INFLUENCE OF PROJECT DESIGN ORIENTATIONS ON SUSTAINABILITY OF WATER AND SANITATION OUTPUT-BASED AID PROJECT BY NAIROBI CITY WATER & SEWERAGE COMPANY, KENYA

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A Research Project Report Submitted in Partial Fulfillment for the Requirements of the Award for the Degree of Master of Arts in Project Planning and Management of the University of Nairobi.

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DECLARATION

I declare that this research project is my original work and has not been presented for degree or any award in any other university.

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DEDICATION

This research project is dedicated to my husband, Mathew Simba, and my children Elsie and Jayson for their wonderful support, patience, encouragement, and prayers. Words cannot express my gratitude, thank you very much.

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ABBREVIATIONS AND ACRONYMS

EIA	Environmental Impact Assessment
IDA	International Development Association
IVA	Independent Verification Agent
M & E	Monitoring and Evaluation
NACOSTI	National Commission for Science, Technology, and Innovation
NCWSC	Nairobi City Water and Sewerage Company
NEMA	National Environmental Management Authority
OBA	Output-Based Aid
O & M	Operations and Maintenance
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children's Fund
WAG'S	Water Association Groups
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WSP's	Water Service Providers

ABSTRACT

One of the major assurances of wellbeing and stable community is adequate access to water and sanitation. Increasing the population with majority living in low-income settlement areas in an urban environment where there is pressure on existing facilities is an inhibition to sustainable development. The leading causes of deaths in majority of the developing countries are inadequate supply of water and poor sanitation. Regardless of several initiatives of project implementation by government and other agencies, sanitation remains a problem especially in the low-income settlement areas with majority of water and sanitation projects stalling due to lack of community involvement, failure to adopt to new technologies, and lack of monitoring and evaluation practices. Thus, to meet water and sanitation challenges, the concept of sustainability forms the basis of this study. The purpose of this study was to establish the influence of project design orientations to sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company. The study was based on four objectives; To assess how technological design orientation influence sustainability of water and sanitation output-based aid project by NCWSC; To examine the extend at which community participation design orientation influence sustainability of water and sanitation output-based aid project by NCWSC; To determine level at which collaboration and networking design orientation influence sustainability of water and sanitation output-based aid project by NCWSC ; and to assess how monitoring and evaluation design orientation influence sustainability of water and sanitation output-based aid project by NCWSC. The study employed descriptive survey design for in-depth analysis of the project design orientations that influence sustainability of water and sanitation projects. With a target population of 160 respondents from NCWSC project team and informal settlement department, and 84 respondents from the project beneficiaries, the research applied census method whereby all the members of population were used to give their responses. The study utilized questionnaires to the respondents from NCWSC, and focus group to the project beneficiaries. In analyzing data, the research utilized descriptive and inferential statistics methods using a statistical tool (SPSS V 21.0), and triangulation of the qualitative analysis. From the findings, the study established that there was a significant positive influence between technological design orientation, community participation design orientation, collaboration and networking design orientation, and monitoring and evaluation design orientation on sustainability of water and sanitation projects with correlation values of ($r=0.636$, $p< 0.05$), ($r=0.690$, $p<0.05$), ($r=0.678$,$p<0.05$), and ($r=0.715$, $p<0.05$) at a confidence level of 5% respectively . The study therefore recommends that monitoring and evaluation design orientation to be considered in the project budget, with availability of personnel for executing the monitoring and evaluation practices. The study also recommends for community participation design orientation in all stages of the project. Also, the study recommends for collaboration and networking of partners from local, national, and international in co-funding of water and sanitation projects, and technical expertise to enhance sustainability. And finally, adopting technology for use in the project that is user friendly for both the project implementers and beneficiaries and compatible with other systems to ensure sustainability. The study also recommends further studies on the influence of project design orientation on sustainability of water and sanitation projects in other regions in Kenya

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Sustainable Development Goals stipulated a commitment in universal provision of access to clean water and sanitation by 2030 with targets of measuring safely managed services that entails closing the loop of sanitation by providing treatment and reuse thus ensuring availability of safe drinking water (United Nations, 2016). As echoed by Silvius and Schipper (2014), water and sanitation projects sustainability signifies that the supply of water and sanitation services and interventions are maintained to function adequately and produce benefits anticipated after project implementation. Thus, the concept of sustainability has resulted to increased attention in recent years on the aspects of project design and execution exercises leading to better understanding in developing projects in a more effective and efficient manner to allowing sustainability.

According to Sabogal, Medlin, Aquino, and Gelting (2014), long-term sustainability of water and sanitation health (WASH) interventions is widely recognized as an intricate and persistent challenge facing societies, government, and international partners across the globe. While from UNICEF (2015), nearly 50% of the population of approximately 2.5 billion people in the developing world lack improved sanitation services, and more than 884 million people already use contaminated drinking water sources. Lack of access to clean water and sanitation facilities, combined with inadequate hygiene practices, kills and sickens thousands of children every day, contributing to impoverishment and reduced opportunities for thousands more.

To ensure sustainability of WASH projects, different policies and regulations were put in place. Agenda 21 offers a universal framework for observing sustainability of water and sanitation by integrating the development and environmental concerns to ensure fulfillment of basic necessity while improving the living standards for current generation while considering impacts on future generations (UNDP-WSP 2006). Thus, environment,

growth, and long-term functionality and service reliability serve as the boundaries for distilling the key sustainability components.

Despite of regulations and substantial improvements in implementation of water and sanitation projects to attain the sustainable development goals, the sustainability trends are disappointing implying that the finances used during project implementation is un-proportional to the expected return on investment (Jiménez Fdez de Palencia, Jawara, LeDeunff, Naylor, & Scharp, 2017).

In the USA alone, huge investments have been done in public sector projects with a high failure rate compared to success rate specifically to water and sanitation projects that operated and managed by the public. This has been as a result of aspects linked to project governance during the project initiation, planning, implementation, and monitoring and evaluation stages (Serrador & Pinto, 2015).

Concurrently, a much worsening pattern of failed WASH projects is being observed in developing countries. For instance in Asian Countries, low sustainability of WASH projects in Pakistan due to lack of risk analysis before the project design to develop concrete mitigation strategies (Irfan & Hassan, 2019). While in Nepal according to Cronin, Badloe, Torlesse, and Nandy (2015) despite of the strive of ensuring access to clean water and sanitation through the implementation of WASH projects, majority are not being sustainable due to lack of sustainability plan.

In Sub-Saharan countries, according to Nabifwo and Kimutai (2018), low levels of sustainability of WASH projects has been attributed by insufficient institutional support, inappropriate legislation or policy, ineffective management systems, and inability to adapt to changing technology. In addition, low level of sustainability trends has resulted to increased poverty cycle and failure of donor-funded projects in developing countries (Gebrehiwot, 2012). While Tafara (2013), established that failure of sustainability in WASH projects in Kenya is due to lack of sustainability plan that ensures the analysis of

economic, social, financial, environmental, legal, and cultural aspects of the project so as to determine the relevance, acceptability, viability and its adaptability.

With preceding, Kenya's water and sanitation projects leave no reservations that sustainability is a challenge. This scenario is manifested in most informal settlements where development projects are undertaken with less impact despite of huge utilization of resources (Alelah & Mueke, 2017).

Nairobi being the capital city of Kenya with an increasing population of 4% per annum according to Kenya National Bureau of Statistics (2019) with 60% of the population living in low -income settlements, there has been need to extend both water and sanitation services. With the annual cost of investment and rehabilitation needed in water supply far exceeding the available public funding, series of reforms underpinned by Water Act 2002 made it possible for water service providers (WSPs) to access market loans and fill the financing gap (Athi Water and Services Board, 2011).

Nairobi Sanitation Output-Based Aid (OBA) project was developed by Nairobi City Water & Sewerage Company (NCWSC) to extend low-cost sewer sanitation and water services in densely populated low-income communities and informal settlements of Nairobi using a unified financing model from various International Development Associations (IDA) investments. The project aimed at developing sewer connections to the landlord compounds by converting the existing pit latrines in to pour flush toilets, and finally connect to the sewer trunk mains for transportation to the treatment plants, and water connections to 12 number informal settlements in Nairobi namely; Kayole Soweto, River Bank, Matopeni, Mukuru, Mathare, Huruma, Maili Saba, Mowlem, Canaan, Mwengenye, Kawagware, and Kibera. In financing of the project, the NCWSC borrowed loans from commercial bank, that was to be repaid by the landlords and implemented the project, after which subsidy was given by the World bank, upon verification by the Independent Verification Agent (IVA) (Munuve, 2019).

Under different stages of the Nairobi Sanitation output-based aid project cycle, considerations had been made on design orientations with little work on sustainability. This possessed a gap in which this study sought to address by investigating the influence of project design orientations on the sustainability of Water and Sanitation output-based aid project by NCWSC.

1.2 Statement of the Problem

Despite of the growing attention to sustainability in project management, there still exists a gap between the literature on sustainability and what is being carried out in practice (Serrador & Pinto, 2015). As echoed by Ndubi, Kagiri, and Muchelule (2018), though the government and other development agencies investing in WASH projects, most of the projects initiated have not been sustainable as the communities are not being involved adequately on matters of hygienic practices. In addition, there has been slow uptake of new technologies, reduced environmental protection, and community cohesion within the low-income settlements (Alelah & Mueke, 2017). In reverting the scenario, donors developed a framework of direct participation however their short-term financial aid does not attain the sustainability threshold as witnessed by the low-income settlements (Ndubi et al., 2018).

