th and 11th ranked factors that has lower effect on cost performance of public building construction in Jimma Town including with low Ave. RII value of (0.56), (0.53), and (0.493) respectively.

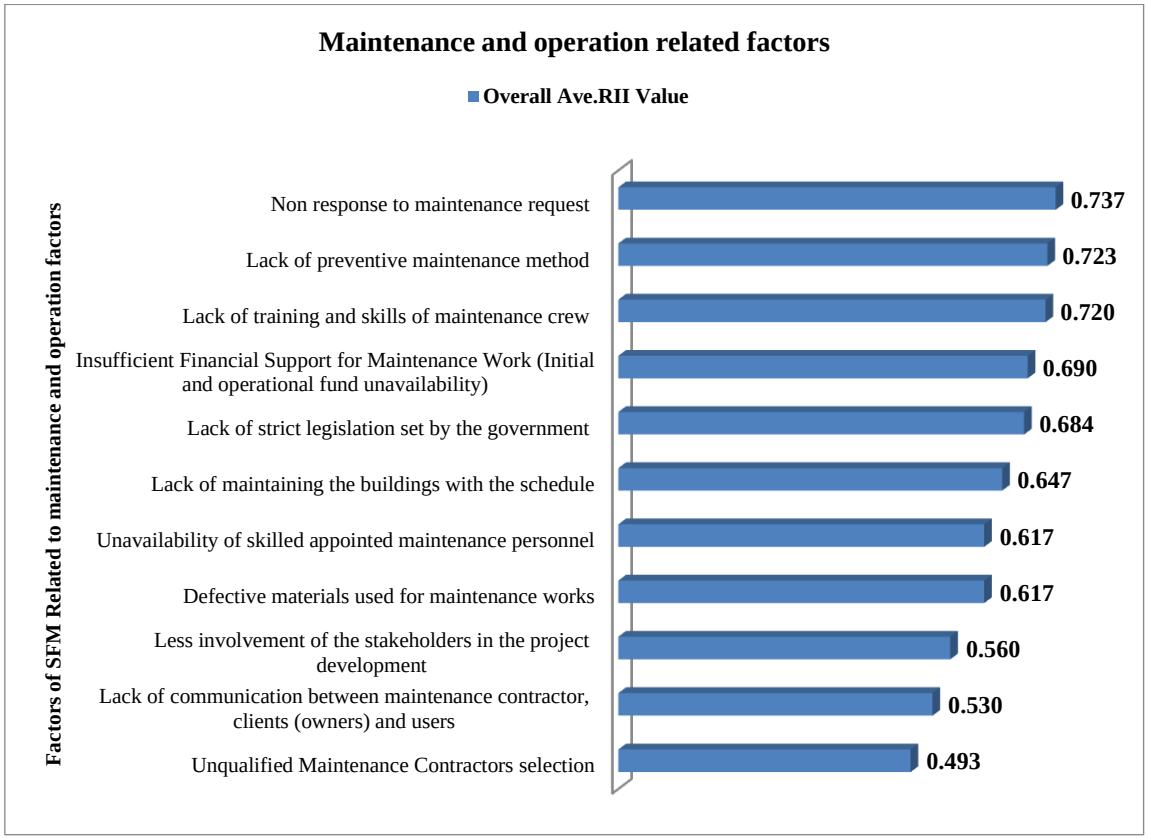


Figure 4.3 Overall Ave. Response of 3Cs on M and O factors and their effect on cost performance

4.3.3 External environment Related Factors

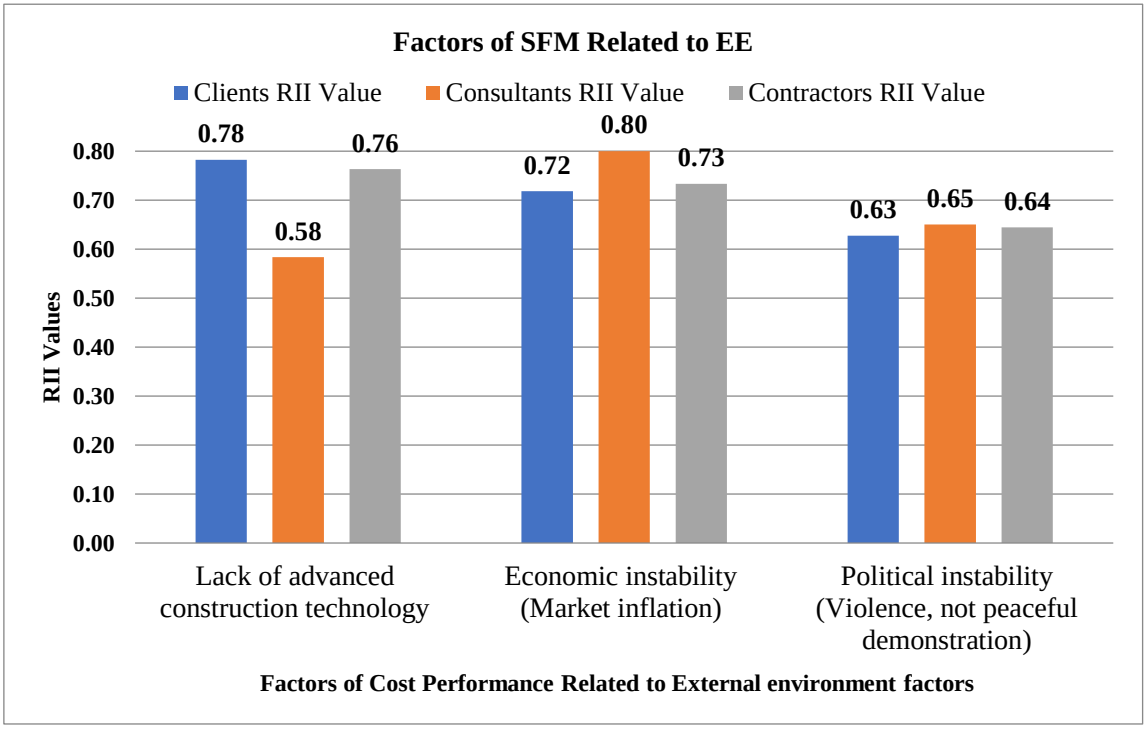


Figure 4. 4 Overall Response of Respondents on Factors of SFM Related to EE factors that affect Cost performance

From Figure 4.4, it is observed that; Lack of advanced construction technology with RII value of (0.78) was determined as the 1st influencing factor of SFM that has high effect on cost performance only by perspective of clients. But, from consultants and contractors point of view it was ranked as 3rd and 1st factor of SFM that has low and high effect on cost performance with RII value of (0.58) and (0.76) respectively.

With respect to clients point of view the 2nd determined factor having with RII value of (0.72) was; Economic instability (Market inflation). However, by consultants and contractors perspective it determined as 1st and 2nd ranked factor of SFM that has very high and high effect cost performance with RII value of (0.80) and (0.73) respectively.

From point of view of clients: the 3rd ranked factor that has medium effect on cost performance was; Political instability (Violence, not peaceful demonstration) with RII value of (0.63). While, from consultants and contractors point of view it was ranked as 2nd and 3rd factor of SFM that has medium effect on cost performance of public building construction in Jimma Town: with RII value of (0.65) and (0.64) respectively.

The next Figure 4.5, clearly show that; the average response of clients, consultants and contractors on external environment related factors that have high and medium effect on cost performance of public building construction in Jimma Town including with Ave. RII

value and ranking order. Then, based on their Ave. RII value the first ranked factor that has high effect on cost performance of public building construction was; Economic instability (Market inflation) determined as the 1st external environment related factor with Ave. RII value of 0.75.

The 2nd determined, external environment related factor that has high effect on cost performance of public building construction was; Lack of advanced construction technology with Ave. RII value of 0.707; that has medium effect on cost performance.

Political instability (Violence, not peaceful demonstration) was determined as 3rd ranked factor with Ave. RII value of 0.64 and it has medium effect on cost performance of public building construction in Jimma Town.

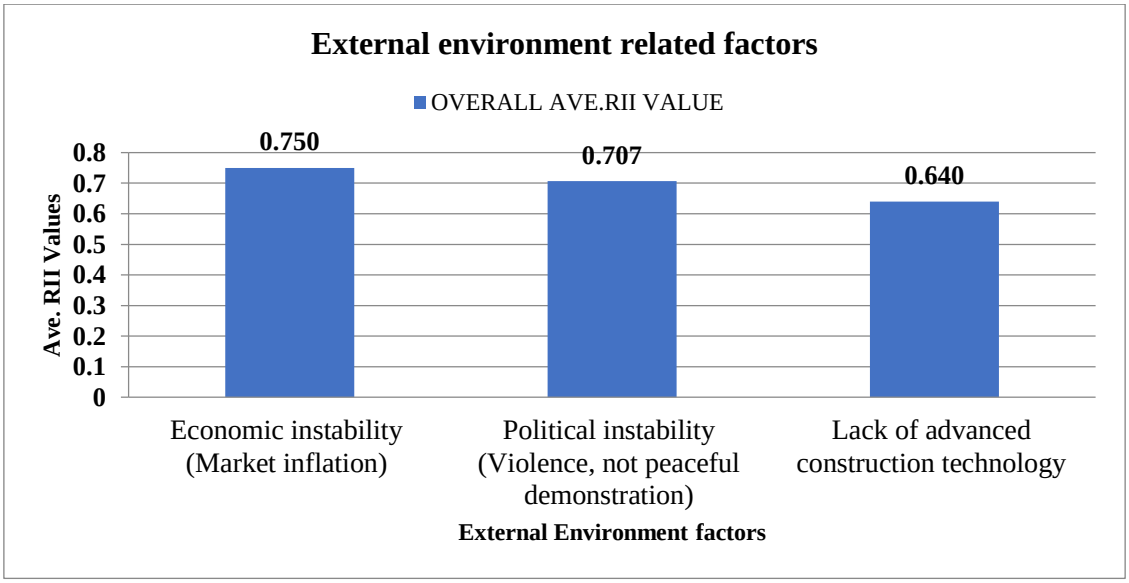


Figure 4.5 Average Response of 3Cs on EE factors and their effect on cost performance

4.3.4 Project management related factors

In Figure 4.6, it is clearly observed that; the identified factors of SFM that have high, medium, and low effect on cost performance; due to project management related factors. Then, from illustrated project management related factors in Figure 4.6 clients, consultants, and contractors reply that; Lack of support from top management about SFM was determined as 1st ranked factor of SFM that has high effect on cost performance of public building construction with RII value of (0.75), (0.78), and (0.79) correspondingly.

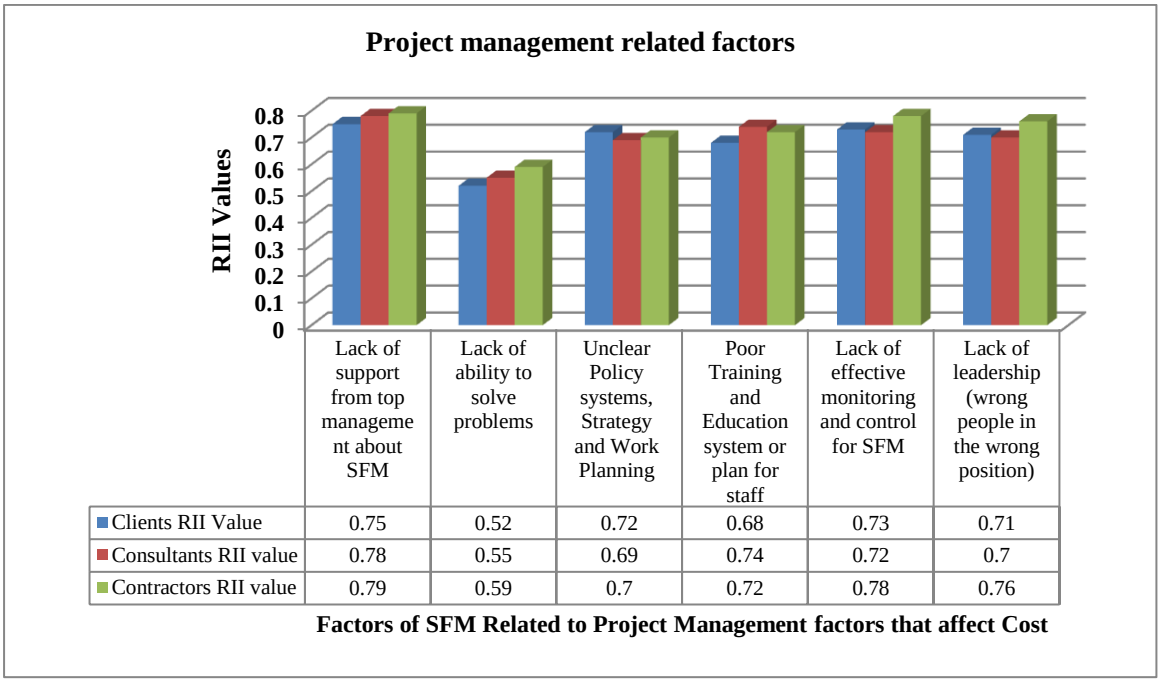
Both from clients, and contractors perspective; the 2nd factor of SFM that has high effect on cost performance of public building construction related to project management factors was; Lack of effective monitoring and control for SFM with RII value (0.73), and (0.78) respectively. But, this factor was ranked as 4th factor of SFM that affect cost performance by consultant's viewpoint with RII value of (0.72).

The 3rd ranked factors of SFM that has high effect on cost performance was; Unclear Policy systems, Strategy and Work Planning with RII value of (0.72) from clients perspective. While, by consultants and contractors point of view it was ranked as 2nd and 5th factor of SFM that has high effect on cost performance with RII value of (0.69) and (0.7) respectively.

Lack of leadership (wrong people in the wrong position); was determined as 4th ranked factor of SFM that has high effect on cost performance having with RII value (0.71), from client point of view. However, from consultants and contractors perspective it determined as 5th and 3rd ranked factor of SFM that has high effect cost performance with RII value of (0.7) and (0.76) correspondingly.

From clients perspective; Poor Training and Education system or plan for staff was ranked as 5th factor of SFM that has medium effect on cost performance with RII value of (0.68). But, this factor was ranked as 3rd and 4th factor of SFM that has high effect on cost performance from view point of consultants and contractors; with RII value of (0.74) and (0.72) respectively.

From clients, consultants, and contractors perspective; the 6th factor of SFM that has low effect on cost performance of public building construction in Jimma Town was: Lack of ability to solve problems with RII value of (0.52), (0.55), and (0.59) correspondingly.



	Lack of support from top management about SFM	Lack of ability to solve problems	Unclear Policy systems, Strategy and Work Planning	Poor Training and Education system or plan for staff	Lack of effective monitoring and control for SFM	Lack of leadership (wrong people in the wrong position)
Clients RII Value	0.75	0.52	0.72	0.68	0.73	0.71
Consultants RII value	0.78	0.55	0.69	0.74	0.72	0.7
Contractors RII value	0.79	0.59	0.7	0.72	0.78	0.76

Figure 4.6 Response of Owners Representatives on PM related factors and their effect on cost performance

The next, Figure 4.7 illustrate that; the Ave. RII value and ranking order of project management related factors that has high, and low effect on cost performance of public

building construction in Jimma Town. The Figure 4.33 clearly indicates that; Lack of support from top management about SFM ranked as 1st and it has high effect on cost performance of public building construction with Ave. RII value of 0.773. This result confirm on research conducted by Gundz and Almuajebh (2020).

The 2nd ranked factor that has high effect on cost performance of public building construction with Ave. RII value of 0.743 was; Lack of effective monitoring and control for SFM.

Lack of leadership (wrong people in the wrong position); was determined as 3rd rank of project management related factor; that has high effect on cost performance of public building construction with Ave. RII value of 0.723.