Significant concerns to the water and sanitation projects in Kenya particularly the low-income settlement projects in Nairobi with contaminated water sources that are unreliable and poor sanitation impacting negatively on human health. In addition to poor management of WASH services, there has been inadequate information on the connection between water, excreta, and disease leading to increased mortality rates (Ndubi et al., 2018).

Extant research sought to establish various factors influencing the sustainability of water and sanitation projects, with all the factors based on project beneficiary's perspective and donor funding done before implementation. For instance, Ndubi et al. (2018) considered factors such as stakeholder participation, financial resources, monitoring & evaluation, and tools and techniques based on projects beneficiaries perspective. While Alelah and Mueke (2017) from his research, consideration was done on influence of

community participation on sustainability of water and sanitation projects in Rhonda slums, Nakuru county that also was based on projects beneficiary perspective. However, no research had been done on influence sustainability of water and sanitation projects with considerations of design orientations from the implementation perspective through output-based aid as mode of funding. This pauses a gap in which this study sought to establish .

1.3 Purpose of the Study

The study purpose was to determine influence of project design orientations on sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company, Kenya

1.4 Research Objectives

The following were the objectives which guided this study

1. To assess how technological design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company
2. To examine the extent at which community participation design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company
3. To determine the level at which collaboration and networking design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company
4. To assess how monitoring and evaluation design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company

1.5 Research Questions

1. How does technological design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company?

2. To what extent does community participation design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company?
3. To what level does collaboration and networking design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company?
4. How does monitoring and evaluation design orientation influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company?

1.6 Research Hypothesis

H_{01}: Technological design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company.

H_{02}: Community participation design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company.

H_{03}: Collaboration and networking design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company.

H_{04}: Monitoring and evaluation design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company.

1.7 Significance of the Study.

In attaining the Sustainable Development Goal 6 for access to clean water and sanitation, the governments may utilize the study findings and recommendations to improve on national policy formulation and any other reviews on legislation of the water sector in implementation of WASH projects.

As a matter of fact, almost all Water Service Providers (WSPs) countrywide experience and share a common number of challenges in executing their mandate of water and sanitation services provision in their areas of jurisdiction. It is anticipated that the study might be of great importance to the WSPs as it provides information that would help to improve forecast utilization by undertaking to implement the recommendations suggested by the research findings. In addition, the findings shall provide the management and leadership of NCWSC with information to help in decision making and help in improving the project design orientations for its projects.

Finally, the research findings might be utilized as secondary sources of data by future researchers to guide their research.

1.8 Basic Assumptions of the Study

The research assumed that the respondents were objective and competent in answering questions correctly and their responses were truthful.

1.9 Limitation of the Study

The researcher was challenged in obtaining information from the respondents on the questions that are related to areas of emotions, feelings, attitude, and perceptions that were not be objectively verified. However, to overcome this challenge, the respondents' were assured of anonymity on their feedbacks.

1.10 Delimitation of the Study

The research focused on the influence of project design orientations on sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage. This is because majority of the WASH projects are implemented by NCWSC who are mandated to supply water and offer sanitation services in Nairobi county.

Four project design orientations were studied are; Technology, Community participation, Collaboration and Networking, and Monitoring and Evaluation. The choice of project design orientations is based on the research gap identified.

The main respondents were the members of the project team and informal settlement department staff of NCWSC who were involved in the planning, implementation, and operation and maintenance of water and sanitation Output-based aid project (Nairobi City Water and Sewerage Company, 2014). In addition, to get the views from the project beneficiaries on sustainability of the said project, a focus group was conducted.

1.11 Definition of Significant Terms

Sustainability of water and sanitation projects:	The ability of water and sanitation projects to continue being in operation while benefiting the current and future generations. In this study, it entails indicators such as; Functionality, Quality, Affordability, Accessibility, and Reliability of the project output.
Project Design Orientations:	These are the planning considerations that are done before project implementation. In this study, they entail; Technological design orientations, community participation design orientation, Collaboration and networking design orientation, Monitoring and evaluation design orientation.
Collaboration & networking design orientation:	Co-working together by the stakeholders in order to achieve a specific objective. Indicators of collaboration and networking considered in the study entail; Partners involved in the project collaboration, collaboration and networking for technical assistance, collaboration in co-funding of the project, and networking and collaboration for integration of projects in the same location
Community participation design orientation:	Community involvement in project decision making, community representation and responsibilities given throughout the project cycle, level of training and capacity building to the community, and level of contribution by the community
Monitoring & evaluation design orientation:	Checking and recording of the project progress during and after implementation .Indicators considered in this study are; Integration of M& E practices in the project, allocation of finances for M&E, availability of M & E personnel, Co-ordination, and schedules for M & E activities.
Technological design orientation:	This entails consideration of techniques and tools for project implementation. Indicators in this study are; Sewer and water connection design technology, information communication technology, billing system technology, and payment technology.

1.12 Organization of the Study

The study was organized into five chapters. Chapter one gave the study introduction by giving the direction of the study by establishing background and problem to be resolved after the completion of the research. It also stated the objectives, significance, basic assumptions, limitations, and delimitations of the study. Chapter two focused on the literature review in which both theoretical and conceptual framework was formulated based on the identified research gap. While chapter three gave the research design, target population, sample size, research instruments, methods and analysis of data collection, and ethical considerations. Chapter four entailed data analysis, interpretation, discussions and presentation and finally, chapter five gave a summary of the research findings, conclusions, recommendations for the study, and areas for future research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter gives reviews on relevant literature of previous studies related to factors influencing sustainability of water and sanitation projects, by first focusing on the concept of sustainability of water and sanitation projects, influence of technological design orientation, community participation design orientation, collaboration and networking design orientations, and Monitoring and evaluation design orientations on sustainability of water and sanitation projects. It also gives a highlight of the theoretical framework and research knowledge gap from the research conceptual framework was developed.

2.2 Sustainability of Water and Sanitation Projects

According to Silvius and Schipper (2014), sustainability is commonly viewed as a valuable tool for an objective understanding of the social, economic, and environmental impacts of the design, implementation, and maintenance of project support systems recommending a holistic approach for managing projects so as to attain sustainability. Thus, some of the metrics and standards ought to be set from project identification through feasibility studies, formulation, design, assessment, funding, implementation, M & E for projects to be sustained.

Marcus (2005) indicated that project sustainability should encompass conventional strategic approaches while adding a long-term perspective during the project implementation. The Strategic Approach integrates four main elements namely; Future orientation that gives anticipation that things will change thus plans ought to be in place from project evolution; External emphasis gives an understanding of the project environment complexity with many aspects such as technology, politics, culture and economics impacting the project outcomes; Environmental fit for ensuring continual fitting of the project and its environment, and process orientation that entails an iterative cycle of planning and implementing projects while learning from experience as reality changes.

To attain sustainability of water sanitation and health projects, Nabifwo and Kimutai (2018) established aspects that ought to be recognized and analyzed established. These include societal influence that measures the impact a society makes upon an establishment in terms of social convention; Stakeholder's influence entails the involvement of persons responsible for resource provision to a specific establishment; Environmental impact upon which an organization's actions affect the geographical environment; Organizational culture that entails the relationship between a corporation and its stakeholders with the resources involved while considering the risks involved on sustainable development of the projects.

In achieving a sustainable universal coverage of water and sanitation facilities and increasing the access to the services, as echoed by Jiménez Fdez de Palencia et al. (2017), it is evident that proper maintenance and ownership at all levels from the local community to national levels where strengthening of enabling environment ought to be done through policy and regulatory formulations. In addition, in the provision of water and sanitation services, all the stakeholders at all levels are responsible for addressing barriers to sustainability that might have been embedded in the governing system.

According to the United Nations (2016), accessing the sustainability indicators for water and sanitation projects is based on sustainability programming framework. This entails indicators on the project such as functionality, accessibility, reliability/continuity, quality of the service, affordability, and environmental protection. Thus, from Nabifwo and Kimutai (2018) if sustainability of water and sanitation projects is to be achieved, project teams need to factor in the indicators during the planning phase of intended projects yielding to sustainability plans.

From Silvius and Schipper (2014), sustainability plan describes how project will be sustained in the long term by focusing on community, financial, and organizational sustainability as it is a requirement by the donors before releasing the funds for a specific project as most of the projects fail after implementation when the donor funding is withdrawn. However, in the case of output-based aid funding mechanism, project

implementation is carried out, and then funds are released by the donor as subsidy's based on verifiable indicators from an independent verification report. In developing countries, the majority of the projects being executed in this means are infrastructural, water, sanitation, and health projects in the informal settlement areas where there is a need for residents to access amenities that they cannot afford (Trémolet, Barbara, & Jones, 2010).

Despite of different modes of funding mechanisms by the donors, in his research, Tafara (2013) established several factors are linked to poor sustainability of water and sanitation projects, majority of them being within the project management, while others emanating from external threats. Thus, to ensure project sustainability, the project managers ought to consider all the design orientations such as technology, community participation, stakeholder involvement, financial mechanisms, monitoring and evaluation, and tools & techniques in line with long term goals of specific projects.

2.3 Technological Design Orientation and Sustainability of Water and Sanitation Projects

With the advancing technology, changing regulations, and user requirements, project managers have sought means and ways of incorporating information systems in projects (Tafara, 2013). Thus, many water and sanitation projects have invested huge amounts of money in implementing information systems with the returns based on how the technologies have been integrated into objectives of the project (Ndubi et al., 2018).

Information Technology (IT) has recently moved beyond applying IT systems into an era of IT-enabled transition. With the increasing trend of IT usage, it continues to be a challenge on how to manage projects better while maximizing the economic benefits. Studies done by Ochelle (2012) stressed the importance of technology for sustainability of projects, indicating that the sustainability of community water supply projects depends on project-controlled factors such as technology, training, project costs, and construction quality in addition to other factors not controlled by the project such as communities' poverty level, and access to technical assistance.

According to Ndubi et al. (2018), technological innovation influences performance improvement thus ensuring sustainability of WASH projects, thus with increasing rapid technological change, it is clear that the organizations ought to develop innovative products and services that enhance sustainability. Numerous researches have indicated positive affiliation between project sustainability and project's technological innovations.

Studies done by Tafara (2013) on factors influencing sustainability of rural community-based water projects in Mtito Andei, Kibwezi sub-county confirmed that sustainability depends on aspects controlled by the project such as technology use in information communication systems, service delivery, accounting systems, and reporting and payment systems. The use of modern technology-enabled reduction in poor project management and enhanced project accountability through minimal adoption.

In water and sanitation projects, use of technology has been hailed by both the water service providers and the water consumers. In the case of informal settlements that are characterized by a large percentage of non-revenue water due to illegal connections, unmetered water points, physical losses attributed by leaks and burst, and scarcity of water supply, water dispenser project was carried out in Nairobi County. This entailed installation of a system base automated water vending machine whereby consumers utilize tokens and get water from the machines. As a result, the project has enabled availability of water to the informal settlements, while reducing the amount of water losses and increasing revenue to the organization (Yamo, 2018).

The advances in information technology have profoundly changed how computerized information systems can be used in water and sanitation projects by identifying the impacts on the effectiveness of the organization's operations and sustainability. In addition, increased reporting requirements by stakeholders have made it necessary for project managers to invest in information systems for ease of evaluation of implemented projects thus enabling interaction of projects and the stakeholders through reports (Strojny, 2015). For instance, the use of the "Jisommee meter" system in low-income settlements project in Nairobi county has enabled the users to read the consumption of water from the meters,

generate bills, and transact the payment through "mpesa". This enabled a reduction in wastage and labor for manual meter reading, billing, and revenue collection while increasing efficiency in revenue collection (Munuve, 2019).

2.4 Community Participation Design Orientation and Sustainability of Water and Sanitation Projects

According to Barasa and Jelagat (2013), community participation is the active process through which beneficiaries influence the execution and direction of a development project with a view of improving personal growth, income, and self- dependence. The beneficiaries take initiatives and actions from the dialogue as inspired by their indigenous knowledge, independent thinking, and discussions in which they can exercise control. Thus, it is their responsibility to be involved in decision making in the entire project cycle to ensure achievement of the project goals and project sustainability.

In his research, Alelah and Mueke (2017), established that after reaching an agreement on most appropriate intervention for a community problem, participatory planning is done. This entails a set of processes through which the interested parties engage together on planning deliberations. In the planning, further discussion on the problem is done by giving focus on project design, budget, resource mobilization, implementation plan, and evaluation plan. Thus, in realization of effective and sustainable development, participatory planning allows for project ownership, support of intervention, and community's history.

According to Nabifwo and Kimutai (2018), many WASH projects are not sustainable due to lack of goodwill from the stakeholders as there is no commitment and ownership. Thus in order to attain sustainability considerations ought to be done on giving the design phase acceptable time and resources to ensure an effective outcome, ensuring the design entails actions required in implementation of other stages with clear roles and responsibilities and specifying the level and participation type to be realized while ensuring competence of the team in all the stages.

In the project needs identification stage, community participation allows for identification and problem prioritization to rank them in the order of preference, thus ensuring effective management as the community needs forms the bases for any developmental planning. On the other hand, the project managers can understand the core issues in each field and foresee the viability of the intended projects. Failure of the involvement in this stage leads to poor sustainability as the project is deemed to stall at the implementation stage (Nyakwaka, Muronga, & Muvumbi, 2018).

Project implementation phase entails putting the project plan into action by coordinating project resources and activities to meet project objectives. In community participation, technical training and assistance in building the community's capacity for tasks during the project implementation contribute to the community's empowerment thus increasing chances for sustainability of the project after withdrawal of technical and managerial assistance (Magero & Muchelule, 2019). In addition, according to Alelah and Mueke (2017), community participation in project implementation allows for maintenance of project relevance and adaptation during the uncertainties by making use of wider ranges of resources, knowledge, and expertise from the locals.

From Barasa and Jelagat (2013), a project that has grown through participatory process at all stages of project cycle from need identification, planning, and implementation stages, should be ideally evaluated in the same manner with the involvement of the community. Thus, participatory M& E entail the process at which the stakeholders at different levels track and review a project or program through sharing contents of ownership, process, and outcomes of M& E activities while implementing or recommending for corrective measures. This ensures ownership at the local level with a commitment not only to the exercise alone but more critically to the future development of a program.

Several benefits are associated with community participation in projects. In his studies, Magero and Muchelule (2019) established that community participation ensures project sustainability through process ownership with the participants taking control of the project. This is attained through the empowerment of people, leading to increased capacity to

manage, monitor and evaluate processes, decision making, and gain analytical know-how of their situations thus increasing the zeal to be engaged in all areas of development.

Nyakwaka et al. (2018) emphasize that community participation is vital to project sustainability as there is involvement of local people as active members and equal partners with their interests and expertise is fundamental to the project success. With participation in roles such as capacity building, decision making, mobilizing political will, technology used, facilities location, and operation and maintenance creates awareness and motivation enabling building a long-term capability in managing projects thus improving accountability.

2.5 Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

Within the emerging concept of public participation, cooperation and partnership between government and citizens have regularly featured in theoretical participation frameworks for managing projects. According to Larsson and Larsson (2019), collaborative project management entails the involvement of the project members in the planning, process control, and networking. Thus, understanding the complexity of uncertainties for environmental, social, and economic aspects, a normative viewpoint of collaboration and networking allows for sustainability of projects.

In networking and collaboration, different stakeholders are involved through financially supporting and technical expertise and integration of different projects in each geographical location. For instance, in implementation of the water and sanitation to low-income settlements in Nairobi, consultations, and collaborations from the stakeholders of water and sanitation programs (WASH) as it allowed for project continuity (Munuve, 2019).

Larsson and Larsson (2019), established key elements of collaboration that fall under dimensions of duration, intensity, depth, and width with effects on project sustainability; This entails communication among the stakeholders, integration of logistics, and the

technological integration. Effective communication by the stakeholders allows for resolution of diverse discoveries in all stages of the project cycle while incorporating innovations under the diverse environment.

From his research on sustainability of WASH projects in Fafi Constituency, Garissa County, Muhia (2015) established that collaboration of partnership in both local, national, and international levels is a vital element for sustainability. Thus top-down and bottom-up communication and co-ordination of the project activities throughout the project cycle allow for success. Such aspects of collaboration involve project funding, labour provision, and sharing of the project benefits among others.

According to Ndubi et al. (2018), networking and collaboration in project allows for government involvement in enforcing regulations throughout the project implementation process such as the National Environmental & Management Authority (NEMA) that allows for baseline study through environmental impact assessment (EIA) through the assurance of certificates. This ensures the environmental sustainability of projects. For instance, in the implementation of Sewer trunk mains project in Nairobi county, an EIA study was carried out allowing regulations on disposal of the effluent discharges ensuring sustainability of the project with considerations of both social and environmental aspects (Athi Water and Services Board, 2011).

2.6 Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

Although monitoring and evaluation practices are usually discussed jointly, they serve diverse yet complementary roles. Monitoring allows for continuous and regular tracking of inputs, processes, and outputs against set targets for projects to ensure adequacy in implementation progress by providing the project manager with know-how on project implementation status. On the other hand, evaluation establishes attribution and causality of project outcomes against the set project objectives with the information being used to develop policies and procedures (Mugo, Keiyoro, Mwangi, & Rambo, 2016).

According to Schwemlein, Cronk, and Bartram (2016), in his research on indicators of monitoring and evaluation of WASH projects, established that there has been increasing significance in determining project performance and their sustainability based on the M & E indicators tracking the economic and social trends, and being at per with the project goals. The M &E measures to improve transparency and accountability generating greater confidence by the stakeholders thus enhancing the project sustainability.

In his research in monitoring and evaluation of WASH in school programs, Deroo, Walter, and Graham (2015) established that in order to ensure that the M& E activities proceed as scheduled, there is a need to have a stipulated budget allocation, competent personnel, partnerships at both local and national levels, and policies and regulations governing. In addition, as echoed by Schwemlein et al. (2016), there ought to be measurable indicators with which monitoring shall take place based on appropriate standards against which measurement shall take place, for instance, water quality.

As echoed by Ndubi et al. (2018), M&E requires coordination of high level from the management, thus drawing inputs for the project execution while giving corrections for any shortcomings from the stakeholders. With stakeholder participation in the design and execution of monitoring and evaluation practices, adds to effective project implementation hence sustainable projects. Nevertheless, given that participation is a consensus-based process, the beneficiaries ought to be involved in the establishment of M& E practices. As established by Mthethwa and Jili (2016), additional costs involved in the formation and implementation of the M& E practices creates economic sustainability challenges in majority of the developing world face funding constraints.

As an M& E practice, reporting the project progress to the stakeholders and beneficiaries enhances transparency and accountability as the trust is built within the project management thus allowing for resource provision and ownership resulting to sustainable project (Njeri & Omwenga, 2019). In addition, to attain efficiency in reporting project progress, the meetings should be as planned, while monitoring the project implementation

with the beneficiaries equipped to participate actively through enquiring about the project progress as this minimizes misappropriation of funds (Mthethwa & Jili, 2016).

2.7 Theoretical Framework

In concepts of giving an explanation on aspects in the natural world that can be tested repeatedly, this section highlights the sustainability development theory which is closely linked to the study.