The 4th ranked factor that has high effect on cost performance of public building construction with Ave. RII value of 0.713 was; Poor Training and Education system or plan for staff. This result confirms research conducted by Dahal and Dahal (2020).

Also, the 5th ranked factor that has high effect on cost performance was; Unclear Policy systems, Strategy and Work Planning with Ave. RII value of (0.703).

Factor that has low effect on cost performance of public building construction was; Lack of ability to solve problems with Ave. RII value of 0.553 also ranked and determined as 6th factor of cost performance of public building construction in Jimma Town.

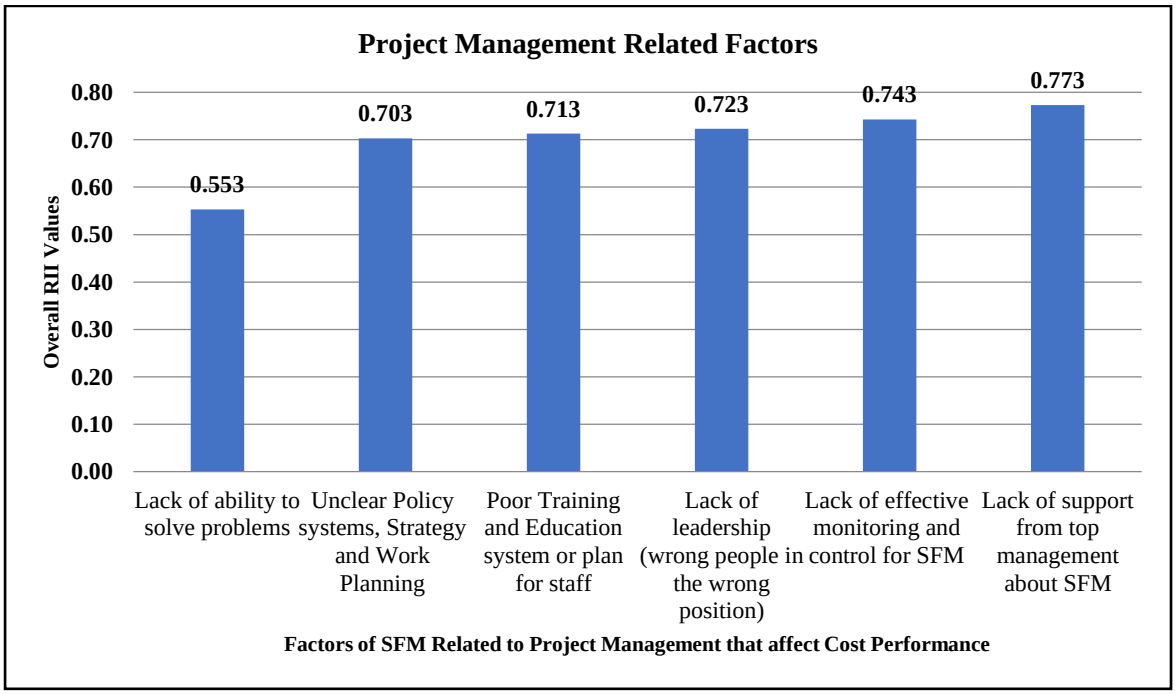


Figure 4.7 Average Response of 3Cs on PM related factors and their effect on cost performance

4.4 Overall Responses of Owners, Consultants and Contractors on Factors of SFM and Their effect on social Performance

4.4.1 Knowledge related factors

Figure 4.8, demonstrate that; the response of all respondents on knowledge related factors that have very high, high, and medium effect on social performance: in public building construction of Jimma Town including with RII value.

From client's, consultants, and contractors perspective: in Figure 4.8 it is observed that; Lack of understanding about SFM with design and construction was determined as 1st ranked factor of SFM that has very high effect on social performance of public building construction with RII value of (0.84), (0.87) and (0.87) respectively.

The 2nd determined factor of SFM that has very high and high effect on social performance of public building construction with RII value of (0.82), (0.78) and (0.79) was; Lack of capabilities/skills to practice SFM from perspective of client's, consultants, and contractors individually.

From client's, consultant's, and contractor's perspective: Lack of knowledge about SFM in the company; was determined as 3rd ranked factor of SFM that has high and very high effect on social performance public building construction with RII value of (0.79), (0.75) and (0.81) correspondingly. The 4th ranked factor of SFM that has medium effect on social performance of public building construction was; Knowledge gap between workers about SFM: from client's, consultants, and contractors point of view with RII value of (0.63), (0.68) and (0.64) respectively in public building construction of Jimma Town.

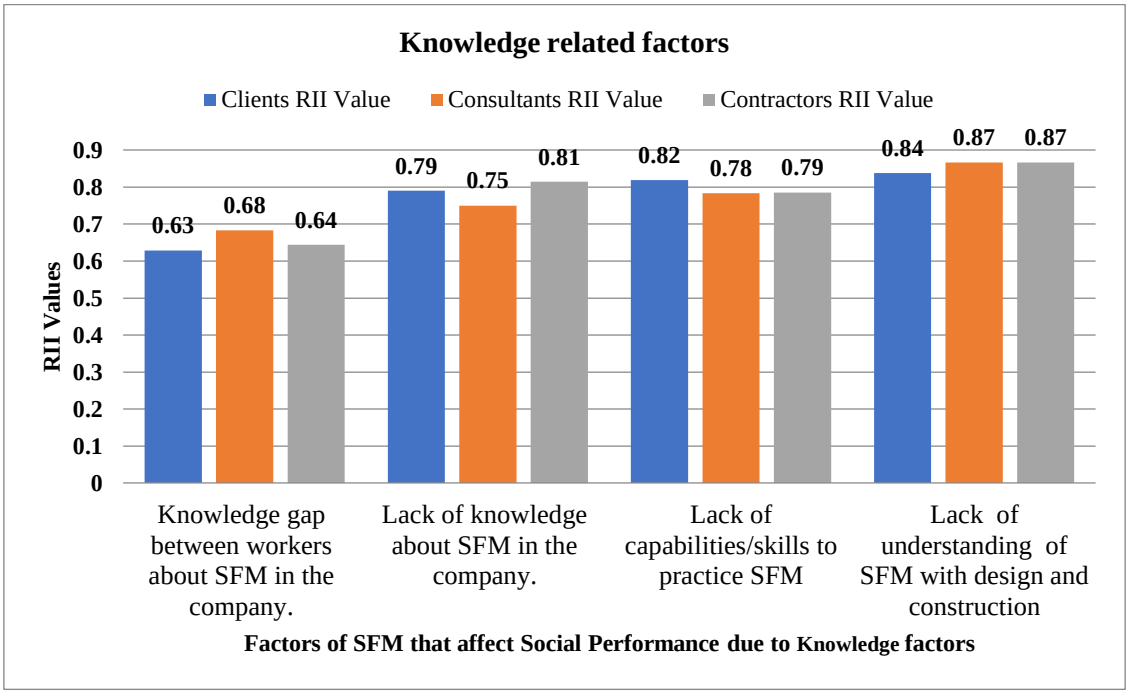


Figure 4.8 Overall Response on Knowledge related factors that affect Social Performance

Also, the average result of 3Cs responses that related to Knowledge factors are illustrate in Figure 4.9; that have very high, high, and medium effect on social performance of public building construction in Jimma Town based on Ave. RII value were ranked. The Figure 4.9 show; the Ave.RII value increase and the effect of factors on social performance of public building construction also increased.

The determined factors that have very high effect on social performance of public building construction in Jimma Town was; Lack of understanding about SFM with design and construction was identified as 1st ranked factor with Ave. RII value of 0.86.

Lack of capabilities/skills to practice SFM with Ave. RII value of 0.797 was ranked as 2nd and highest effect on social performance of public building construction in Jimma Town.

The 3rd ranked factor that has third highest effect on social performance of public building construction in Jimma Town was; Lack of knowledge about SFM in the company with Ave. RII value of 0.783.

Lastly, Knowledge gap between workers about SFM in the company; was ranked as 4th with Ave. RII value of 0.65 and that has medium effect on social performance of public building construction in Jimma Town.

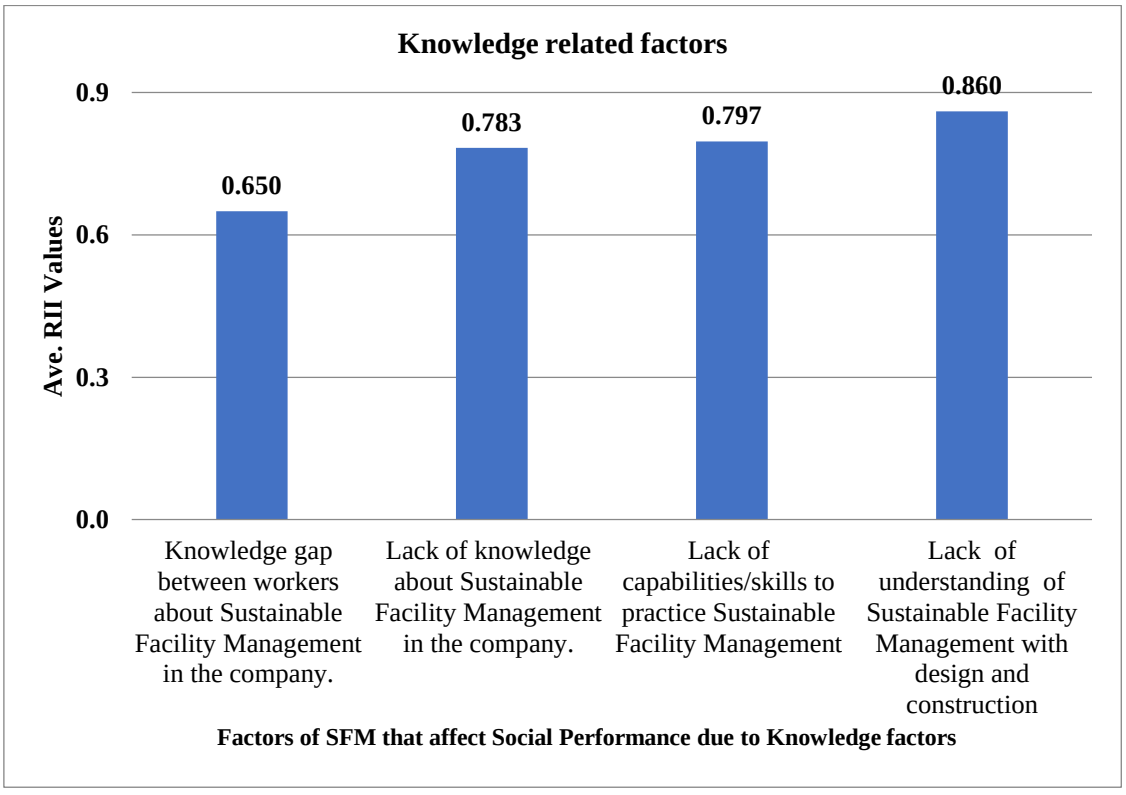


Figure 4. 9 Overall response of 3Cs Knowledge related factors and their effect on social performance

4.4.2 Design and planning stage related factors

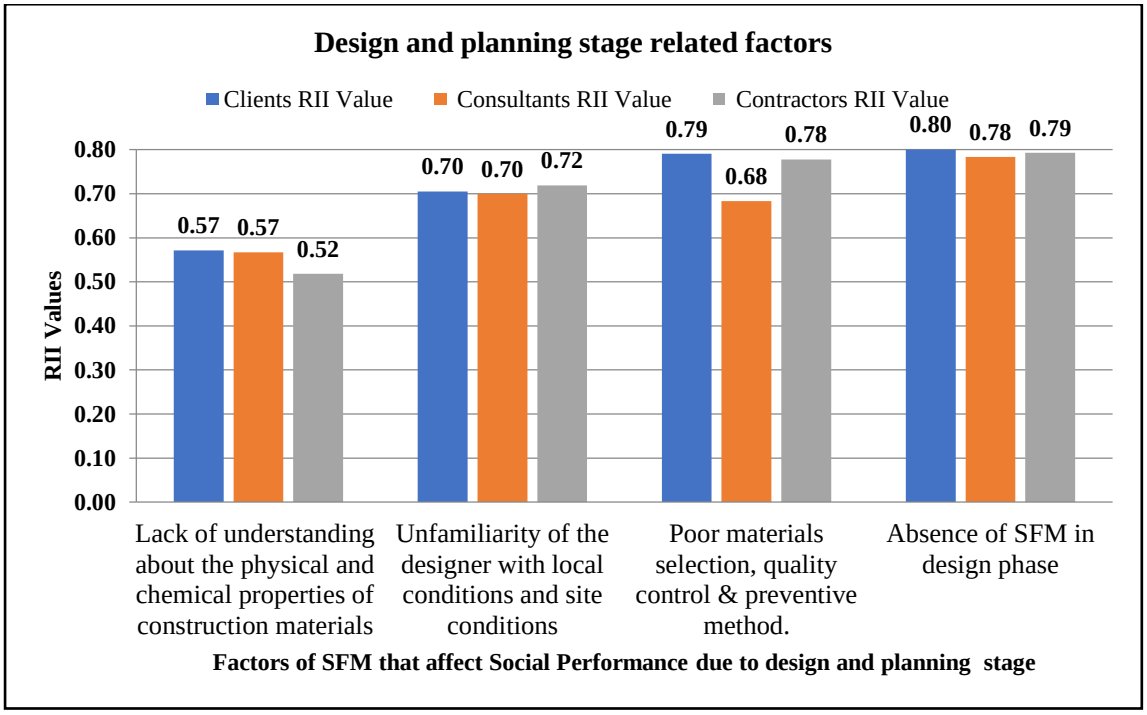


Figure 4.10 Overall Response of 3Cs on D and PS related factors and their effect on Social Performance

In Figure 4.10, design and planning stage related factors are illustrated with RII value of each factor; that have very high, high, medium, and low effect on social performance of public building construction in Jimma Town.

Based on RII value among the listed factors: Absence of SFM in design phase; was determined as 1st factor of SFM that has very high and high effect on social performance of public building construction by client's, consultants, and contractors perspective; with RII value of (0.80), (0.78) and (0.79) respectively.

The 2nd determined factor of SFM that has high and high effect on social performance of public building construction with RII value of (0.79), (0.68) and (0.78) was Poor materials selection, quality control & preventive method; from perspective of client's, consultants, and contractors individually.

From client's, consultants, and contractors point of view: Unfamiliarity of the designer with local conditions and site conditions; was determined as 3rd ranked factor of SFM with RII value of (0.70), (0.70) and (0.72); and that has high effect on social performance of public building construction in Jimma Town.

Lastly, from client's, consultants, and contractors outlook: the 4th ranked factor of SFM that has low effect on social performance of public building construction was; Lack of understanding about the physical and chemical properties of construction materials with

RII value of (0.57), (0.57) and (0.52) respectively in public building construction of Jimma Town related to design and planning stage factors.

Also, Design and planning stage related factors; that has highest and lowest effect on social performance of public building construction in Jimma Town: are demonstrate in Figure 4.11: based on the Ave. RII value and with ranking order of each factor depending on clients, consultants, and contractors responses.

Based on the respondents result; the 1st ranked factor with Ave. RII value of 0.79 was Absence of SFM in design phase and has the 1st highest effect on social performance of public building construction in Jimma Town.

The 2nd ranked factor and highest effect on social performance of public building construction in Jimma Town with Ave. RII value of 0.75 was; Poor materials selection, quality control & preventive method.

The 3rd determined factor was; Unfamiliarity of the designer with local conditions and site conditions with Ave. RII value of 0.707; that has the third highest effect on social performance of public building construction in Jimma Town.

Also, Figure 4.11 illustrate that; the 4th factor that has low effect on social performance of public building construction in Jimma Town; Lack of understanding about the physical and chemical properties of construction materials was determined as 4th ranked factor with Ave. RII value of 0.553: due to design and planning stage related factor.