2.7.1 Sustainability Theory

Sustainability concept was first employed concerning natural resources and how they ought to be utilized as they are finite and cannot support the world's projected population with current resource utilization and growth levels (Silvius & Schipper, 2015). The theory of sustainable development gives an indication that the concerns of sustainable development is management of the change process and not setting end goals with static outcomes. Thus, it recognizes the existence of uncertainties on the ongoing processes in the diverse environment and local settings by giving support (Armenia, Dangelico, Nonino, & Pompei, 2019).

From Harrington (2016), sustainable development theory was initiated in the 1980s with a focus on the coordination on economic, social, and environmental development at different stages of development such as embryonic stage before 1972, molding stage between 1972 and 1987, and present development stage from 1987 forward. The theory became an essential part of agenda international, national and local levels with more comprehensive and universal changing from an individual factor of ecology to current sustainable development goals

According to Chawla, Chanda, Angra, and Chawla (2018), consideration of the political, economic, social and cultural relationships which are vital to the development agenda is inherent in this concept. Sustainable development theory involves a broad picture of global thought and local community action, while continually and objectively thinking about, and refining e specific intricacies of the relationships of the development existence and beneficiaries. Thus, the management of projects requires competences of contextual,

behavioral, and technical skills. In addition, Harrington (2016), recommends that sustainable development theory, both human and social capital ought to be treated as natural resources to allow for effective and efficient use of resources, thus increasing long term sustainable benefits from the project implementation.

Armenia et al. (2019) established that the sustainable development long-term objectives aim at people empowerment people, increased community participation, promotion of social cohesion, strengthening of cultural identity and institutional growth, and promoting success in project sustainability. This is linked to the sustainable development theory that advocates for the determination of community preferences and balancing of the competing interests of economic and environment during the project need analysis.

The significance of the sustainable theory to this research is that it emphasizes social aspects linked to capacity assessment through community participation and collaboration from the stakeholders, changing environmental aspects of technology and economical aspects linked to effective use of resources during monitoring and evaluation that are being considered as project design orientations in the study.

2.8 Conceptual Framework

The study gave focus on the relationship between independent variables such as technology, community participation, collaboration and networking, and monitoring and evaluation design orientation and their influence on sustainability of water and sanitation projects, herein referred to as the dependent variable. This is as illustrated in **Figure 1**

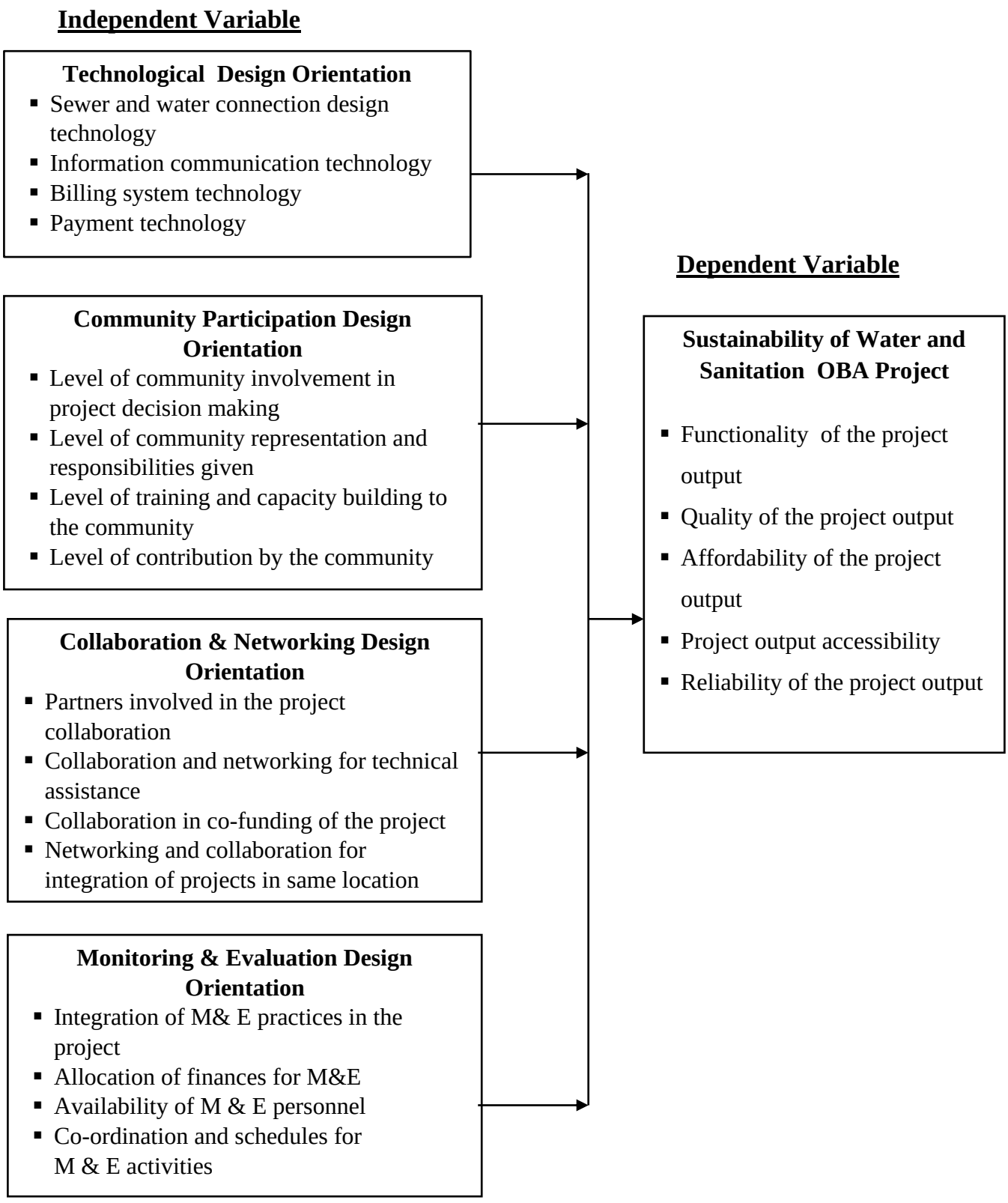

Figure 1: Conceptual Framework

2.9 Summary of Literature Review

Based on the previous studies as illustrated in Table 2.1 below, gives the research knowledge gap that ought to be addressed by the current research.

Table 2.1: Research Knowledge Gap

Objective	Variable on Focus	Author & Year	Title of the study	Findings	Knowledge Gap
To assess how technological design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Technological Design Orientation	(Ndubi et al., 2018)	Influence of Project Management on Sustainability of Water and Sanitation Projects in Kibra Sub-County, Kenya	Use of technology has significant impacts on project sustainability. This is based on use of proper techniques enhancing project planning, implementation, and monitoring	Impact of training the project users on technology
To examine the extend at which community participation design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Community Participation Design Orientations	(Alelah & Mueke, 2017)	Influence of Community Participation on Sustainability of Water and Sanitation Projects in Rhonda Slum in Nakuru County, Kenya.	Community participation impacts positively on WASH projects' sustainability	The community involvement in monitoring the project performance at all the implementation stages.
To determine the level at which collaboration and networking design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Collaboration and Networking Design Orientation	(Muhia, 2015)	Factors Influencing Sustainability of Water and Sanitation and Health projects Implemented by Sustainable Development and Peace Building initiatives at Fafi	Collaboration in integrating projects in the same geographical location at local, national and international levels enables ownership thus enhancing sustainability	The effect of size and number of partners to be incorporated in a specific project

			Constituency, Garissa County, Kenya.		
To assess how monitoring and evaluation design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Monitoring and Evaluation Design Orientation	(Deroo et al., 2015)	Monitoring and evaluation of WASH in schools' programs: lessons from implementing organizations	To enhance sustainability of WASH projects, there ought to be involvement of both local, national, and international level monitoring and evaluation.	The schedules and activities of M & E during post-implementation of the WASH projects

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes various research methodology components that were applied in this study. These entailed research design, target population, sampling size and procedure, methods of data collection and analyzing, ethical issues, and operationalization of variables.

3.2 Research Design

This study utilized a descriptive survey design for an in-depth analysis of project design orientations that influence sustainability of water and sanitation projects. The design is considered suitable for doing causal studies with cause-effect relationships, which are conducted in order to explain any behavior or reactions of people to a given phenomenon (Cooper & Schindler, 2013). While in survey designs, collection of data is done by use of questionnaires or interview guides from a selected sample of the target population (Wambugu, Kyalo, Nyonje, Mbii, 2015).

3.3 Target Population

The target population for this study was 160 NCWSC personnel and project beneficiaries from the 12 number low-income settlements as shown in **Table 3.1**

Table 3.1 : Target Population Frame

Category	Location	Number of Personnel	Total
NCWSC Personnel	Project Department	60	
	Informal Settlement Department	100	
	Sub Total		160
Project Beneficiaries	Kayole Soweto	1367	
	Mathare	45	
	Mukuru	433	
	Kibera	70	
	Maili Saba	457	
	Canaan	240	

	Huruma	78	
	Mwengenye	61	
	Kawagware	260	
	Mowlem	165	
	Matopeni	1025	
	Riverbank	228	
	Sub Total		4307
Total			4467

Source: (Nairobi City Water and Sewerage Company, 2014)

From Table 3.1, the target population was composed of 160 personnel from NCWSC in the departments of Project team and Informal settlement that were used in planning, implementation, operation and maintenance of the water and sanitation output-based aid project. In addition, 4307 persons from the 12 number low-income settlement who were the project beneficiaries (Nairobi City Water and Sewerage Company, 2014).

3.4 Sample size and Sampling procedure

The research applied census method for the respondents to give their responses for different categories as illustrated in **Table 3.2**

Table 3.2 Sample size Frame

Category	Location	Number of Personnel	Sample size
NCWSC Personnel	Project Department	60	
	Informal Settlement Department	100	
	Sub Total		160
Project Beneficiaries	Kayole Soweto	1367	6-8
	Mathare	45	6-8
	Mukuru	433	6-8
	Kibera	70	6-8
	Maili Saba	457	6-8
	Canaan	240	6-8
	Huruma	78	6-8
	Mwengenye	61	6-8
	Kawagware	260	6-8

	Mowlem	165	6-8
	Matopeni	1025	6-8
	Riverbank	228	6-8
	Sub Total		84
Total			244

From Table 3.2, 160 personnel from NCWSC were used to give their responses because the size of the population had diversified (heterogeneous) characteristics. On the project beneficiaries, focus group was being utilized with each group composed on 6-8 persons as recommended by Mugenda and Mugenda (2003) to give their responses on sustainability of water and sanitation OBA . The census method was utilized due to its advantage as it gives more accurate data as every unit of the population is studied before concluding the research (Kabir, 2016).

3.5 Research Instruments

The study utilized questionnaires and focus group as primary tools for data collection due to the nature of data required and the type of respondents. The questionnaire was divided into six sections comprising of structured questions. Section A was comprised of personal information of the respondent such as age, gender, education level, and work experience. Section B was composed of questions based on the indicators of technological design orientations such as; sewer and water connection design technology, information communication technology, billing system technology, and payment technology. Section C questions were based on the indicators of community participation design orientations such as; level of community involvement in project decision making, level of community representation and responsibilities given, level of training and capacity building done to the community, and level of contribution by the community . Section D questions were based on indicators of networking and collaboration design orientations such as; partners involved in the project collaboration, collaboration and networking for technical assistance, collaboration in project co-funding, and networking & collaboration for integration of projects in the same geographical location. Section E questions were based on indicators of Monitoring and Evaluation design orientations such as; integration of M & E practices in the project, allocation of finances for M & E, availability of M & E personnel, and coordination & scheduling of M & E activities. Finally, section F questions were based on the indicators of the

project sustainability such as; functionality of the project, quality of the project, affordability of the project, project accessibility, and reliability of the project.

The structured questions entailed close-ended questions applying a Five-point Likert Scale that includes; (1) Strongly disagree (2) Disagree (3) Neutral (4) Agree, and (5) Strongly agree.

On the other hand, a focus group was done to the project beneficiaries from the 12 number low-income settlements to get their views on sustainability of the Sanitation output-based aid project based on service of the project.

3.5.1 Pilot Testing

In this research, 10 % equivalent of the target population that is, 16 respondents were identified from Nyeri Water and Sanitation services as it has a similar structure and the same mandate as NCWSC whereby, pilot testing of the research instrument was done by sharing the research instrument and collecting the feedback. This enabled clarification of variables and the establishment of the validity and reliability of the research instrument as recommended by (Mugenda & Mugenda, 2003).

3.5.2 Validity of the Instruments

The study employed content and construct validity that measures the suitability of the research instrument in data collection. This was attained by evaluating the pilot test results and sharing of the research instrument with the experts in the field of study such as the research supervisor and other lecturers who gave their opinion. All this facilitated revision and modification of the research instrument thus enhancing its validity on both the content and construct through confirmation of appropriateness, significance and the practicality of inferences a researcher makes based on the data collected as echoed by (Donald, Delno, & Tromp, 2006)

3.5.3 Reliability of the Instruments

Reliability of the research instrument refers to the consistency of rankings collected with components of balance and equivalence implying that the instrument shall give similar outcomes with replicated measurements of the corresponding object (Donald et al., 2006).

For this research, Internal-consistency method was used to test the research instrument reliability by computing for Cronbach Alpha reliability coefficient (α) as follows;

$$\alpha = \frac{N.\bar{C}}{\bar{V} + (N-1).\bar{C}}$$

Where α = Cronbach Alpha reliability coefficient

N = No. of items

$\bar{V}$ =Average variance

$\bar{C}$=Average covariance between the item pairs

As echoed by Taber (2018), use of Cronbach Alpha reliability coefficient is recommendable while using structured questions applying a Five-point Likert Scale as it provides a unique estimate of internal consistency as opposed to ranges of possible reliabilities.

From the computations, the Cronbach Alpha reliability coefficient (α) obtained for this study was 0. 71 which gave an indication that the research instrument is reliable based on research by Taber (2018). In addition, by use of triangulation in the focus group through posing a question differently with an aim of obtaining a similar response, confirmed consistency.

3.6 Data Collection Procedure

An introductory letter was gotten from the university and permit obtained from National Commission for Science, Technology, and Innovation (NACOSTI) that gave consent that the researcher is a bonafade student and permitted for the data collection process for the research.

After booking appointments with respondents from NCWSC staff and scheduling meeting with the project beneficiaries through Water Association groups (WAG's) in the specified low-income settlements, primary data collection was done by administering questionnaires to NCWSC staff, and conducting a focus group with the project beneficiaries so as to get the first-hand information.

3.7 Data Analysis Techniques

The research utilized both descriptive statistics and inferential statistics for quantitative data analysis using the SPSS version 21 software due to its advantages such as; capability of organizing

data in tabular form, saving different outputs and files, handling multiples of data and identifying any errors from the outputs, and creating graphical representation from menus and syntaxes. The qualitative data analysis was used to back up the interpretation of the quantitative data through the triangulation method whereby both the qualitative and quantitative data was represented in tabular form based Bogner, Litting, and Menz (2009) research.

In descriptive statistics, the computation of mean, mode, frequency, median, percentages, and standard deviation was done while in inferential statistics analysis Spearman rank-order correlation coefficient and a regression model was used to interpret the results. The Spearman rank-order correlation coefficient is used to establish the correlation of ordinal variables in which the change is not constant(monotonic).

The regression model was applied to predict the dependent variable (sustainability of the project) when independent variables (technological design orientation, community participation design orientation, collaboration and networking design orientation, and monitoring & evaluation design orientation) change. The method is preferred as it gives the linear equation coefficient for more than a single independent variable. The regression model is as illustrated below;

Sustainability of water and sanitation project when technological design orientation changes

$$y_1 = \beta_0 + \beta_1 X_1 + \varepsilon$$

Sustainability of water and sanitation project when community participation design orientation changes

$$y_2 = \beta_0 + \beta_2 X_2 + \varepsilon$$

Sustainability of water and sanitation project when networking and collaboration design orientation changes

$$y_3 = \beta_0 + \beta_3 X_3 + \varepsilon$$

Sustainability of water and sanitation project when monitoring and evaluation design orientation changes

$$y_4 = \beta_0 + \beta_4 X_4 + \varepsilon$$

Hence, sustainability of project when technological design orientation, community participation design orientation, networking and collaboration design orientation, and monitoring and evaluation design orientation change is given by;

$$Y = y_1 + y_2 + y_3 + y_4$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where; Y = Sustainability of water and sanitation project; β_0=consant or intercept of the regression line; $\beta_1, \beta_2, \beta_3$ and β_4 represent the regression coefficients for predictor variables; X_1=Technological design orientation; X_2= Community participation design orientation; X_3=Collaboration and networking design orientation; X_4= Monitoring and evaluation design orientation; and $\varepsilon =$ Error term

3.8 Ethical Issues

The researcher observed essential norms such as; confidentiality that allowed for protection of the respondent's information; a consent for voluntary participation by the respondents; honesty that allowed for honest in reporting of data, methods, procedures, and results of the study in avoidance of fabrication and misrepresentation of data; respect that allowed for acknowledgement through citations and referencing other researchers' contributions. In addition, the researcher obtained an introduction letter from the university as a guarantee that she is a bonafide student, and also a permit from National Commission for Science Technology, and Innovation (NACOSTI) was obtained that allowed for data collection.

3.9 Operationalization of Variables.

This section highlights both the dependent and independent variables that are to be investigated in the study as shown in **Table 3. 3**

Table 3.3: Operationalization of Variables

Objective	Name & Type of variable	Indicators	Measurement scale	Data collection tools	Data Analysis Techniques	Tools of analysis
To assess how technological design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Technological Design Orientation-Independent variable	▪ Sewer and Water connection design technology ▪ Information communication technology ▪ Billing system technology ▪ Payment technology	Ordinal	▪ Questionnaire ▪ Focus group	Descriptive	Percentage, Mean, Frequency, and Standard deviation
					Inferential	Spearman rank-order correlation, and Regression Analysis
To examine the extend at which community participation design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Community Participation Design Orientation-Independent variable	▪ Level of community involvement in project decision making ▪ Level of community representation and responsibilities given ▪ Level of training and capacity building to the community ▪ Level of contribution by the community	Ordinal	▪ Questionnaire ▪ Focus group	Descriptive	Percentage, Mean, Frequency, and Standard deviation
					Inferential	Spearman rank-order correlation, and Regression Analysis

To determine level at which collaboration and networking design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Collaboration and networking design orientation- Independent Variable	▪ Partners involved in the project collaboration ▪ Collaboration and networking for technical assistance ▪ Collaboration in co-funding of the project ▪ Networking and collaboration for integration of projects in the same location	Ordinal	▪ Questionnaire ▪ Focus group	Descriptive	Percentage, Mean, Frequency, and Standard deviation
					Inferential	Spearman rank-order correlation, and Regression Analysis
To assess how monitoring and evaluation design orientation influence sustainability of water and sanitation output-based aid project by NCWSC	Monitoring and evaluation design orientation- Independent Variable	▪ Integration of M& E practices in the project ▪ Allocation of finances for M&E ▪ Availability of M & E personnel ▪ Co-ordination and schedules for ▪ M & E activities	Ordinal	▪ Questionnaire ▪ Focus group	Descriptive	Percentage, Mean, Frequency, and Standard deviation
					Inferential	Spearman rank-order correlation, and Regression Analysis
	Sustainability of water and sanitation output-based aid project - Dependent Variable	▪ Functionality of the project output ▪ Quality of the project output ▪ Affordability of the project output ▪ Project output accessibility ▪ Reliability of the project output	Ordinal	▪ Questionnaire ▪ Focus group	Descriptive	Percentage, Mean, Frequency, and Standard deviation
					Inferential	Spearman rank-order correlation, and Regression Analysis

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents the research results that have been analyzed and presented based on thematic areas guided by the research objectives. The subsections discussed include; questionnaire response rate, demographic characteristics of the respondents, technological design orientation and sustainability of water and sanitation projects, community participation design orientation and sustainability of water and sanitation projects, Collaboration and networking, and sustainability of water and sanitation projects, Monitoring and evaluation, and sustainability of water and sanitation projects, and sustainability of water and sanitation projects.