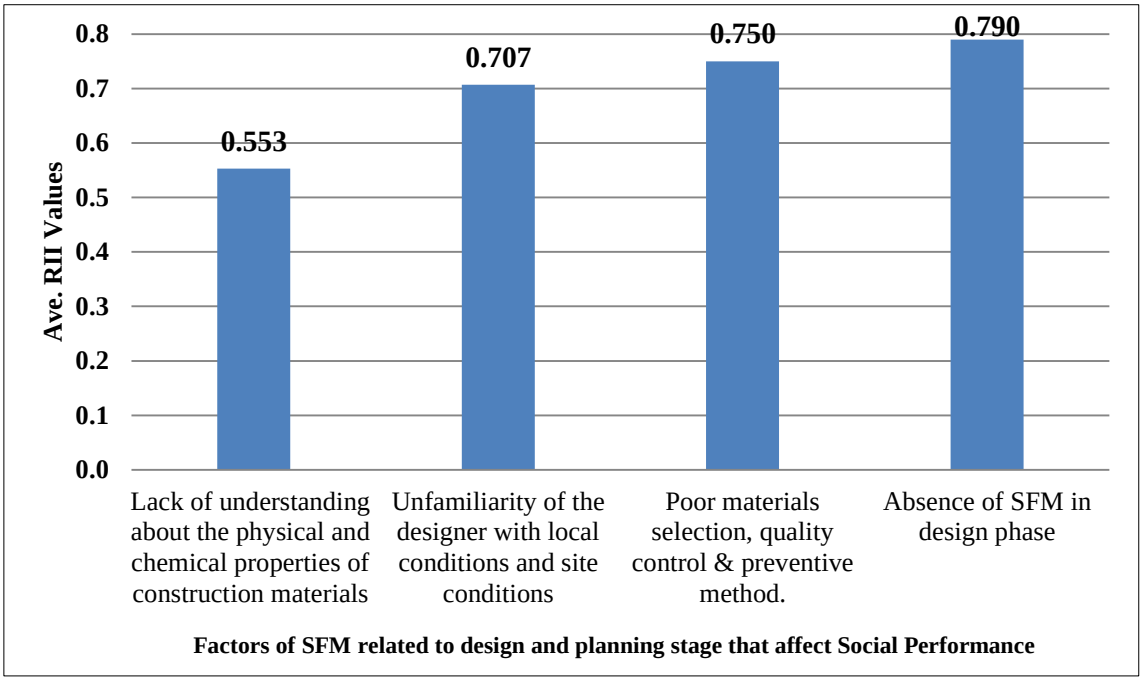
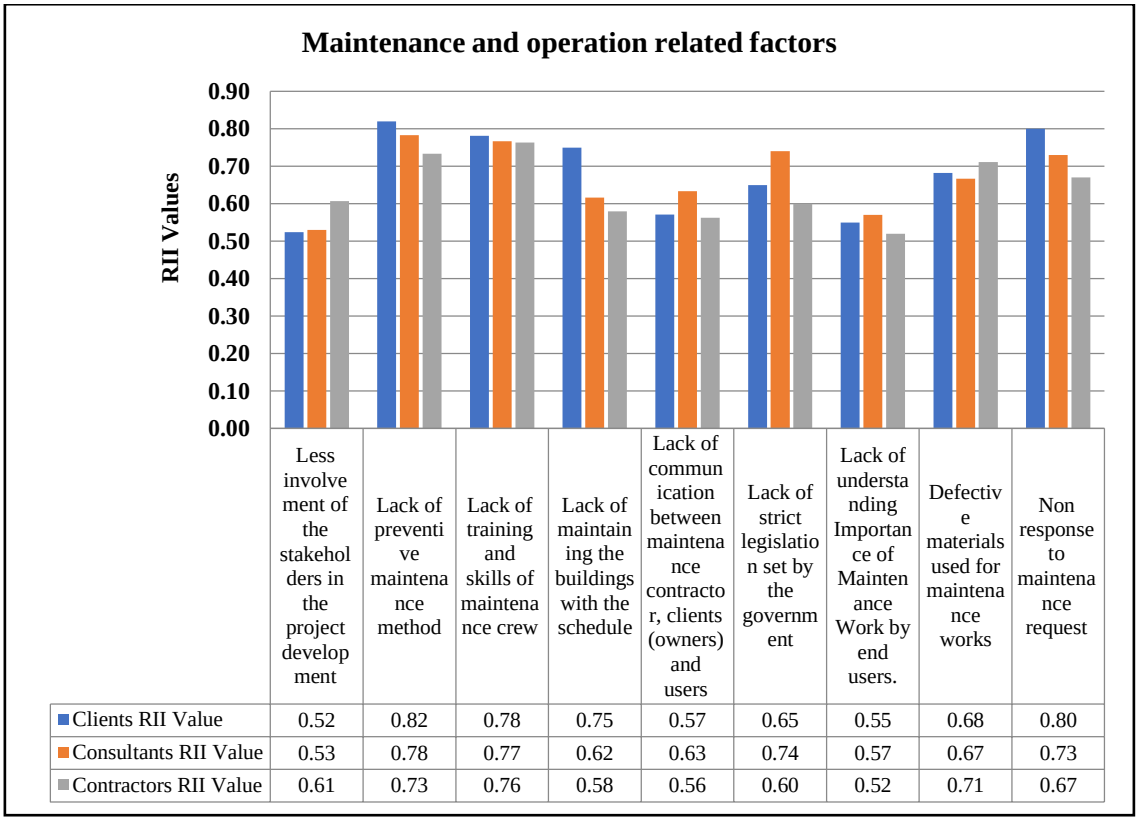


Figure 4.11Average Response of 3Cs on D and PS factors and their effect on social performance

4.4.3 Maintenance and operation related factors



	Less involvement of the stakeholders in the project development	Lack of preventive maintenance method	Lack of training and skills of maintenance crew	Lack of maintaining the buildings with the schedule	Lack of communication between maintenance contractor, clients (owners) and users	Lack of strict legislation set by the government	Lack of understanding Importance of Maintenance Work by end users.	Defective materials used for maintenance works	Non response to maintenance request
Clients RII Value	0.52	0.82	0.78	0.75	0.57	0.65	0.55	0.68	0.80
Consultants RII Value	0.53	0.78	0.77	0.62	0.63	0.74	0.57	0.67	0.73
Contractors RII Value	0.61	0.73	0.76	0.58	0.56	0.60	0.52	0.71	0.67

Figure 4.12 Response of Owners on M and O related factors and their effect on social performance

The identified maintenance and operation related factors of SFM: that have very high, high, medium and low effect on social performance of public building construction in Jimma Town indicate in Figure 4.12, including with RII values. The highest RII value that has highest effect on social performance of public building construction in Jimma Town: both from client's and consultant's perspectives; Lack of preventive maintenance method was determined as 1st ranked factor of SFM with RII value of (0.82) and (0.78) respectively. However, from contractor's point of view; it was ranked as 2nd factor of SFM that affect social performance with RII value of (0.73).

From client's perspective; Non response to maintenance request was determined as 2nd ranked factor of SFM that has very high effect on social performance with RII value of (0.8). While, from consultant's and contractor's point of view; this factor was ranked as 4th with RII value of (0.73) and (0.67) correspondingly.

Lack of training and skills of maintenance crew; was ranked as 3rd factor of SFM with RII value of (0.78); that has high effect on social performance from client's point of view. But, from consultant's and contractor's viewpoint: it was determined as 2nd and 1st ranked

factor of SFM that affect social performance with RII value of (0.78) and (0.76) respectively.

The 4th ranked factor of SFM that has high effect on social performance with RII value of (0.75) was Lack of maintaining the buildings with the schedule from client's outlook. However, both from consultant's and contractor's viewpoint it was ranked as 8th factor of SFM that affect social performance with RII value of (0.62) and (0.56) correspondingly.

Defective materials used for maintenance works; was determined as 5th ranked factor of SFM with RII value of (0.68); that has high effect on social performance from client's point of view. But, from consultant's and contractor's viewpoint: it was determined as 5th and 3rd ranked factor of SFM that affect social performance with RII value of (0.67) and (0.71) respectively.

The 6th ranked factor of SFM that has medium effect on social performance was; Lack of strict legislation set by the government both from client's and contractor's point of view with RII value of (0.65) and (0.6) correspondingly.. But, from consultant's perspective it was ranked as 3rd highest factor of SFM that affect social performance with RII value of (0.74).

The 7th ranked factor of SFM that has low effect on social performance with RII value of (0.57) was Lack of communication between maintenance contractor, clients (owners) and users; from client's perspective. While, from consultant's and contractor's point of view; this factor was ranked as 6th and 8th with RII value of (0.63) and (0.56) correspondingly.

Both from client's and consultant's outlook: Lack of understanding Importance of Maintenance Work by end users; was determined as 8th ranked factor of SFM that has low effect on social performance with RII value of (0.55) and (0.57) respectively. However, from contractor's viewpoint: it was determined as 9th ranked factor of SFM that has lower effect on social performance with RII value of (0.52).

Less involvement of the stakeholders in the project development was determined as 9th ranked factor of SFM with RII value of (0.52); that has lower effect on social performance both from client's and consultant's point of view. But, from contractor's viewpoint: it was determined as 5th ranked factor of SFM that affect social performance with RII value of (0.61) in public building construction of Jimma Town.

The next, Figure 4.13 show that; the Ave. RII values of 3Cs on M and O related factors that have high, medium, and lowest effects on social performance of public building construction in Jimma Town.

From the ranked and evaluated factors; Lack of preventive maintenance method was determined as the 1st highest Ave. RII value (0.777) and factor that has very high effect on social performance of public building construction in Jimma Town: due to maintenance and operation related factors.

The 2nd factor that has highest effect on social performance of public building construction in Jimma Town was; Lack of training and skills of maintenance crew were determined as 2nd ranked factor with Ave. RII value of (0.77).

The 3rd ranked factor related to maintenance and operation; that has third highest effect on social performance of public building construction in Jimma Town: was Non response to maintenance request; with Ave. RII value of (0.733). This result confirm on the research conducted by Awol et al., (2016); the authors found that lack maintenance in Jimma Town were cause risk in life of people.

Defective materials used for maintenance works; with Ave. RII value of (0.687) was determined as the 4th ranked factor and that has medium effect on social performance of public building construction in Jimma Town.

The 5th factor that has medium effect on social performance of public building construction in Jimma Town was; Lack of strict legislation set by the government with Ave. RII value of (0.663).

Lack of maintaining the buildings with the schedule; with Ave. RII value of (0.687) was determined as the 6th ranked factor and that has medium effect on social performance of public building construction in Jimma Town.

Similarly, the Figure 4.13 shows that; the lowest Ave. RII value and lowest effect on social performance of public building construction in Jimma Town: due to maintenance and operation related factors. Therefore, factors that have lowest effect on social performance of public building construction in Jimma Town are; with Ave. RII value of (0.587), (0.553), and (0.547); Lack of communication between maintenance contractor, clients (owners) and users, Less involvement of the stakeholders in the project development, and Lack of understanding Importance of Maintenance Work by end users were determined as 7th,8th, and 9th ranked factors that have low effect on social performance of public building construction in Jimma Town.

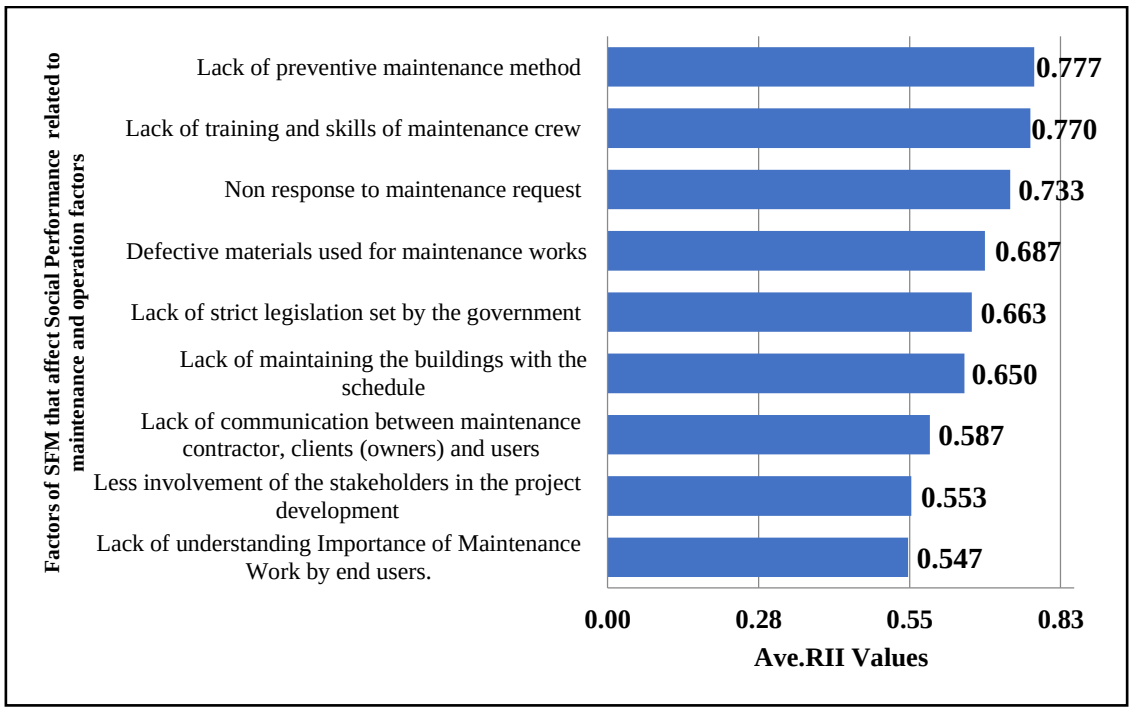


Figure 4. 13Average Response of 3Cs on M and O factors and their effect on social performance

4.4.4 External environment related factors

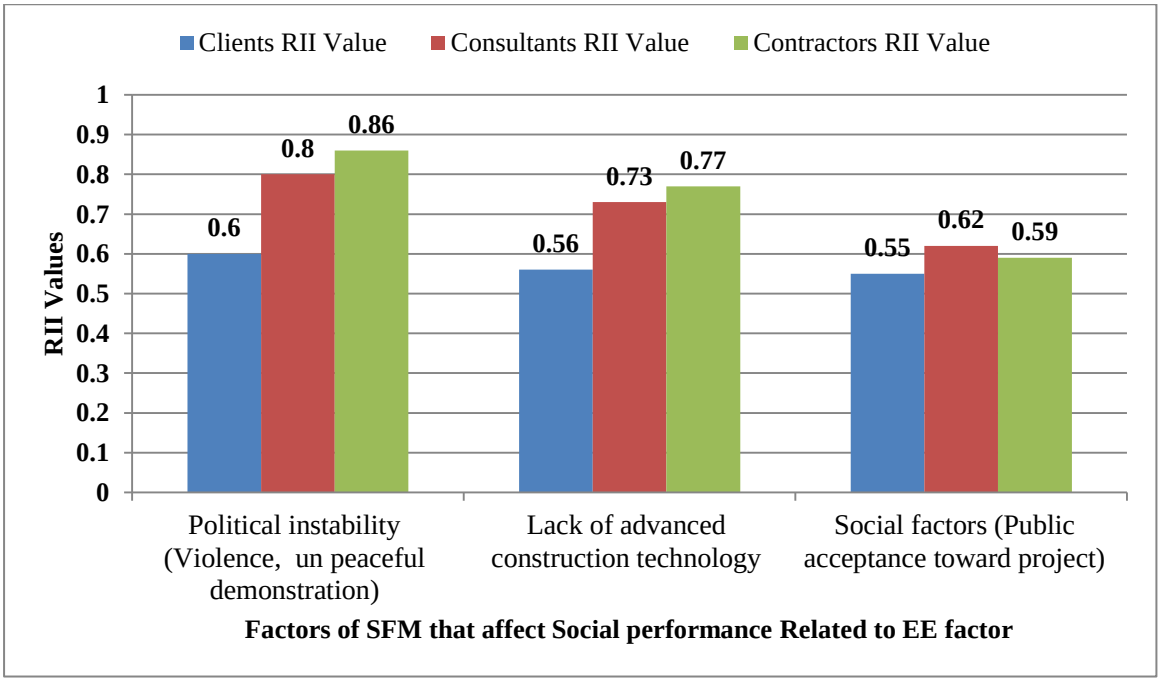


Figure 4.14 Overall Response of 3Cs on Factors of SFM that affect Social performance Related to EE factors

Above Figure 4.14, show that; the external environment related factors including RII values; that have very high, high, medium, and low effect on social performance of public building construction in Jimma Town.

From Figure 4.14; the 1st ranked factor that has medium and very high effect on social performance of public building construction with RII value of (0.6), (0.8), and (0.86) was;

Political instability (Violence, not peaceful demonstration) from perspective of client's, consultants, and contractors individually.

From client's, consultants, and contractors point of view: Lack of advanced construction technology; was the 2nd ranked factor of SFM that has low and high effect on social performance of public building construction with RII value of (0.56), (0.73) and (0.77); respectively.

Social factors (Public acceptance toward project); was determined as 3rd factor of SFM with RII value of (0.55), (0.62) and (0.59) respectively and that has low and medium effect on social performance of public building construction in Jimma Town: from perspective of client's, consultant's, and contractor's individually.

The next, Figure 4.15 demonstrates that; the highest, medium, and lowest Ave. RII value that have high, medium, and low effect on social performance of public building construction in Jimma Town; due to external environment related factors. Then, the 1st ranked factor that has highest effect on social performance of public building construction in Jimma Town: was Political instability (Violence, not peaceful demonstration) having with (0.753) Ave. RII value.

The 2nd highest Ave. RII value that has medium effect on social performance of public building construction in Jimma Town was; Lack of advanced construction technology having with (0.687) Ave. RII value.

Having with Ave. RII value of (0.587); Social factors (Public acceptance toward project) was determined as 3rd ranked factor, and lowest effect on social performance of public building construction in Jimma Town.

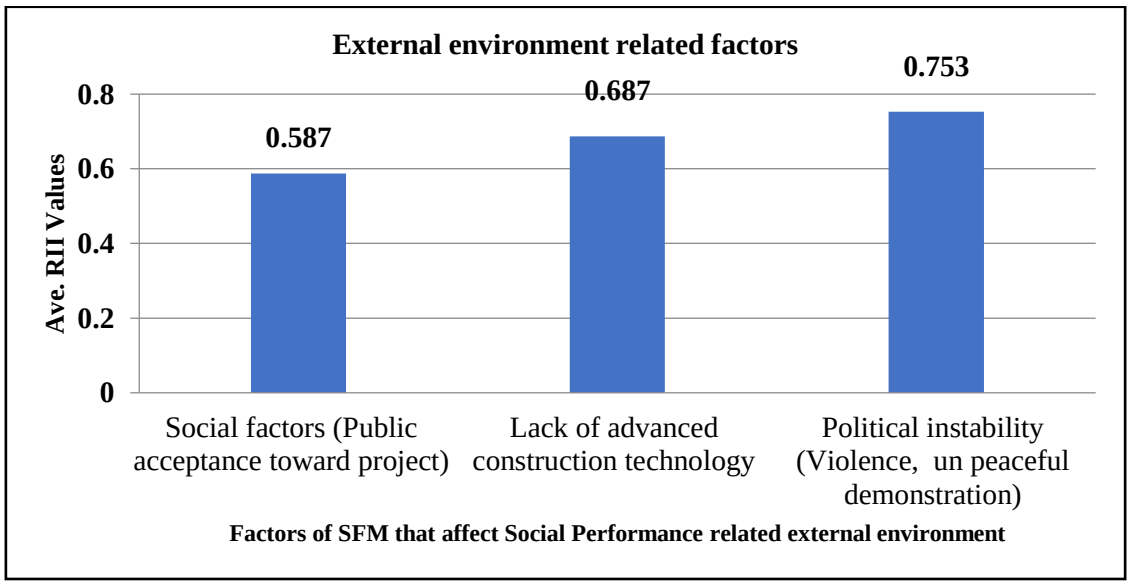
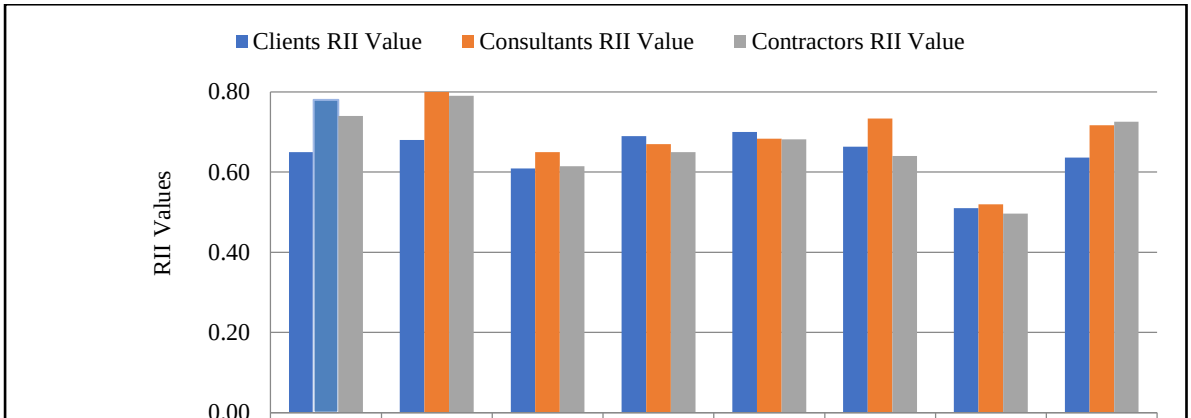


Figure 4. 15 Average Response of 3Cs on EE factors and their effect on social performance

4.4.5 Project management related factors



	Lack of effective monitoring and control for SFM	Lack of leadership (wrong people in the wrong position)	Unclear Policy systems, Strategy and Work Planning	Unwilling ness to implement SFM	Increasing liability on facility managers	Poor Training and Education system or plan	Lack of ability to solve problems	Lack of team work
Clients RII Value	0.65	0.68	0.61	0.69	0.70	0.66	0.51	0.64
Consultants RII Value	0.78	0.80	0.65	0.67	0.68	0.73	0.52	0.72
Contractors RII Value	0.74	0.79	0.61	0.65	0.68	0.64	0.50	0.73

Figure 4.16 Overall Response of 3Cs on Project Management related factors and their effect on Social Performance

Figure 4.16; show that the response of client's, consultant's and contractor's RII value of project management related factors that have high, medium, and low effect on social performance of public building construction in Jimma Town.

From client's perspective; increasing liability on facility managers was determined as 1st ranked factor of SFM that has very high effect on social performance with RII value of (0.7). While, from consultant's and contractor's point of view; this factor was ranked as 5th and 4th with RII value of (0.68) and (0.68) correspondingly.

Unwillingness to implement SFM; was ranked as 2nd ranked factor of SFM related to project management from viewpoint of client's: with RII value of (0.69); that has high effect on social performance. However, from consultant's and contractor's perspective it was ranked as 6th and 5th factor of SFM that affect social performance with RII value of (0.67) and (0.65) respectively.

The 3rd ranked factor of SFM that has medium effect on social performance with RII value of (0.68) was Lack of leadership (wrong people in the wrong position); from client's outlook. But, both from consultant's and contractor's viewpoint it was ranked as 1st factor of SFM that affect social performance with RII value of (0.80) and (0.79) correspondingly.

From client's perspective; Poor Training and Education system or plan was determined as 4th ranked factor of SFM that has medium effect on social performance with RII value of

(0.66). While, from consultant's and contractor's point of view; this factor was ranked as 3rd and 6th with RII value of (0.73) and (0.64) respectively.

Lack of effective monitoring and control for SFM; was ranked as 5th factor of SFM that has medium effect on social performance with RII value of (0.65) from client's outlook. But, both from consultant's and contractor's viewpoint it was ranked as 2nd factor of SFM that affect social performance with RII value of (0.62) and (0.74) correspondingly.

The 6th ranked factor of SFM that has medium effect on social performance with RII value of (0.64) was Lack of team work from client's viewpoint. However, both from consultant's and contractor's viewpoint it was ranked as 4th and 3rd factor of SFM that affect social performance with RII value of (0.72) and (0.73) respectively.

From client's, consultant's and contractor's perspective; Unclear Policy systems, Strategy and Work Planning of SFM; was determined as 7th ranked factor of SFM that has medium effect on social performance with RII value of (0.61), (0.65) and (0.61) correspondingly.

Also, from client's, consultant's and contractor's viewpoint; Lack of ability to solve problems; was ranked as 8th factor of SFM with RII value of (0.51), (0.52) and (0.50) respectively: was determined as lower effect on social performance of public building construction in Jimma Town.

The next, Figure 4.17 demonstrate that; the result of the 3Cs with highest, medium, and lowest Ave. RII value of project management related factors: that has high, medium, and low effects on social performance of public building construction in Jimma Town.

From mentioned project management related factor in the bar chart (Figure 4.17); the 1st factor that has high effect on social performance public building construction in Jimma Town was; Lack of leadership (wrong people in the wrong position) with Ave. RII value of 0.757.

Lack of effective monitoring and control for SFM; was determined as 2nd ranked factor with Ave. RII value of 0.723 from project management related factors and the second highest factor that has medium effect on social performance of public building construction in Jimma Town.

The 3rd ranked and highest Ave. RII value 0.697 factor that has medium effect on social performance of public building construction in Jimma Town: was Lack of team work.

Increasing liability on facility managers; was determined as 4th ranked factor with Ave. RII value of 0.687 from project management related factors and it has medium effect on social performance of public building construction in Jimma Town.

The 5th ranked factor that has medium effect on social performance of public building construction in Jimma Town was; Poor Training and Education system or plan with Ave. RII value of 0.677.

The 6th ranked factor that has medium effect on social performance of public building construction in Jimma Town: was; Unwillingness to implement SFM with Ave. RII value of 0.67.

The 7th ranked factor that has medium effect on social performance of public building construction in Jimma Town: was; Unclear Policy systems, Strategy and Work Planning of SFM with Ave. RII value of 0.623.

Lack of ability to solve problems with Ave. RII value of 0.51 was determined as 8th ranked factor that has low effect on social performance; due to project management related factors of public building construction in Jimma Town.

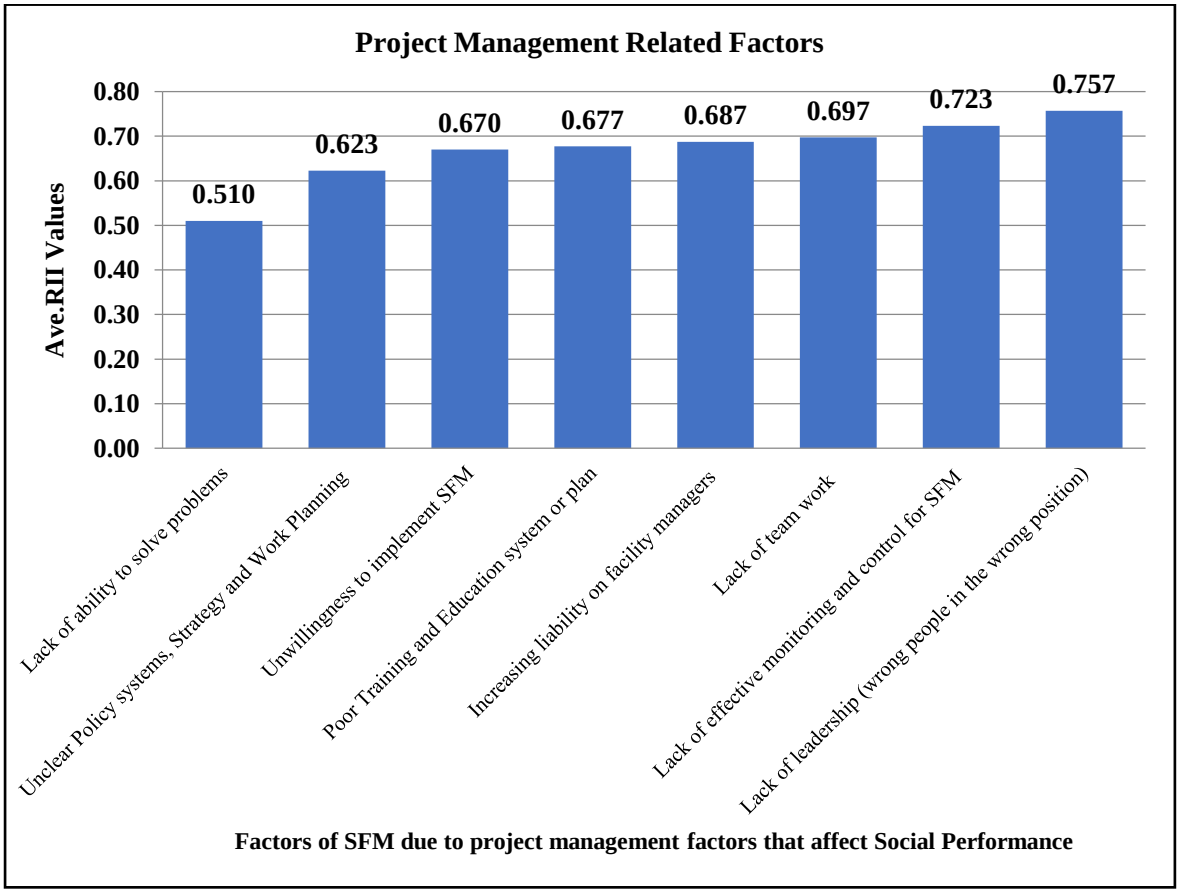


Figure 4.17 Average Response of 3Cs on PM related factors and their effect on social performance

4.5 Result from Interview Questionnaires

The interview questionnaire was distributed for owner, consultants, and contractors those were involved in building construction projects of Jimma Town: for more than five years' experience and those are currently involved in building construction. Among the participants for this study, 7 participants from client, 4 from consultants, and 9 from contractors.

4.5.1 Response of Owners Representatives

1. Hiring facility manager in company

Table 4.4 Response of the owners on hiring of facility manager in the company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	7	100.0	100.0	100.0

From Table 4.4, it is clearly presenting that; the owner representatives agree that there is contribution of facility manager's owner side.

2. Responsibility of facility manager in the construction company

Table 4.5, below shows that; responses of owner's representatives on: the responsibility of facility manager of construction company including percentage. From listed obligation of facility manager: both Facility maintenance planning and Controlling building maintenance method or system were identified as 1st duty having with 28.6%. And the 2nd duties of facility manager were; Testing and inspection of building maintenance, Drafting maintenance report, and Environment, health and safety having with 14.3%.

Table 4.5 Response of the owners on Facility manager responsibilities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Facility maintenance planning	2	28.6	28.6	28.6
	Testing and inspection of building maintenance	1	14.3	14.3	42.9
	Controlling building maintenance method or system	2	28.6	28.6	71.4
	Drafting maintenance report	1	14.3	14.3	85.7
	Environment, health and safety	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

3. Disadvantage of not hiring a facility manager for company

Table 4.6 Response of the owners on demerit of not hiring facility manager in the company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Higher maintenance cost	2	28.6	28.6	28.6
	Unmotivated working environment	2	28.6	28.6	57.1
	Lack of health safety of workers	1	14.3	14.3	71.4
	Less satisfaction of the customers	2	28.6	28.6	100.0
	Total	7	100.0	100.0	

The table 4.6, above describes that; the interview results of owner response on demerit of not hiring facility manager in the company. As per the respondents it is obvious that; not hiring facility manager in the company was led to: Higher maintenance cost, Unmotivated working environment and less satisfaction of the customers were identified as a major disadvantage having with 28.6%. Also, Lack of health safety of workers was the next major disadvantage of missing a facility manager in Construction Company.