4.2 Questionnaire Return Rate

This section provides information on the questionnaire return rate in which a total of 160 questionnaires were delivered to the respondents from NCWSC. This is as presented in **Table 4.1**

Table 4.1: Questionnaire Return Rate

Return Rate	Frequency (F)	Percentage (%)
Returned and completely filled	131	81.9
Returned and partially filled	7	4.4
Not Returned	22	13.8
Issued	160	100

As illustrated in Table 4.1, from a total of 160 questionnaires that were delivered to the respondents, 131 responses were received giving a response rate of 81.9 %. The study did not attain a 100% response rate as 22 questionnaires were not returned as the said respondents claimed they were busy, while 7 questionnaires were partially filled thus, they couldn't be utilized in the analysis. The response rate is good and adequate for analysis as echoed by Mugenda and Mugenda (2003).

4.3 Focus Group Response Rate

This section provides information on the focus group response rate in which a total of 12 number group discussions were made with the project beneficiaries in the low-income settlements. This is as illustrated in **Table 4.2**

Table 4.2: Focus Group Response Rate

Project Beneficiary	Frequency (F)	Gender	
		Male	Female
Kayole Soweto	8	5	3
Mathare	7	3	4
Mukuru	6	3	3
Kibera	5	3	2
Maili Saba	7	2	5
Canaan	8	3	5
Huruma	8	4	4
Mwengenye	6	4	2
Kawagware	4	1	3
Mowlem	7	3	4
Matopeni	6	4	2
Riverbank	6	3	3

As shown in Table 4.2, there was good response rate from the 12 number low income settlements who were the project beneficiaries based on the sample size of 6-8 persons per discussion group as echoed by (Cooper & Schindler, 2013). Hence, the response on influence on sustainability of water and sanitation output-based aid project was adequate.

4.4 Demographic Information of the Respondents

This section outlines demographic data of the respondents that were interviewed. The elements that were considered are gender, age, level of education, working experience in NCWSC. This demographic information enabled the researcher to establish the nature of respondents and their capability in responding to the questionnaire.

4.4.1 Distribution of Respondents by Gender

The researcher sought to establish the gender of the respondents in providing information on the influence of project design orientations on sustainability of water and sanitation projects as this forms basis of policy formulation. This is as illustrated in **Table 4.3**

Table 4.3: Distribution of Respondents by Gender

Gender	Frequency (F)	Percentage (%)
Male	78	59.5
Female	53	40.5
Total	131	100

From the Table 4.3, there was a fair gender representation for both male and female respondents, with the majority being male as they represented 59.5% while the female were 40.5 % represented. This gave a clear illustration of involved of both genders in planning, implementation, operation, and maintenance of the sanitation project. In addition, based on the gender representation gives a weight that the research findings and recommendations may be used for policy formulation (Kenya National Bureau of Statistics, 2019).

4.4.2 Distribution of Respondents by Age

The study sought to establish the age of the respondents as illustrated in **Table 4.4**.

Table 4.4: Distribution of Respondents by Age

Age Bracket	Frequency (F)	Percentage (%)
Below 24 years	10	7.6
Between 25-29 years	21	16.0
Between 30-34 years	36	27.5
Between 35-39 years	27	20.6
Between 40-44 years	21	16.0
Over 44 years	16	12.2
Total	131	100

Age bracket rounded off to the nearest whole number

As illustrated in Table 4.4, majority of the respondents were aged between 30-34 years with a percentage of 27.5% while least of the respondents were below 24 years of age giving a percentage of 7.6 %. From the table, it is also evident that there was a fair representation of the respondents from the given age brackets.

4.4.3 Distribution of Respondents by Level of Education

The study sought to establish the level of education from the respondents. Findings are as illustrated in **Table 4.5**

Table 4.5: Distribution of Respondents by Level of Education

Education Level	Frequency (F)	Percentage (%)
Certificate	18	13.7
Diploma	60	45.8
Bachelors Degree	37	28.2
Masters Degree	16	12.2
Total	131	100

From Table 4.5, it is evident that majority of the respondents have a diploma as the highest level of education with 45.8 %, while the least of respondents have a master's degree as the highest level of education with a percentage of 12.2%. In addition, the table gives a clear indication that the respondents have capability in responding to the research questionnaire.

4.4.4 Distribution of Respondents by Working Experience in NCWSC

The study sought to establish the respondent's working experience in NCWSC. Findings are as illustrated in **Table 4.6**

Table 4.6: Distribution of Respondents by Working Experience in NCWSC

Work Experience in NCWSC	Frequency (F)	Percentage (%)
Below 2 years	3	2.3
Between 2-5 years	44	33.6
Between 6-9 years	49	37.4
Over 10 years	35	26.7
Total	131	100

Age bracket rounded off to the nearest whole number

From Table 4.6, it is evident that majority of the respondents with a percentage of 37.4% have worked in NCWSC for 6-9 years while least of the respondents with a percentage of 2.3 % have work experience in NCWSC below 2 years. The findings give a clear indication that the respondents in general have working experience in NCWSC which builds up as an advantage to the study as the responses of the research objective emanate from experienced respondents.

4.5 Technological Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the influence of technological design orientations on sustainability of water and sanitation output-based aid project by NCWSC based on the indictors of ; sewer and water connection design technology, information communication technology, billing system technology, and payment technology as indicated below.

4.5.1 Sewer and Water connection Design Technology

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.7**.

Table 4.7: Sewer and Water Connection Design Technology

Statement	Mean	Std. Deviation
The choice of designs for water and sewer connections was based on modern technology	4.05	0.678
Similar connection design technology was applied to all the 12 number low-income settlements in Nairobi	4.17	0.913

From Table 4.7 above, it is clear that the respondents agree on the statements in regard to the choice of sewer and water connection design technology with a mean ranging from 4.05 - 4.17, and standard deviation of 0.678-0.913. This gives a clear indication that the

choice of design technology in the changing environment based on the market and user requirements is vital element in project implementation (Tafara, 2013).

4.5.2 Information Communication Design Technology

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.8**.

Table 4.8: Information Communication Design Technology

Statement	Mean	Std. Deviation
Project team embraced use the of information systems for communication and reporting of the project progress	4.01	0.924
Use of information communication systems enhanced accountability throughout the project cycle	3.83	0.938

As shown in Table 4.8 on information communication technology, the respondents agreed that the project team embraced use of the information systems for communicating and reporting of project progress with a mean of 4.01 and standard deviation of 0.924, and use of information communication system enhanced accountability throughout the project cycle with a mean of 3.83 and standard deviation of 0.938.

From the findings, it can be deduced that use of information communication technology in enhancing the accountability of water and sanitation project was low thus hindering the success of project sustainability. This confirms the studies by Tafara (2013) that despite of increasing trends in the usage of information technology, does not guarantee the accountability of the projects as this is based on attitude of the project team members.

4.5.3 Billing System Technology

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.9**.

Table 4.9: Billing System Technology

Statement	Mean	Std. Deviation
The project employed modern billing system for charging use of water and sewer services	4.14	0.802
The billing system in place is compatible with other systems for reporting and payment	4.03	0.744

As shown in Table 4.9, the respondents agreed that the project employed modern billing system for charging of water and sewer services with a mean of 4.14 and standard deviation of 0.802, and the billing system was compatible with other systems for reporting and payment with a mean of 4.03 and standard deviation of 0.744. This is evident in that for any system in use, it ought to be compatible with other systems and user-friendly (Yamo, 2018).

4.5.4 Payment Technology

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.10**.

Table 4.10: Payment Technology

Statement	Mean	Std. Deviation
Payment technology for sewer and water connection was made available to the project beneficiaries	3.98	0.808
Uniform payment technology was applied in all the 12 number low-income settlements in Nairobi	4.21	0.823
Payment technology applied was customized to fit the users in the 12 number low-income settlements in Nairobi	3.88	0.851
The project beneficiaries were trained on the application payment technology	4.37	0.637

As indicated in Table 4.10, the respondents agreed that the project beneficiaries were trained on the application of payment technology with a mean of 4.37 and a standard deviation of 0.637, and the payment technology was made available to the project beneficiaries with a mean of 3.88 and standard deviation of 0.851. In addition, the respondents agreed that uniform payment technology was applied with mean of 4.21 and standard deviation of 0.823, and it was customized to fit the users with a mean of 3.98 and standard deviation of 0.808 in all the 12 number low-income settlements.

From the findings, it can be deduced that use of modern payment systems technology is key to sustainability of water and sanitation projects as it allows for effectiveness and efficiency in charging and payment of water and sewerage services. This is however dependent on compatibility with other systems in place, and accessibility of the system to the beneficiaries. This is in agreement with Ndubi et al. (2018) on the use technology allows for reduction in manual labour while increasing the efficiency of the output for a given project enhancing its sustainability.