4. Type of maintenance mostly practices in company

Table 4.7 Response of the owners on type of maintenance frequently practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance)	7	100.0	100.0	100.0

Table 4.7, indicate that interview result obtained from the owner representatives; then, all the representatives of clients agree that; Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance) was practiced than preventive Maintenance.

5. Budget plan for maintenance during the design period

The interview result of owner representatives on budget plan for maintenance during the design period are shown in Table 4.8. Then, all the representatives of clients agree that; their construction company not have a budget plan during the design phase for maintenance work.

Table 4.8 Response of the owners on maintenance work Budget during the design phase

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		7	100.0	100.0	100.0

6. Reason of not including a budget plan for maintenance during the design period

Table 4.9 Response of the owners on excluding a budget plan for maintenance during the design period

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lack of budget	4	57.1	57.1	57.1
	Lack of skilled workers	1	14.3	14.3	71.4
	Less interest by owner	2	28.6	28.6	100.0
	Total	7	100.0	100.0	

Table 4.9, displays that; the reason why the construction companies were not includes a budget plan for building maintenance work during the design period was; due to Lack of budget, Less interest by owner, and Lack of skilled workers, based on respondent percentage value; were identified as 1st, 2nd, and 3rd factor respectively.

7. SFM plan or strategy in company

The interview result of owner representative is illustrated in Table 4.10; therefore based on the reply of the respondent all the representatives of clients agree that; SFM plan or strategy in company was not planned in company for building construction.

Table 4.10 Response of the owners on having SFM plan or strategy in company

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		7	100.0	100.0	100.0

8. Effects of SFM factors on cost performance building construction

According to Table 4.11, it displays that; the response of owner representative on the effects of cost performance: due to excluding SFM in the construction company with percentage. Then, excluding SFM were have moderate and high effects on cost performance of public building construction.

Table 4.11 Response of the owners on extent of effects on cost performance not having SFM in company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderate Effect	3	42.9	42.9	42.9
	High Effect	3	42.9	42.9	85.7
	Very High Effect	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

9. Effects of SFM factors on social performance building construction

Table 4.12, indicate that; the response of owner representative on the effects of social performance: not having SFM in the construction company with percentage. These were led to; Service delay for end users, Unsafe working environment, and less motivation; are

major effects on social having with equal percentages 28.6%. Also, excluding SFM in building Construction Company was effect on customer's satisfaction with 14.3%.

Table 4.12 Response of the owners on effects of not having SFM on social performance of the building project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfaction of customers	1	14.3	14.3	14.3
	Service delay for end users	2	28.6	28.6	42.9
	Un safe working environment	2	28.6	28.6	71.4
	Less motivation	2	28.6	28.6	100.0
	Total	7	100.0	100.0	

10. Effects designer experience on SFM goal

Below table 4.13, illustrate that; the response of owner representative on lack of experience by designer has effect on SFM goal in percentage. Therefore, based on the respondent reply 57.1% of respondents accept that experience of designer affect goal of SFM and 42.9% of respondents not accept that experience of designer affect goal of SFM.

Table 4.13 Response of the owners on Lack of experienced designer's effect on SFM goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	57.1	57.1	57.1
	No	3	42.9	42.9	100.0
	Total	7	100.0	100.0	

11. Lack of strict legislation of building law effect the goal of SFM

Table 4.14 show that; the response of owner representatives on effect of SFM goal due to; lack of strict legislation of building law: then 71.4% of the respondents agree that lack of strict legislation of building law has effect on SFM goal. But, less percentage (28.6%) of the respondents that lack of strict legislation of building law has less effect on SFM goal.

Table 4.14 Response of the owners on effect of SFM goal due to lack of strict legislation of building law

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	71.4	71.4	71.4
	No	2	28.6	28.6	100.0
	Total	7	100.0	100.0	

12. Common factors of maintenance in building construction of Jimma Town

According to Table 4.15, it is clearly show that; the response of owner representative on common factors of maintenance in building construction of Jimma Town with percentage. Based on the reply of the respondents common factors of building maintenance are; Cost,

Management factor, and External impacts were identified as a main factor that influence building construction maintenance work with equal percentage of 28.6%. And, Professional skill was identified as less influencing factors of building construction maintenance work with 14.3%.

Table 4.15 Response of the owners on common factors of maintenance in building construction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cost	2	28.6	28.6	28.6
	Management factor	2	28.6	28.6	57.1
	Professional skill	1	14.3	14.3	71.4
	External impacts	2	28.6	28.6	100.0
	Total	7	100.0	100.0	

4.5.2 Response of Contractors

1. Hiring facility manager in company

Table 4.16 Response of the contractors on hiring of facility manager in the company

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		9	100.0	100.0	100.0

Table 4.16, clearly show that; the response of contractors on hiring of facility manager in their own company. Therefore, based on their reply there is no involvement of facility managers in contractor's side.

2. Disadvantage of not hiring a facility manager for company

Below Table 4.17, describe that; the response of contractors on demerit of not hiring facility manager in the company. As per the respondents in table 4.17, it is obvious indicate that; not hiring facility manager in the company was led to: Lack of health safety of workers has 1st effect on the company with 33.3%. Both; Less profitability, Unmotivated working environment, and less satisfaction of the customers were identified as 2nd disadvantage for the company having with 22.2%.

Table 4.17 Response of the contractors on demerit of not hiring facility manager in the company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less profitability	2	22.2	22.2	22.2
	Unmotivated working environment	2	22.2	22.2	44.4
	Lack of health safety of workers	3	33.3	33.3	77.8
	Less satisfaction of the customers	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

3. Type of maintenance mostly practices in company

Table 4.18, result obtained from the interview indicate that; all the contractors were responds; Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance) was practiced than preventive maintenance.

Table 4.18 Response of the contractors on type of maintenance frequently practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance)	9	100.0	100.0	100.0

4. Budget plan for maintenance during the design period

The interview result response of the contractors shows in Table 4.19; as per the reply of the respondents all are agreed that; there is no a budget plan during the design phase for building maintenance work by their construction company.

Table 4.19 Response of the contractors on maintenance work Budget during the design phase

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		9	100.0	100.0	100.0

5. Reason of not including a budget plan for maintenance during the design period

It is clearly show that; in Table 4.20, the response of contractors on the why the construction companies were not includes a budget plan for building maintenance work during the design period are; due to Lack of budget with higher percentage response value 55.6% as 1st and Less interest by owner with 44.4% response value as 2nd; were as a main reason for not including in design phase.

Table 4.20 Response of the contractors on excluding a budget plan for maintenance during the design period

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lack of budget	5	55.6	55.6	55.6
	Less interest by owner	4	44.4	44.4	100.0
	Total	9	100.0	100.0	

6. SFM plan or strategy in company

The response of contractors on including SFM plan or strategy in company is illustrated in Table 4.21: therefore, based on the reply of the respondent all contractors agree that; their company was not has plan or strategy for SFM in company.

Table 4.21 Response of the contractors on having SFM plan or strategy in company

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		9	100.0	100.0	100.0

7. Effects of SFM factors on cost performance building construction

According to Table 4.22, it is show that; the response of contractors on the effects of cost performance: due to excluding SFM in the construction company with percentage. Then, excluding SFM were has high effects on cost performance of public building construction having with 55.6%.

Table 4.22 Response of the contractors on extent of effects on cost performance not having SFM in company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low Effect	2	22.2	22.2	22.2
	Moderate Effect	1	11.1	11.1	33.3
	High Effect	5	55.6	55.6	88.9
	Very High Effect	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

8. Effects of SFM factors on social performance building construction

Below Table 4.23, show that the response of contractors on not having SFM in construction company; and its effect on social performance including with percentage. According to the response of c contractors: Less motivation was has high percentage (33.3%) than other and identified as 1st, both Service delay for end users, and Low efficiency (22.22%) were determined as 2nd; the 3rd identified low effects are Customer

satisfaction, and Unsafe working environment (22.22%); these were have effects on social performance of building projects.

Table 4.23 Response of the contractors on effects of not having SFM on social performance of the building project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfaction of customers	1	11.1	11.1	11.1
	Service delay for end users	2	22.2	22.2	33.3
	Un safe working environment	1	11.1	11.1	44.4
	Less motivation	3	33.3	33.3	77.8
	Low efficiency	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

9. Effects designer experience on SFM goal

Below Table 4.24, indicate that; the response percentage of contractors on effects of SFM goal: due to lack of experience by designer. Therefore, based on the respondent reply 66.7% of respondents accept that experience of designer affect goal of SFM and only 33.3% of respondents not accept that experience of designer affect goal of SFM.

Table 4.24 Response of the contractors on Lack of experienced designer's effect on SFM goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	66.7	66.7	66.7
	No	3	33.3	33.3	100.0
	Total	9	100.0	100.0	

10. Lack of strict legislation of building law effect the goal of SFM

Table 4.25, illustrate that the response of contractors on effect of SFM goal due to; lack of strict legislation of building law. Then, 77.8% contractor's respondents accept that lack of strict legislation of building law has effect on SFM goal. But, 22.2% of contractor's respondents was; reply that lack of strict legislation of building law has no effect on SFM goal.

Table 4.25 Response of the contractors on effect of SFM goal due to lack of strict legislation of building law

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	7	77.8	77.8	77.8
	No	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

11. Common factors of maintenance in building construction of Jimma Town

In Table 4.26, it is obviously display that the response of contractors on common factors of maintenance in building construction of Jimma Town: with percentage. Based on the reply of the respondents common factors of building maintenance are; Cost that related to maintenance and operation, and External impacts were identified as a main factor that influence building construction maintenance work with 33.3%. And, Management factor, and Professional skill; were identified as 3rd and 4th influencing factors of building construction maintenance work with 22.2% and 11.1% respectively.

Table 4.26 Response of the contractors on common factors of maintenance in building construction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cost	3	33.3	33.3	33.3
	Management factor	2	22.2	22.2	55.6
	Professional skill	1	11.1	11.1	66.7
	External impacts	3	33.3	33.3	100.0
	Total	9	100.0	100.0	

4.5.3 Response of Consultants

1. Hiring facility manager in company

Table 4.27, clearly show that; the response of consultants on hiring of facility manager in their own company. Therefore, based on their reply there is no involvement of facility managers in consultant side.

Table 4.27 Response of the consultants on hiring of facility manager in the company

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		4	100.0	100.0	100.0

2. Disadvantage of not hiring a facility manager for company

Table 4.28, describes that; the response of consultants on demerit of not hiring facility manager in the company. As per the respondents in table 4.28, it is obviously show that; not hiring facility manager in the company was led to: Lack of health safety of workers and half of the respondents agree that it has 1st effect on the company. Both; Higher maintenance cost, and less satisfaction of the customers were identified as 2nd disadvantage for the company having with 25%.

Table 4.28 Response of the consultants on demerit of not hiring FM in the company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Higher maintenance cost	1	25.0	25.0	25.0
	Lack of health safety of workers	2	50.0	50.0	75.0
	Less satisfaction of the customers	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

3. Type of maintenance mostly practices in company

Table 4.29, result obtained from the interview shows that; all the consultants were respond that; Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance) was practiced than preventive maintenance.

Table 4.29 Response of the consultants on type of maintenance frequently practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance)	4	100.0	100.0	100.0

4. Budget plan for maintenance during the design period

The interview result response of the consultants shows in Table 4.30; as per the reply of the respondents all are agreed that; there is no a budget plan during the design phase for building maintenance work by their construction company.

Table 4.30 Response of the consultants on maintenance work Budget during the DP

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		4	100.0	100.0	100.0

5. Reason of not including a budget plan for maintenance during the design period

It is clearly show that; in Table 4.31, the response of consultants on the why the construction companies were not includes a budget plan for building maintenance work during the design period are; both due to Lack of budget and Less interest by owner, were main reason of not including in design phase.

Table 4.31 Response of the consultants on excluding a budget plan for maintenance during the design period

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lack of budget	2	50.0	50.0	50.0
	Less interest by owner	2	50.0	50.0	100.0
	Total	4	100.0	100.0	

6. SFM plan or strategy in company

Table 4.32 Response of the consultants on having SFM plan or strategy in company

Valid	No	Frequency	Percent	Valid Percent	Cumulative Percent
		4	100.0	100.0	100.0

The response of consultants on including SFM plan or strategy in company is illustrated in Table 4.32, therefore based on the reply of the respondent all consultants agree that; their company was not have plan or strategy for SFM in company.

7. Effects of SFM factors on cost performance building construction

According to Table 4.33, it is show that; the response of consultants on the effects of cost performance: due to excluding SFM in the construction company with percentage. Then, excluding SFM were has high effects on cost performance of public building construction having with 50%.

Table 4.33 Response of the consultants on extent of effects on cost performance not having SFM in company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Moderate Effect	1	25.0	25.0	25.0
	High Effect	2	50.0	50.0	75.0
	Very High Effect	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

8. Effects of SFM factors on social performance building construction

Below table 4.34, show that the response of consultants on not having SFM in construction company; and its effect on social performance including with percentage. According to the response of consultants; these were effect on; customer satisfaction, service delay for end users, Unsafe working environment, and less motivation; are major effects on social having with equal percentages 25%.

Table 4.34 Response of the consultants on effects of not having SFM on social performance of the building project

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Satisfaction of customers	1	25.0	25.0	25.0
	Service delay for end users	1	25.0	25.0	50.0
	Un safe working environment	1	25.0	25.0	75.0
	Less motivation	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

9. Effects designer experience on SFM goal

Below table 4.35, indicate that; the response percentage of consultants on effects of SFM goal: due to lack of experience by designer. Therefore, based on the respondent reply 75% of respondents accept that experience of designer affect goal of SFM and only 25% of respondents not accept that experience of designer affect goal of SFM.

Table 4.35 Response of the consultants on Lack of experienced designers effect on SFM goal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	3	75.0	75.0	75.0
	No	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

10. Lack of strict legislation of building law effect the goal of SFM

Table 4.36, illustrate that the response of consultants on effect of SFM goal due to; lack of strict legislation of building law. Then, all respondents agree that lack of strict legislation of building law has effect on SFM goal.

Table4. 36 Response of the consultants on effect of SFM goal due to lack of strict legislation of building law

Valid	Yes	Frequency	Percent	Valid Percent	Cumulative Percent
		4	100.0	100.0	100.0

11. Common factors of maintenance in building construction of Jimma Town

In table 4.37, it is obviously display that the response of consultants on common factors of maintenance in building construction of Jimma Town with percentage. Based on the reply of the respondents common factors of building maintenance are; Cost that related to maintenance and operation was identified as a main factor that influence building construction maintenance work with 50%. And, Management factor, and External impacts were identified as equal influencing factors of building construction maintenance work with 25%.

Table 4.37 Response of the consultants on common factors of maintenance in building construction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cost	2	50.0	50.0	50.0
	Management factor	1	25.0	25.0	75.0
	External impacts	1	25.0	25.0	100.0
	Total	4	100.0	100.0	

CHAPTER FIVE

CONCLUSION AND RECCOMENDATION

5.1 CONCLUSION

The study was totally identified 43 factors in five categories: from the literature review to recognize the important factors of SFM in public building construction of Jimma Town. These are; (1) Knowledge Related Factors; (2) Design and Planning Stage Related Factors; (3) Maintenance and Operation Related Factors; (4) External Environment Related Factors; and (5) Project Management Related Factors respectively.

The study revealed factors that has highest effect on cost performance are; Absence of SFM in design phase, Poor materials selection, quality control & preventive method, Low concern to future maintenance, Lack of understanding about the physical and chemical properties of construction materials, Non response to maintenance request, Lack of preventive maintenance method, Lack of training and skills of maintenance crew, Economic instability (Market inflation), Lack of advanced construction technology, Lack of support from top management about SFM, Lack of effective monitoring and control for SFM, Lack of leadership (wrong people in the wrong position), and Poor Training and Education system or plan for staff; were determined as main factors that have major effect on cost performance of public building construction in Jimma Town.

The study also, determined the significant factors; that has highest effects on social performance are; Lack of understanding about SFM with design and construction, Lack of capabilities/skills to practice SFM, Lack of knowledge about SFM in the company, Absence of SFM in design phase, Poor materials selection, quality control & preventive method, Lack of preventive maintenance method, Lack of training and skills of maintenance crew, Non response to maintenance request, Political instability (Violence, not peaceful demonstration), Lack of leadership (wrong people in the wrong position), and Lack of effective monitoring and control for SFM; were determined as major factors that affect social performance of public building construction in Jimma Town.

From the interview result that was made with the all respondents: the study find that; less number of facility manager's employment in the company: this led to less satisfaction of the customers, unmotivated working environment, lack of health safety of workers and higher maintenance cost. Similarly, in each respondents company there is no a budget plan during the design phase for maintenance work; due to Lack of budget, and Less interest by owner and Unplanned Maintenance; Corrective (Including Immediate or

Emergency Maintenance) was mostly practiced: than preventive maintenance: this also affect cost and social performance of public building construction in Jimma Town.

In the same way, lack of experience by designer, lack SFM plan or strategy in company and lack of strict legislation of building law were have effect on SFM goal and these was affect customer satisfaction, workers motivation, service delay for end users and unsafe working environment; in public building construction of Jimma Town.

Generally, the study conclude that; there were many major factors that affect SFM to implement in building construction project and this again influence cost and social performance of public building construction Jimma Town.

Therefore, promotion of sustainability in facility management is considered as a way for the public building construction to balance economic and social performance in implementing construction projects. If we accept this, the link between sustainability with facility management and building construction becomes clear: because construction has high economic significance, strong environmental and social influences. Also, SFM is a continuous process that ensures the environmental protection and elevating quality of life for the present and future generations. The aim of this study is to preserve the building in its initial effective state and this must be started from building design at organizational strategic level. If completed building facilities management is not managed properly, they cannot perform as intended. Therefore, sustainability and building facilities management incorporation is required to upkeep the facilities in best operation conditions.

5.2 RECOMMENDATION

To achieve sustainable facility management aim in public building construction of Jimma Town. The following recommendation suggested;

1. Both for clients and consultants: sustainable facility management goal, plan, strategies and budget; should include starting from design phase: to achieve sustainability in the industry, three principles emerge: resource efficiency, cost efficiency and design for human adaptation. These integrate sustainability principles into construction projects right from the conceptual stage.
2. The SFM design should optimize the use of locally-available materials. In most cases, locally manufactured products are cheaper than their imported counterparts since their transport costs are not as huge. This is done by consultants and contractors.
3. Both for clients, consultants and contractors: Awareness and training should be given; for workers of the construction company and maintenance crew. This help to improve the skill and capability of workers.
4. Proper material selection should be mandatory during construction building maintenance work. These forward to good working environment and minimize additional cost of maintenance work cost related to material quality.
5. Government should include a strict legislation policy of SFM for protection and balances the environmental, economical, and social impact. And inflation of material cost in the market should also control and managed.
6. Top managers should motivate and encourage workers of their company to integrate sustainability into facility management and way of monitoring should be effective to check and achieve goal of SFM.
7. All 3Cs should; focus on development of the engineering capabilities in the maintenance area through educational course and for engineers and other workers.
8. All 3Cs company should hire facility managers for achievement of SFM goal and better facility management services towards building users.
9. The client should prepare a tender or contract document for public building maintenance work to support SFM goal.
10. Waste management system should implement during and after a maintenance work to achieve SFM aim.

A. Further study

The finding of this study: help for other academicals or researchers as a reference and starting point to improve the finding and inspire them more in depth about sustainable facility management in Jimma Town. Hereafter, depending on this title some focusing areas for further study by other investigator are;

I. Further studies on sustainable facility management effects separately on cost and social performances in Jimma Town: by including case studies and quantitative method to validate the questionnaire and interview results of this study: by using additional software.

II. Study on sustainable facility management practice and implementation starting from design and construction phases in Jimma Town.

III. Further studies on justification of this study results by comparing sustainable facility management system both in public and private buildings that give services for the communities using measurable methods.

IV. Also, further study on sustainable facility management success factors of building construction projects: in Jimma Town and other Town.

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APPENDIXES

APPENDIX-A: QUESTIONNAIRE

JIMMA UNIVERSITY

School of Graduate Studies

Jimma Institute of Technology

Faculty of Civil and Environmental Engineering

Construction Engineering and Management Chair

Questionnaire Survey on:-

- **ASSESSMENT ON THE EFFECTS OF SUSTAINABLE FACILITY MANAGEMENT PERFORMANCE OF PUBLIC BUILDING CONSTRUCTION: IN THE CASE OF JIMMA TOWN**

Dear Respondent

The following questionnaires are prepared to collect data about **effects of sustainable facility management on the performance of public building construction in Jimma Town.** Therefore, the researcher uses your company information only for academic research purpose. Your genuine information is a critically supports or important to come a sound and meaningful conclusion and recommendations. I would like to thanks for your commitment of time, energy, effort kindly cooperation and returning them back on time.

Specific Objectives of the study are;

1. To identify factors that affect sustainable facility management in public building construction of Jimma Town.
2. To determine the effects of sustainable facility management factors on cost performance of public building construction in the Jimma Town.
3. To determine the effects of sustainable facility management factors on social performance of public building construction in the Jimma Town.

By; - Mulugeta Mamo

Mobile. +25191243773/ 0972610343

Advised by: -

Dr. Getachew Kebede

Eng. Samson Yohannes (MSc.)

APPENDIXE-B:

PART ONE: GENERAL INFORMATION

Please add (√) as appropriate:

1. Your organization type:

Owner	Contractor	Consultant

2. The respondent position:

   Project Manager ◯ Facility Manager ◯ te Engineer ◯ ice Engineer ◯

   Designer ◯ Others (specify) _____

3. Working experience of the respondent:

   Less than 1 year ◯ From 1 to 5 years ◯ From 6 to 10years ◯ Over 10 ◯ years

4. Number of completed building construction projects by your company:

   Less than 5 ◯ From 5 to 10 ◯ From 10 to 15 ◯ More than 15 ◯

5. Does your company have past experience related to maintenance of public buildings?

   Yes ◯ No ◯

6. If your answer is 'yes' for question no. 5 tick or mark number of maintained or improved public building construction projects by your company within last ten years?

   Less than 5 ◯ From 5 to 10 ◯ From 10 to 15 ◯ More than 15 ◯

Part II: Factors That Affect SFM in Public Building Construction of Jimma Town

The listed below **factors are affect Sustainable Facility Management** in Public Building Construction. From those listed factors depending on your experience, please express your opinion on rate of importance in building construction projects based on the representative numbers listed below. (Please tick the appropriate box).

1= Very low important, 2= Low important, 3= Moderate important, 4= High important and 5**= Very high important**

Table 1: Identified factors of sustainable facility management from literatures

S.No	Related Factors That Affect Sustainable Facility Management	Rate of importance				
		1	**2**	**3**	**4**	**5**
1.	**Knowledge related factors**					
	Lack of knowledge about Sustainable Facility Management in the company.					
	Knowledge gap between workers about Sustainable Facility Management in the company.					
	Lack of understanding of Sustainable Facility Management with design and construction					
	Lack of capabilities/skills to practice Sustainable Facility Management					
2.	**Design and Planning stage related factors**	**1**	**2**	**3**	**4**	**5**
	Lack of understanding about the physical and chemical properties of construction materials					
	Missing to make allowance for the differing thermal and moisture movements of materials					
	Poor materials selection, quality control & preventive method.					
	Absence of SFM in design phase					
	Unfamiliarity of the designer with local conditions and site conditions					
	Low concern to future maintenance: (not considering maintenance analysis during design stage of building)					
	Design Complexity:(Failure of the designer to allow enough clearance to get the tools in and out for maintenance in the structure)					
	Faulty Design: (when designer ignores the spacing for contraction and expansion movement)					
	Lack of Building Maintenance Manuals					
	Lack of local material standard and specification					
3.	**Related to maintenance and operation factors**	**1**	**2**	**3**	**4**	**5**
	Lack of preventive maintenance method					

	Unqualified Maintenance Contractors selection					
	Insufficient Financial Support for Maintenance Work (Initial and operational fund unavailability)					
	Lack of understanding Importance of Maintenance Work by end users.					
	Defective materials used for maintenance works					
	Lack of training and skills of maintenance crew					
	Lacking in maintaining the buildings with the schedule					
	Non-availability to replacement parts and components					
	Lack of communication between maintenance contractor, clients (owners) and users					
	Unavailability of skilled appointed maintenance personnel					
	Non response to maintenance request					
	Lack of strict legislation set by the government					
	Lack of building maintenance standard procedures.					
	Lack of ability to brief the project objectives clearly					
	Less involvement of the stakeholders in the project development					
4.	**External environment related factors**	**1**	**2**	**3**	**4**	**5**
	Political instability (Violence, not peaceful demonstration)					
	Economic instability (Market inflation)					
	Social factors (Public acceptance toward project)					
	Lack of advanced construction technology					
5.	**Project management related factors**	**1**	**2**	**3**	**4**	**5**
	Lack of incentives to create routines on SFM issue					
	Lack of effective monitoring and control for SFM					
	Lack of leadership (wrong people in the wrong position)					
	Unclear Policy systems, Strategy and Work Planning					
	Lack of team work					
	Poor Training and Education system or plan					
	Increasing liability on facility managers					
	Lack of ability to solve problems					
	Lack of support from top management about SFM					
	Unwillingness to implement SFM					

Part III: Effects of SFM Factors on Cost Performance of Public Building Construction in the Jimma Town

Below are numbers of sustainable facility management factors which **affecting cost performances** of construction projects. From your experience, please express your opinion on the effects of the following as factors that affecting performances of public building construction in Jimma Town based on the associated numbers given here. Please tick the appropriate box.

1= Very Low Effect, 2= Low Effect, 3= Moderate Effect, 4= High Effect and 5= Very High Effect

Table 2: Effects of SFM factors on cost performance of public building construction

S.No	Factors Sustainable Facility Management And Their Effect On Cost Performance	Rate of effects				
		1	**2**	**3**	**4**	**5**
	Design and Planning stage related factors					
	Lack of understanding about the physical and chemical properties of construction materials					
	Missing to make allowance for the differing thermal and moisture movements of materials					
	Poor materials selection, quality control & preventive method.					
	Absence of SFM in design phase					
	Unfamiliarity of the designer with local conditions and site conditions					
	Low concern to future maintenance: (not considering maintenance analysis during design stage of building)					
	Design Complexity:(Failure of the designer to allow enough clearance to get the tools in and out for maintenance in the structure)					
	Faulty Design: (when designer ignores the spacing for contraction and expansion movement)					
	Lack of Building Maintenance Manuals					
	Lack of local material standard and specification					
2.	**Related to maintenance and operation factors**	**1**	**2**	**3**	**4**	**5**
	Lack of preventive maintenance method					
	Unqualified Maintenance Contractors selection					
	Insufficient Financial Support for Maintenance Work (Initial and operational fund unavailability)					
	Lack of understanding Importance of Maintenance Work by end users.					
	Defective materials used for maintenance works					
	Lack of training and skills of maintenance crew					
	Lacking in maintaining the buildings with the schedule					

	Non-availability to replacement parts and components					
	Lack of communication between maintenance contractor, clients (owners) and users					
	Unavailability of skilled appointed maintenance personnel					
	Non response to maintenance request					
	Lack of strict legislation set by the government					
	Lack of building maintenance standard procedures.					
	Lack of ability to brief the project objectives clearly					
	Less involvement of the stakeholders in the project development					
3.	**External environment related factors**	**1**	**2**	**3**	**4**	**5**
	Political instability (Violence, un peaceful demonstration)					
	Economic instability (Market inflation)					
	Lack of advanced construction technology					
	Project management related factors	**1**	**2**	**3**	**4**	**5**
	Lack of effective monitoring and control for SFM					
	Lack of leadership (wrong people in the wrong position)					
	Unclear Policy systems, Strategy and Work Planning					
	Poor Training and Education system or plan for staff					
	Lack of ability to solve problems					
	Lack of support from top management about SFM					

Part IV: Effects of SFM Factors on Social Performance of Public Building Construction in the Jimma Town

Below are numbers of sustainable facility management factors which **affecting social performances** of construction projects. From your experience, please express your opinion on the effects of the following as factors that affecting performances of public building construction in Jimma Town based on the associated numbers given here. Please tick the appropriate box.

1= Very Low Effect, 2= Low Effect, 3= Moderate Effect, 4= High Effect and 5= Very High Effect

Table 3: Effects of SFM factors on social performance of public building construction

S.No	Factors Of Sustainable Facility Management and their effect on social performance	Rate of effects				
		1	**2**	**3**	**4**	**5**
1.	**Knowledge related factors**					
	Lack of knowledge about Sustainable Facility Management in the company.					
	Knowledge gap between workers about Sustainable Facility Management in the company.					
	Lack of understanding of Sustainable Facility Management with design and construction					
	Lack of capabilities/skills to practice Sustainable Facility Management					
2.	**Design and Planning stage related factors**	**1**	**2**	**3**	**4**	**5**
	Lack of understanding about the physical and chemical properties of construction materials					
	Poor materials selection, quality control & preventive method.					
	Absence of SFM in design phase					
	Unfamiliarity of the designer with local conditions and site conditions					
3.	**Related to maintenance and operation factors**	**1**	**2**	**3**	**4**	**5**
	Lack of preventive maintenance method					
	Lack of understanding Importance of Maintenance Work by end users.					
	Defective materials used for maintenance works					
	Lack of training and skills of maintenance crew					
	Lacking in maintaining the buildings with the schedule					
	Lack of communication between maintenance contractor, clients (owners) and users					
	Non response to maintenance request					
	Lack of strict legislation set by the government					
	Lack of ability to brief the project objectives clearly					

	Less involvement of the stakeholders in the project development					
		1	**2**	**3**	**4**	**5**
1.	**External environment related factors**					
	Political instability (Violence, un peaceful demonstration)					
	Social factors (Public acceptance toward project)					
	Lack of advanced construction technology					
		1	**2**	**3**	**4**	**5**
2.	**Project management related factors**					
	Lack of incentives to create routines on SFM issue					
	Lack of effective monitoring and control for SFM					
	Lack of leadership (wrong people in the wrong position)					
	Unclear Policy systems, Strategy and Work Planning					
	Lack of team work					
	Poor Training and Education system or plan					
	Increasing liability on facility managers					
	Lack of ability to solve problems					
	Lack of support from top management about SFM					
	Unwillingness to implement SFM					

APPENDIX-C: INTERVIEW QUESTIONS

Name of the organization _____

Name of the Project: _____

Name of Respondent (optional): _____

Position/role: _____

Date and time: _____

The interviewee is a member of the organizations and previously involved or still involved in the project.

Introduction

Good morning/Good afternoon Mr. or Ms.: my name is Mulugeta Mamo. Before starting my question, I would like to say thank you for your voluntary participation in this interview. The interview has only one section and it will take approximately 30 minutes. This semi-structured interview, which is forwarded to the Clients, contractors, and consultants who are involved in the building construction project, is part of this academic research that aims **to assess the Effects of Sustainable Facility Management on the Performance of Public Building Construction: In the case of Jimma Town.** With this survey, I would like to assess factors of SFM and their effect on cost and social performance of public building construction in Jimma Town. All information you provide will be kept in strict confidentiality and only used for academic research. Please feel free to answer the questions with what you know and what you think in your mind. Again thank you for the commitment.