4.5.5 Triangulation of Quantitative and Qualitative data analysis on Technological Design Orientation and Sustainability of Water and Sanitation Projects

From the focus group discussions with the project beneficiaries, the respondents confirmed that,

"We embrace the use of Jisomee meter technology in billing and paying both the water and sewer charges as there are no disputes as we read the meters and bill ourselves".

From the triangulation of both the quantitative and qualitative data analysis, it can be deduced that use of technology in water and sanitation projects in designing, information communication technology, billing and payment system is a vital aspect in enhancing sustainability (Ndubi et al., 2018).

4.5.6 Correlation of Technological Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the relationship of technological design orientation and sustainability of water and sanitation projects using Spearman Rank order Correlation method. The results are as shown in Table 4.11

Table 4.11: Correlation of Technological Design Orientation and Sustainability of Water and Sanitation Projects

	Sustainability of water and sanitation projects	Technological design orientation
Sustainability of water and sanitation projects (r)	1.000	
(p) Sig.(2-tailed)	.	
Technological design orientation (r)	0.636**	1.000
(p) Sig.(2-tailed)	0.000	.

**=Significant variable at 5% confidence level

As illustrated in Table 4.11, there is a positive and significant relationship between technological design orientation and sustainability of water and sanitation projects with a magnitude of (r= 0.636, P< 0.000) at confidence level of 5%.

This gives an indication that the study hypothesis, H_{01} on Technological design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company is rejected as the P value is less than 5% level of significant.

4.6 Community Participation Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the influence of community participation design orientations on sustainability of water and sanitation output-based aid project by NCWSC based on the indictors of; level of community involvement in project decision making, level of community representation and responsibilities given, level of training and capacity building to the community, and level of contribution by the community as shown below.

4.6.1 Level of Community Involvement in Project Decision Making

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.12**

Table 4.12: Level of Community Involvement in Project Decision Making

Statement	Frequency	Std. Deviation
The communities were involved in selecting the designs of water and sewer connections	3.46	0.947
The communities were involved in selecting location points for water and sewer connections	4.10	0.722
The communities were involved in assessing the project performance	3.75	0.683

As shown in Table 4.12 , the respondents agreed that the communities were involved in selecting designs and location points for water and sewer connections with a mean of 3.46 and 4.10, and a standard deviation of 0.947 and 0.722 respectively. In addition, the respondents agreed that the communities were involved in assessing project performance with a mean of 3.75 and a standard deviation of 0.683. This gives an indication that community involvement in decision making allows for a sense of ownership for a given project (Magero & Muchelule, 2019).

In addition, it can be deduced that, community involvement plays a critical role in project decision making throughout the stages of project cycle with their contribution in know-how of the project , labour provision and financial support. This enables sense of belonging for the communities hence enhancing sustainability of water and sanitation projects. These findings concur with (Nyakwaka et al., 2018) were community participation in decision making creates awareness and motivation enabling building a long-term capabilities in managing projects thus enhancing sustainability.

4.6.2 Level of Community Representation and Responsibilities Given

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.13**

Table 4.13: Level of Community Representation and Responsibilities Given

Statement	Frequency	Std. Deviation
The communities were represented in the project progress meetings	3.70	0.958
The communities were given responsibilities during project implementation	3.80	0.863
The communities were represented during the project hand over	3.85	0.685

As indicated in Table 4.13, the respondents agreed that the communities were represented in the project progress meetings and during project hand over with a mean of 3.70 and 3.85, and standard deviation of 0.958 and 0.685 respectively. In addition, the respondents agreed that the communities were given responsibilities during project implementation with a mean of 3.80 and a standard deviation of 0.863.

The findings gives an indication that community representation and sharing of responsibilities enhance motivation thus building a long-term capability in managing projects thus improving sustainability (Nyakwaka et al., 2018). This creates an attitude of sense of belonging thus allowing for ownership of project that enhances sustainability of water and sanitation projects. The findings agree with Alelah and Mueke (2017) that community representation and allocation of responsibilities allows for making use of wider range knowledge and expertise from the locals allowing for adaptation during the future uncertainties thus enhancing sustainability of water and sanitation projects.

4.6.3 Level of Training and Capacity Building to the Community

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.14**

Table 4.14: Level of Training and Capacity Building to the Community

Statement	Frequency	Std. Deviation
NCWSC gave training to the communities on how to operate and manage the project	4.39	0.675
All the communities from the 12 no. informal settlements were represented during the training period	3.92	0.945

As shown in Table 4.14, the respondents agreed that training was done on operation and management of project with a mean of 4.39 and standard deviation of 0.945, with all the

communities from the 12 number low-income settlements represented during training period with mean of 3.92 and standard deviation of 0.945.

These findings gives an indication that training and capacity building for the community beneficiaries allows for a better understanding of the project (Barasa & Jelagat, 2013). In addition, the findings also agree on community empowerment through training and capacity building on the project matters allows for proper management of project activities thus contribution to sustainability of water and sanitation projects. This confirms to the studies by Magero and Muchelule (2019), that through empowerment of community leads to increased capacity for managing, monitoring and evaluating the processes for development thus enhancing sustainability of water and sanitation projects.

4.6.4 Level of Contribution by the Community

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.15**

Table 4.15: Level of Contribution by the Community

Statement	Frequency	Std. Deviation
The communities contributed part of labour in project implementation	3.93	0.946
Part of funds for operation and maintenance of the project were contributed by the communities through water and sewer charges	3.79	0.990

As shown in Table 4.15, the respondents agreed that the communities contributed part of labour in project implementation with a mean of 3.93 and a standard deviation of 0.946. In addition, the respondents agreed that part of funds for operation and maintenance of the project were contributed by communities through water and sewer charges with a mean of 3.79 and a standard deviation of 0.990. The findings show that in a given project,

contribution by community through labour and or funding allows for strong partnerships enhancing sustainability (Nyakwaka et al., 2018).

4.6.5 Triangulation of Quantitative and Qualitative data analysis on Community Participation Design Orientation and Sustainability of Water and Sanitation Projects

From the focus group discussions with the project beneficiaries, the respondents confirmed,

"We were involved in decision making on the project matters, provided manual labour in the project implementation and this gave an indication of ownership of the project".

From the triangulation of both the quantitative and qualitative findings, it can be deduced that community participation design orientation through involvement in decision making, representation and responsibilities given, contribution of labour and funds, and training and capacity building allows for a sense of ownership and belonging thus enhancing sustainability (Alelah & Mueke, 2017).

4.6.6 Correlation of Community Participation Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the correlation of community participation design orientation and sustainability of water and sanitation projects using Spearman Rank order Correlation method. The results are as shown in Table 4.16

Table 4.16: Correlation of Community Participation Design Orientation and Sustainability of Water and Sanitation Projects

	Sustainability of water and sanitation projects	Community Participation design orientation
Sustainability of water and sanitation projects (r)	1.000	
(p) Sig.(2-tailed)	.	
Community Participation design orientation (r)	0.690**	1.000
(p) Sig.(2-tailed)	0.002	.

**=Significant variable at 5% confidence level

As illustrated in Table 4.16, there is a positive and significant relationship between community participation design orientation and sustainability of water and sanitation projects with a magnitude of (r= 0.690, P< 0.002) at confidence level of 5%.

This gives an indication that the study hypothesis, H_{02} on community participation design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company is rejected as the P value is less than 5% level of significant.

4.7 Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the influence of collaboration and networking design orientations on sustainability of water and sanitation output-based aid project by NCWSC based on the indictors of ; Partners involved in the project collaboration, Collaboration and networking for technical assistance, Collaboration and networking in co-funding of the project, and Networking and collaboration for integration of projects in same location. Details are as indicated below.

4.7.1 Partners Involved in the Project Collaboration

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are tabulated in **Table 4.17**.

Table 4.17: Partners Involved in the Project Collaboration

Statement	Frequency	Std. Deviation
The collaborated partners were from local, national and international levels	4.44	0.824
The partners in collaboration were involved in all the stages of project cycle	4.08	0.691

As indicated in Table 4.17, the respondents agreed that the partners were from local, national and international levels with a mean of 4.44 and standard deviation of 0.824, and the collaborated partners were involved in all the stages of project cycle with a mean of 4.08 and standard deviation of 0.691. This implies that partners in collaboration for development of a specific project from both local, national, and international levels, ought to be involved in project activities.

Based on the research by Trémolet et al. (2010), the level of involvement by the partners may vary based on the project objectives based on the major elements of collaboration such as the duration, intensity and depth ought to be stated at the initial stages of project implementation. The findings are as eluded by Ndubi et al. (2018), that through involvement of different partners allows for enforcement of regulations throughout the project implementation thus ensuring sustainability of water and sanitation projects.

4.7.2 Collaboration and Networking for Technical Assistance

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are tabulated in **Table 4.18**.

Table 4.18: Collaboration and Networking for Technical Assistance

Statement	Frequency	Std. Deviation
Collaboration and networking was done for technical assistance prior to project implementation	3.74	0.856
Technical assistance offered through collaboration and networking was for all fields of the project	3.73	0.884
Benchmarking tool was applied for enhancing technical assistance in collaboration and networking	3.49	1.119

As shown in Table 4.18, the respondents agreed that collaboration and networking was done prior to the project implementation with a mean of 3.74 and a standard deviation of 0.856 and the technical assistance offered was for all fields of the projects with a mean of 3.73 and standard deviation of 0.884. In addition, the respondents agreed that the benchmarking tool was applied for enhancing technical assistance with a mean of 3.49 and a standard deviation of 1.119.