Part One. Interview Questions

1) What is your role in the organizations?
   Project Manager ( ) Facility Manager ( ) Site Engineer ( ) Office Engineer ( )
   Designer ( ) Others (specify) _____
2) Who is your employee?
   Owner side ( ) Contractor side ( ) Consultant side ( )
3) Does your company have a facility manager?
   Yes ( ) No ( )
4) If your company hired a facility manager; what are his/her responsibility and advantage for the company?
   - Facility maintenance planning Ensuring that facilities meet the standard and government regulation ( ) Testing and inspection of building maintenance ( )
   - Controlling building maintenance method or system ( ) Drafting maintenance report ( )
   - Environment, health and safety ( )

   ➢ Reduction of maintenance expenses Profitability of the invested capital for the company
   ➢ Health and safety of the worker ( ) Minimizing environmental pollution ( )
   ➢ Good services for end users ( ) Creating well working environment ( )
5) If your company not hired a facility manager; what are disadvantage for the company?

- Higher maintenance cost Less profitability Unmotivated working environment
- Lack of health safety of workers Less satisfaction of the customers

6) In your experience which type of maintenance mostly practices by your company?
   - Planned Maintenance (Preventive Maintenance)
   - Unplanned Maintenance; Corrective (Including Immediate or Emergency Maintenance)
7) Does your company plan a budget for maintenance during the design period?
   Yes No
8) If 'no' why?
   -
9) Does your company have SFM plan or strategy?
   Yes No
10) How much effects of not having SFM on cost performance of the building project in degree?
   Very Low Effect Low Effect Moderate Effect High Effect and Very High Effect
11) What are the effects of not having SFM on social performance of the building project?
   _____
12) Do you think lack of experienced designers effect the goal of SFM?
   Yes No
13) Do you think lack of strict legislation of building law effect the goal of SFM?
   Yes No
14) In your experience; what are the common factors of maintenance in building construction?

   _____

APPENDIXE-D: GLOSSARY

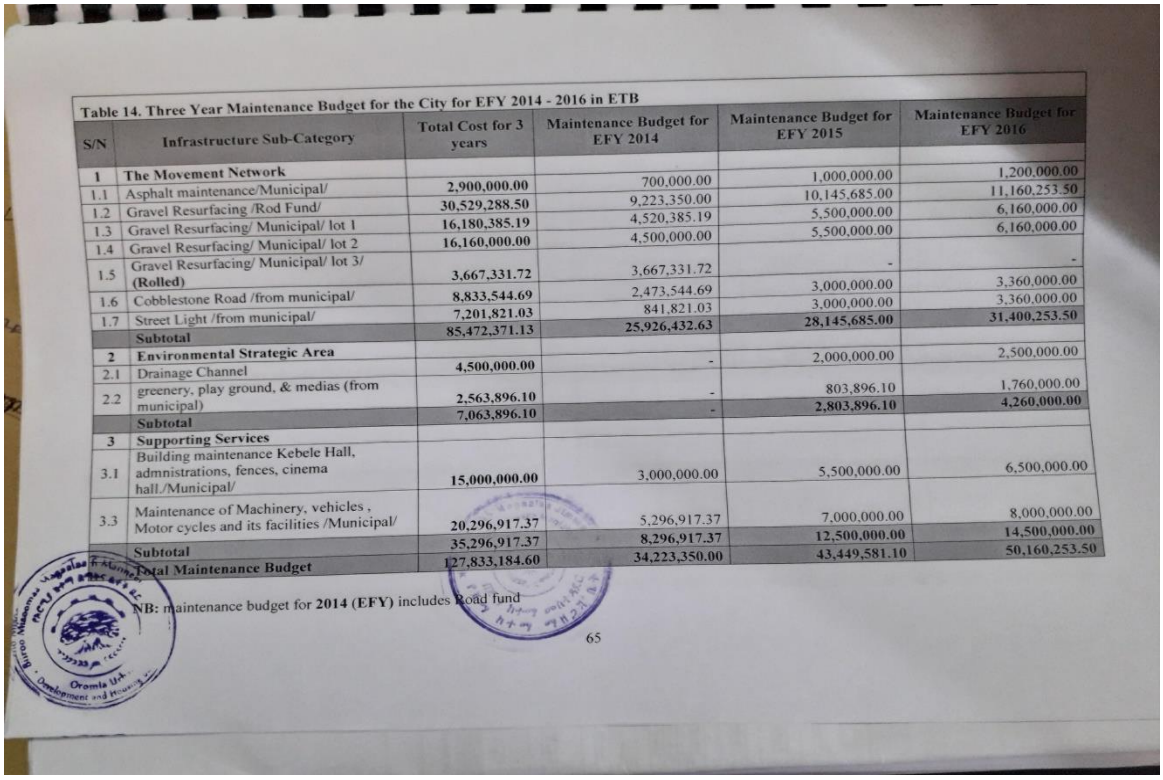

Table 14. Three Year Maintenance Budget for the City for EFY 2014 - 2016 in ETB

S/N	Infrastructure Sub-Category	Total Cost for 3 years	Maintenance Budget for EFY 2014	Maintenance Budget for EFY 2015	Maintenance Budget for EFY 2016
1	**The Movement Network**				
1.1	Asphalt maintenance/Municipal/	2,900,000.00	700,000.00	1,000,000.00	1,200,000.00
1.2	Gravel Resurfacing /Rod Fund/	30,529,288.50	9,223,350.00	10,145,685.00	11,160,253.50
1.3	Gravel Resurfacing/ Municipal/ lot 1	16,180,385.19	4,520,385.19	5,500,000.00	6,160,000.00
1.4	Gravel Resurfacing/ Municipal/ lot 2	16,160,000.00	4,500,000.00	5,500,000.00	6,160,000.00
1.5	Gravel Resurfacing/ Municipal/ lot 3/ (Rolled)	3,667,331.72	3,667,331.72	-	-
1.6	Cobblestone Road /from municipal/	8,833,544.69	2,473,544.69	3,000,000.00	3,360,000.00
1.7	Street Light /from municipal/	7,201,821.03	841,821.03	3,000,000.00	3,360,000.00
	Subtotal	85,472,371.13	25,926,432.63	28,145,685.00	31,400,253.50
2	**Environmental Strategic Area**				
2.1	Drainage Channel	4,500,000.00	-	2,000,000.00	2,500,000.00
2.2	greenery, play ground, & medias (from municipal)	2,563,896.10	-	803,896.10	1,760,000.00
	Subtotal	7,063,896.10	-	2,803,896.10	4,260,000.00
3	**Supporting Services**				
3.1	Building maintenance Kebele Hall, admnistrations, fences, cinema hall./Municipal/	15,000,000.00	3,000,000.00	5,500,000.00	6,500,000.00
3.3	Maintenance of Machinery, vehicles , Motor cycles and its facilities /Municipal/	20,296,917.37	5,296,917.37	7,000,000.00	8,000,000.00
	Subtotal	35,296,917.37	8,296,917.37	12,500,000.00	14,500,000.00
	Total Maintenance Budget	127,833,184.60	34,223,350.00	43,449,581.10	50,160,253.50

NB: maintenance budget for **2014 (EFY)** includes Road fund

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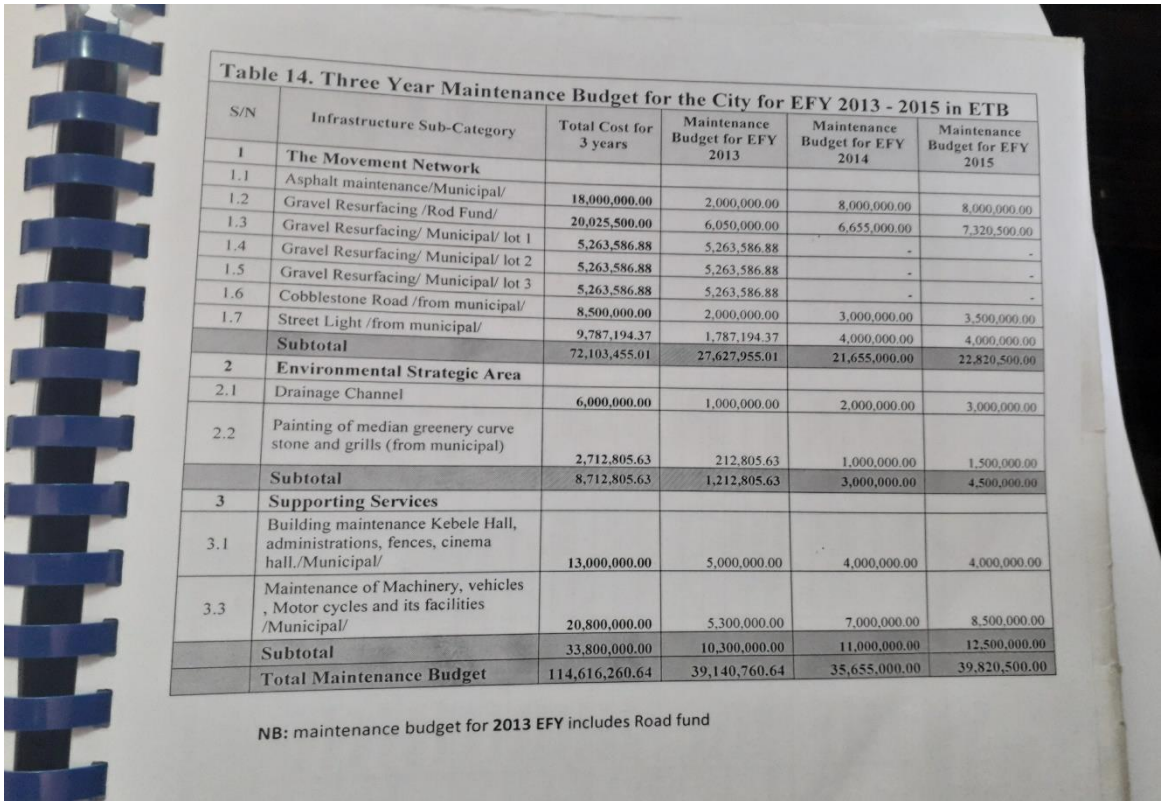


Table 14. Three Year Maintenance Budget for the City for EFY 2013 - 2015 in ETB

S/N	Infrastructure Sub-Category	Total Cost for 3 years	Maintenance Budget for EFY 2013	Maintenance Budget for EFY 2014	Maintenance Budget for EFY 2015
1	**The Movement Network**				
1.1	Asphalt maintenance/Municipal/	18,000,000.00	2,000,000.00	8,000,000.00	8,000,000.00
1.2	Gravel Resurfacing /Rod Fund/	20,025,500.00	6,050,000.00	6,655,000.00	7,320,500.00
1.3	Gravel Resurfacing/ Municipal/ lot 1	5,263,586.88	5,263,586.88	-	-
1.4	Gravel Resurfacing/ Municipal/ lot 2	5,263,586.88	5,263,586.88	-	-
1.5	Gravel Resurfacing/ Municipal/ lot 3	5,263,586.88	5,263,586.88	-	-
1.6	Cobblestone Road /from municipal/	8,500,000.00	2,000,000.00	3,000,000.00	3,500,000.00
1.7	Street Light /from municipal/	9,787,194.37	1,787,194.37	4,000,000.00	4,000,000.00
	Subtotal	72,103,455.01	27,627,955.01	21,655,000.00	22,820,500.00
2	**Environmental Strategic Area**				
2.1	Drainage Channel	6,000,000.00	1,000,000.00	2,000,000.00	3,000,000.00
2.2	Painting of median greenery curve stone and grills (from municipal)	2,712,805.63	212,805.63	1,000,000.00	1,500,000.00
	Subtotal	8,712,805.63	1,212,805.63	3,000,000.00	4,500,000.00
3	**Supporting Services**				
3.1	Building maintenance Kebele Hall, administrations, fences, cinema hall./Municipal/	13,000,000.00	5,000,000.00	4,000,000.00	4,000,000.00
3.3	Maintenance of Machinery, vehicles , Motor cycles and its facilities /Municipal/	20,800,000.00	5,300,000.00	7,000,000.00	8,500,000.00
	Subtotal	33,800,000.00	10,300,000.00	11,000,000.00	12,500,000.00
	Total Maintenance Budget	114,616,260.64	39,140,760.64	35,655,000.00	39,820,500.00

NB: maintenance budget for **2013 EFY** includes Road fund

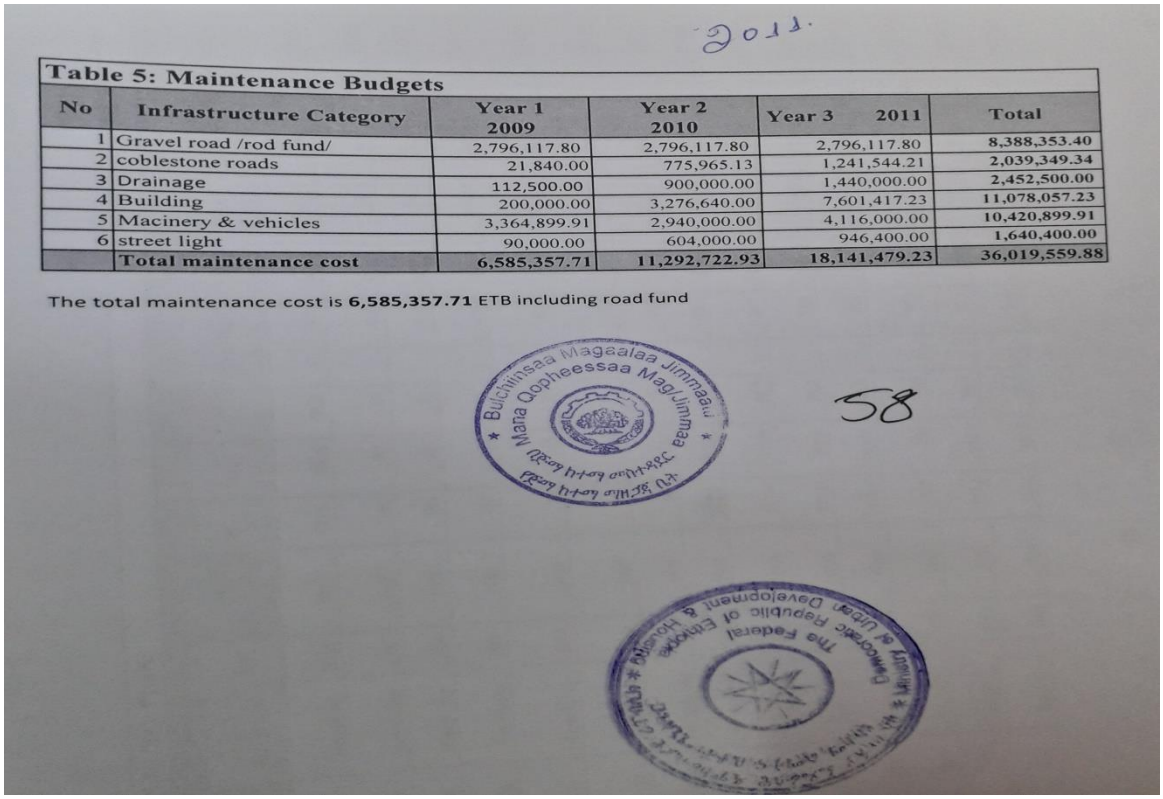
Table 14. Three Year Maintenance Budget for the City for EFY 2012 - 2014 in ETB

S/N	Infrastructure Sub-Category	Total Cost for 3 years	Maintenance Budget for EFY 2012	Maintenance Budget for EFY 2013	Maintenance Budget for EFY 2014
1	**The Movement Network**				
1.1	Gravel Resurfacing /Rod Fund/	16,500,000.00	5,500,000.00	5,500,000.00	5,500,000.00
1.2	Cobblestone Road /from municipal/	11,471,130.48	4,817,519.74	3,024,305.37	3,629,305.37
1.3	Street Light /from municipal/	7,238,722.00	1,238,722.00	3,000,000.00	3,000,000.00
	Subtotal	35,209,852.48	11,556,241.74	11,524,305.37	12,129,305.37
2	**Environmental Strategic Area**				
2.1	Drainage Channel	6,000,000.00	2,000,000.00	2,000,000.00	2,000,000.00
2.2	Painting of median greenery curvestone and grills (from municipal)	1,330,799.41	1,330,799.41	-	-
2.3	Maintenance of median grills greenery (from municipal)	87,263.85	87,263.85		
	Subtotal	7,330,799.41	3,418,063.26	2,000,000.00	2,000,000.00
3	**Supporting Services**				
3.1	Building /kebele hall (from municipal)	6,000,000.00	3,000,000.00	1,500,000.00	1,500,000.00
3.2	Building (cinima hall Maintenance) from state	3,219,777.00	3,219,777.00	-	-
3.3	Maintenance of Machinery & vehicles	18,000,000.00	4,000,000.00	7,000,000.00	7,000,000.00
	Subtotal	27,219,777.00	10,219,777.00	8,500,000.00	8,500,000.00
	Total Maintenance Budget	69,847,692.74	25,194,082.00	22,024,305.37	22,629,305.37

NB; maintenance budget for 2012 EFY includes the budget which the city got from state and road fund.

Table 14. Three Year Maintenance Budget for the City for EFY 2011 - 2013 in ETB

S/N	Infrastructure Sub-Category	Total Cost for 3 years	Maintenance Budget for EFY 2011	Maintenance Budget for EFY 2012	Maintenance Budget for EFY 2013
1	**The Movement Network**				
1.1	Earth Road /Rod Fund/	6,059,688.00	2,019,896.00	2,019,896.00	2,019,896.00
1.2	Cobblestone /Rod Fund/	3,000,000.00	1,000,000.00	1,000,000.00	1,000,000.00
1.3	Street Light	2,500,000.00	-	1,000,000.00	1,500,000.00
	Subtotal	11,559,688.00	3,019,896.00	4,019,896.00	4,519,896.00
2	**Environmental Strategic Area**				
2.1	Drainage Channel /Rod Fund/	6,200,000.00	900,000.00	1,900,000.00	3,400,000.00
2.2	Maintenance of sewer system	2,500,000.00	2,500,000.00	-	-
	Subtotal	8,700,000.00	3,400,000.00	1,900,000.00	3,400,000.00
3	**Supporting Services**				
3.1	Building	11,698,217.64	3,698,217.64	3,500,000.00	4,500,000.00
3.2	Machinery	11,000,000.00	3,000,000.00	3,500,000.00	4,500,000.00
	Subtotal	22,698,217.64	6,698,217.64	7,000,000.00	9,000,000.00
	Total Maintenance Budget	42,957,905.64	13,118,113.64	12,919,896.00	16,919,896.00



2011.

Table 5: Maintenance Budgets

No	Infrastructure Category	Year 1 2009	Year 2 2010	Year 3 2011	Total
1	Gravel road /rod fund/	2,796,117.80	2,796,117.80	2,796,117.80	8,388,353.40
2	coblestone roads	21,840.00	775,965.13	1,241,544.21	2,039,349.34
3	Drainage	112,500.00	900,000.00	1,440,000.00	2,452,500.00
4	Building	200,000.00	3,276,640.00	7,601,417.23	11,078,057.23
5	Macinery & vehicles	3,364,899.91	2,940,000.00	4,116,000.00	10,420,899.91
6	street light	90,000.00	604,000.00	946,400.00	1,640,400.00
	Total maintenance cost	**6,585,357.71**	**11,292,722.93**	**18,141,479.23**	**36,019,559.88**

The total maintenance cost is **6,585,357.71** ETB including road fund

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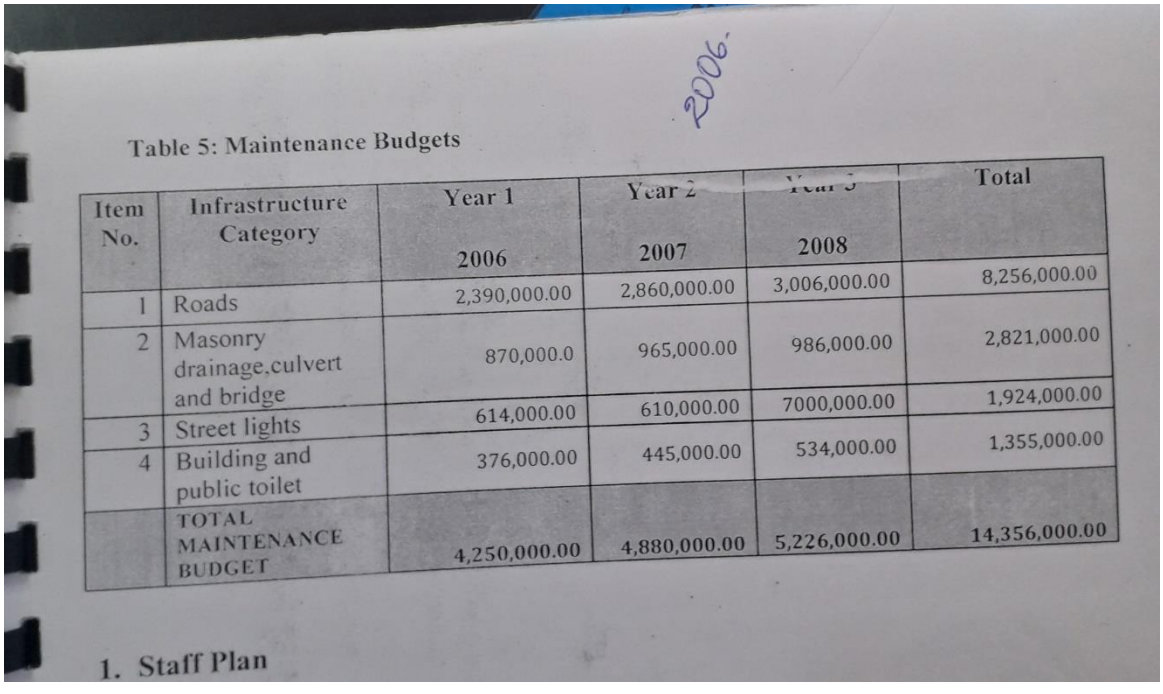


2006.

Table 5: Maintenance Budgets

Item No.	Infrastructure Category	Year 1 2006	Year 2 2007	Year 3 2008	Total
1	Roads	2,390,000.00	2,860,000.00	3,006,000.00	8,256,000.00
2	Masonry drainage,culvert and bridge	870,000.0	965,000.00	986,000.00	2,821,000.00
3	Street lights	614,000.00	610,000.00	7000,000.00	1,924,000.00
4	Building and public toilet	376,000.00	445,000.00	534,000.00	1,355,000.00
	TOTAL MAINTENANCE BUDGET	4,250,000.00	4,880,000.00	5,226,000.00	14,356,000.00

1. Staff Plan

2008

Annex 7:- Maintenance Budgets

Maintenance Budgets

No	Infrastructure Category	Year 1 2008	Year 2 2009	Year 3 2010	Total
1	Gravel road /rod fund/	2,796,117.80	3,215,535.47	3,858,642.56	9,870,295.83
2	Cobblestone roads	348,400.00	400,660.00	480,792.00	1,229,852.00
3	Building	1,000,000.00	1,150,000.00	1,380,000.00	3,530,000.00
4	Machinery & vehicles	2,070,000.00	2,380,500.00	2,856,600.00	7,307,100.00
5	street light	451,850.00	519,627.50	623,553.00	1,595,030.50
TOTAL MAINTENANCE BUDGET		6,666,367.80	7,666,322.97	9,199,587.56	23,532,278.33

The total maintenance cost is **6,666,367.80 ETB** including road fund.

TABLE 5: MAINTENANCE BUDGETS

Infrastructure Category	2010 EFY	2011 EFY	2012 EFY	Total
I. The Movement Network				
1.1.Gravel Road	2,679,472.11	3,919,896.00	3,919,896.00	10,519,264.11
1.2.Cobblestone Roads	942,482.77	1,560,000.00	2,582,500.00	5,772,482.77
1.3.Street Light	856,600.00	980,000.00	1,071,250.00	3,251,600.00
Subtotal	**4,478,554.88**	**6,459,896.00**	**7,573,646.00**	**19,543,346.88**
II. Environmental Strategic Area				
2.1.Drainage Channel	633,175	1,200,000.00	2,100,000.00	3,933,175.00
Subtotal	**633,175**	**1,200,000**	**2,100,000**	**3,933,175**
III. Supporting Services				
3.1.Building	308,783.56	560,000.00	996,250.00	2,208,783.56
3.1.Machinery& Vehicles	2,104,000.00	2,200,000.00	3,000,000.00	7,304,000.00
Subtotal	**2,412,783.56**	**2,760,000.00**	**3,996,250.00**	**9,512,783.56**
Total Maintenance Budget	**7,524,513.44**	**10,419,896.00**	**13,669,896.00**	**31,614,305.44**

The total maintenance cost is **7,524,513.44 ETB** including road fund

9. Maintenance Plan

Table 5: Maintenance Budgets

Item No.	Infrastructure Category	Year 1 2004	Year 2 2005	Year 3 2006	Total
1	Asphalt Maintenance	0	2,400,000	2,600,000	5,000,000
2	Gravel road	2,450,000.00	480,000	530,000	3,460,000
3	Culvert	32,000	48,200	64,400	144,600
4	Masonry drainage	150,000.00	200,000.00	250,000.00	600,000.00
5	Street Lights	200,000.00	700,000	1,000,000	1,900,000.00
6	Cobble stone	80,000	120,000	140,000	340,000.00
7	Sanitation	50,000.00	55,000.00	60,000.00	165,000.00
8	Solid waste management	50,000.00	50,000.00	50,000.00	150,000.00
9	Building Maintenance	500,000.00	0.00	0.00	500,000.00
10	Total	3,512,000	4,053,200	4,694,400	12,259,600
	TOTAL MAINTENANCE BUDGET	**3,512,000.00**	**3,853,200**	**4,444,400**	**10,444,600**

Operation and Maintenance Budget hold for infra of Gravel, Culvert and Drainage from Road fund Budget for the remain part from city of municipal Revenue.

le 5: Maintenance budgets for the coming three consecutive years

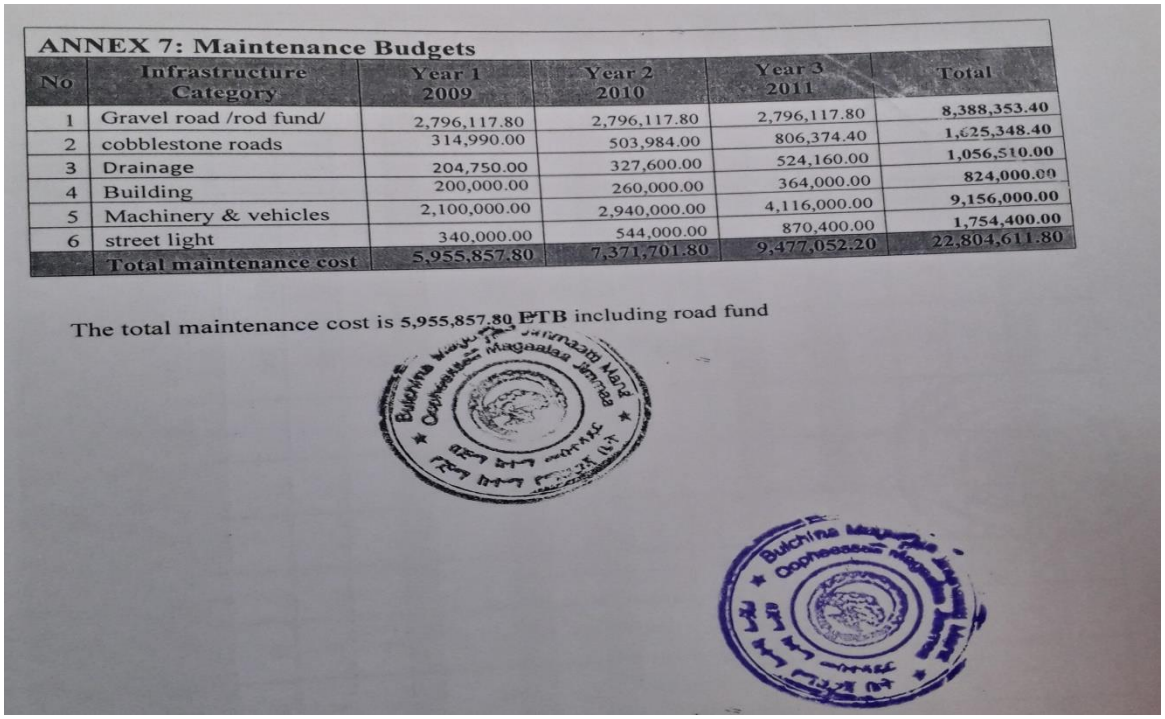
Item No.	Infrastructure Category	Year 1 2003	Year 2 2004	Year 3 2005	Total
1	Asphalt Roads	2,000,000.00	2,200,000.00	2,400,000.00	6,600,000.00
2	Gravel road	400,000.00	430,000.00	480,000.00	1,310,000.00
3	Culvert	20,000.00	32,000.00	48,200.00	100,200.00
5	Electricity	250,000.00	300,000.00	400,000.00	950,000.00
6	Cobble stone	-----	100,000.00	120,000.00	220,000.00
8	Buildings	500,000.00	-------	------	500,000.00
	TOTAL MAINTENANCE BUDGET	**3,170,000.00**	**3,062,000.00**	**3,448,200.00**	**9,680,200.00**

6. Staff Information

The infrastructure department of Jimma Municipality and Social and Economic Affairs departments is responsible for the infrastructure development. The number of staff available and required according to the current organizational structure of the departments is shown in table below..

Table 6: Staffing for delivery and management

Item No.	Infrastructure Category	Responsible Department	No of Staff required	No of staff available
1	Roads	infrastructure department	3	2
2	Drainage	infrastructure department	2	2
3	Sanitation	Social and Economic Affairs	7	4
4	Solid Waste	Social and Economic Affairs	7	4
5	Markets	Social and Economic Affairs	5	2
6	Abattoirs	Social and Economic Affairs	7	4
7	Street Lighting	infrastructure department	1	1
8	Fire fighting	Social and Economic Affairs	5	4



ANNEX 7: Maintenance Budgets

No	Infrastructure Category	Year 1 2009	Year 2 2010	Year 3 2011	Total
1	Gravel road /rod fund/	2,796,117.80	2,796,117.80	2,796,117.80	8,388,353.40
2	cobblestone roads	314,990.00	503,984.00	806,374.40	1,625,348.40
3	Drainage	204,750.00	327,600.00	524,160.00	1,056,510.00
4	Building	200,000.00	260,000.00	364,000.00	824,000.00
5	Machinery & vehicles	2,100,000.00	2,940,000.00	4,116,000.00	9,156,000.00
6	street light	340,000.00	544,000.00	870,400.00	1,754,400.00
	Total maintenance cost	5,955,857.80	7,371,701.80	9,477,052.20	22,804,611.80

The total maintenance cost is 5,955,857.80 ETB including road fund

Another maintained buildings in Jimma University are;-

1. Main campus Student cafeteria (Zegeye Cafe)
2. Main campus dormitories (4 in number)
3. Dormitories in BECO campus (4 in number)
4. Kitto library (roof maintenance)
5. Dormitories in Agricultural campus (2 in number)