The findings give an indication that collaboration and networking for technical assistance enables the adoption of new ideas to the project, however, assessment ought to be done on the nature of technical assistance given as echoed by (Larsson & Larsson, 2019). In addition, collaboration and networking for technical assistance ought to be done before the project implementation for different fields based on the project objectives, and benchmarking tool is useful for enhancing technical assistance through collaboration. The findings confirms to research findings by Muhia (2015) that technical assistance offered through collaboration and networking enables bring in of new technology while integrating with local technology thus enabling sustainability of water and sanitation projects.

4.7.3 Collaboration in Co-funding of the Project

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are tabulated in **Table 4.19**.

Table 4.19 Collaboration in Co-funding of the Project

Statement	Frequency	Std. Deviation
There was collaboration in co-funding of the project	4.56	0.714
The collaboration for co-funding for the project was done nationally through world bank and locally through commercial loans	4.63	0.672

As indicated in Table 4.19, the respondents agreed that there was collaboration in co-funding of the project with a mean of 4.56 and standard deviation of 0.714, and the collaboration for co-funding of the project was done nationally through world bank and locally through commercial loans with a mean of 4.63 and standard deviation of 0.672.

This indicates that collaboration for project funding in both local, national, and international levels enables for effective utilization of the funds as echoed by Muhia (2015). In addition, collaboration for co-funding of the project both local, national and international level influences positively the sustainability of water and sanitation projects. According to Trémolet et al. (2010), in financing of the project through collaboration allows for continuity of the project once donor funding is withdrawn enabling sustainability of sanitation projects.

4.7.4 Collaboration and Networking for Integration of Projects in Same Location

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in a Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are tabulated in **Table 4.20**.

Table 4.20: Collaboration and Networking for Integration of Projects in the Same Location

Statement	Frequency	Std. Deviation
Through networking and collaboration, there was integration of projects in the same geographical location	3.98	0.774
Networking and collaboration for the project integration enabled reduction of project cost	3.88	0.702
Networking and collaboration for projects integration necessitated growth of the individual low-income settlement	3.81	0.805

As indicated in Table 4.20, the respondents agreed that there was integration of projects in the same geographical location with a mean of 3.98 and a standard deviation of 3.88, and the project integration enabled reduction of project cost with a mean of 3.88 and standard deviation of 0.702. In addition, the respondents agreed that networking and collaboration for project integration necessitated growth rate of the individuals in the low-income settlement. This gave an indication that integration of projects in the same geographical location allows for better understanding on complexity of uncertainties for environmental, social, and economic aspects thus allowing for sustainability (Larsson & Larsson, 2019)

4.7.5 Triangulation of Quantitative and Qualitative data analysis on Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

From the focus group discussions with the project beneficiaries, the respondents confirmed that,

"We were collaborated on the project matters, and this provided a platform of putting across matters arising and other unforeseen uncertainties regarding the project".

From the triangulation of both the quantitative and qualitative findings, it can be deduced that collaboration in projects allows for multiple benefits from the project outcome under changing environment as echoed by (Trémolet et al., 2010).

4.6.6 Correlation of Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the relationship of collaboration and networking design orientation and sustainability of water and sanitation projects using Spearman Rank order Correlation method. The results are as shown in **Table 4.21**

Table 4.21 : Correlation of Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

	Sustainability of water and sanitation projects	Collaboration and networking design orientation
Sustainability of water and sanitation projects (r)	1.000	
(p) Sig.(2-tailed)	.	
Collaboration and networking design orientation (r)	0.678**	1.000
(p) Sig.(2-tailed)	0.004	.

**=Significant variable at 5% confidence level

As illustrated in Table 4.21, there is a positive and significant relationship between collaboration and networking design orientation and sustainability of water and sanitation projects with a magnitude of (r= 0.678, P< 0.004) at confidence level of 5%.

This gives an indication that the study hypothesis, H_{03} on collaboration and networking design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company is rejected as the P value is less than 5% level of significant.

4.8 Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the influence of monitoring and evaluation design orientations on sustainability of water and sanitation output-based aid project by NCWSC based on indicators of; Integration of M& E practices in the project, Allocation of finances for M&E, Availability of M & E personnel, and Co-ordination and schedules for M& E activities. Details is as shown below.

4.8.1 Integration of M & E Practices in the Project

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from

Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.22**.

Table 4.22: Integration of M & E Practices in the Project

Statement	Frequency	Std. Deviation
Monitoring and evaluation practices were embedded in the project document	4.31	0.680
Monitoring and evaluation activities were executed in all the stages of the project	3.87	0.738

As indicated in Table 4.22, the respondents agreed that the practices were embedded in the project document with a mean of 4.31 and standard deviation of 0.680, and the activities were executed in all the stages of the project with a mean of 3.87 and standard deviation of 0.738. The findings give an indication that, for any of the activity to be executed in the project, it ought to be embedded in the project document so as to be executed as required.

From the findings, there ought to be integration of M & E practices in the project by first embedding in the project document with execution at all the stages of project cycle. As echoed by Ndubi et al. (2018), monitoring at all stages of project enhances transparency and accountability thus allowing for sustainability of water and sanitation projects. In addition, adherence to M &E schedule, allows for continuous tracking inputs, processes and outputs against set targets thus providing the project manager with know-how on implementation status (Mugo et al., 2016).

4.8.2 Allocation of Finances for M & E Activities

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.23**.

Table 4.23: Allocation of Finances for M & E Activities

Statement	Frequency	Std. Deviation
Finances were allocated from the project budget for monitoring and evaluation practices	4.00	0.645
The allocated finances were adequate for monitoring and evaluation activities throughout the project cycle	3.70	0.857

As shown in Table 4.23, the respondents agreed that the finances were allocated from the project budget with a mean of 4.00 and standard deviation of 0.645, and the finances were adequate for M& E activities throughout the project cycle with a mean of 3.70 and standard deviation of 0.857. The findings gave a clear picture that the finances for M& E activities should be allocated from the project budget based on the principles of budgeting as echoed by Trémolet et al. (2010).

4.8.3 Availability of M & E Personnel

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.24**.

Table 4.24: Availability of M & E Personnel

Statement	Frequency	Std. Deviation
The personnel for monitoring and evaluation were externally outsourced	4.47	0.758
Monitoring and evaluation personnel had knowledge and skills required for the execution of M & E activities	3.97	0.754

As shown in Table 4.24, the respondents agreed that the personnel were externally outsourced with a mean of 4.47 and a standard deviation of 0.758, and the personnel had knowledge and skills required for execution of M & E activities with a mean of 3.97 and standard deviation of 0.754. The findings give indication that based on the organization's

capabilities, outsourcing of personnel allows for execution of duties based on the expertise in a given field as echoed by Deroo et al. (2015). In addition, the personnel for monitoring and evaluation activities ought to have necessary knowledge and skills necessary for executing the tasks as this allows for effectiveness and efficiency in project quality thus enhancing sustainability of water and sanitation projects (Deroo et al., 2015).

4.8.4 Co-ordination and Schedules for M & E Activities

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed in Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.25**.

Table 4.25: Co-ordination and Schedules for M & E Activities

Statement	Frequency	Std. Deviation
Monitoring and evaluation activities were coordinated by the project manager	4.13	0.738
Monitoring and evaluation activities were implemented as scheduled	3.50	1.026
There was adequate time allocated for monitoring and evaluation activities	3.53	1.098
Monitoring and evaluation activities were uniform in all the 12 number low-income settlements of Nairobi	3.70	1.135

As shown in Table 4.25, the respondents agreed that the project manager coordinated the activities with a mean of 4.13 and a standard deviation of 0.738. In addition, the M & E activities were uniform in all the 12 number low-income settlements with a mean of 3.70 and a standard deviation of 1.135 and were implemented as scheduled with a mean of 3.50 and standard deviation of 1.026. The findings suggest that despite of coordination of the M& E activities by the project manager, implementation may not be as scheduled due to the unforeseen uncertainties. Thus, it is prudent to carry ought risk analysis and develop mitigation strategies to allow for progressing of the project activities (Irfan & Hassan, 2019).

4.8.5 Triangulation of Quantitative and Qualitative data analysis on Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

From the focus group discussions, the respondents confirmed that,

"We were involved in assessing project progress and incase of any failure or malfunctioning of the project output, we report to NCWSC and are able to get assistance".

Triangulation of both the qualitative and quantitative responses gave a clear indication that monitoring and evaluation has a positive influence on sustainability of water and sanitation projects as echoed by (Deroo et al., 2015).

4.8.6 Correlation of Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

The study sought to establish the relationship of monitoring and evaluation design orientation and sustainability of water and sanitation projects using Spearman Rank order Correlation method. The results are as shown in **Table 4.26**

Table 4.26: Correlation of Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

	Sustainability of water and sanitation projects	Monitoring and evaluation design orientation
Sustainability of water and sanitation projects (r)	1.000	
(p) Sig.(2-tailed)	.	
Monitoring and evaluation design orientation (r)	0.715**	1.000
(p) Sig.(2-tailed)	0.000	.

**=Significant variable at 5% confidence level

As illustrated in Table 4.26, there is a positive and significant relationship between monitoring and evaluation design orientation and sustainability of water and sanitation projects with a magnitude of ($r= 0.715$, $P< 0.000$) at confidence level of 5%.

This gives an indication that the study hypothesis, H_{04} on monitoring and evaluation design orientation does not significantly influence sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company is rejected as the P value is less than 5% level of significant.

4.9 Sustainability of Water and Sanitation Projects

The study sought to establish sustainability of water and sanitation output-based aid project by NCWSC based on indicators of; Functionality, Quality, Affordability., Accessibility, and Reliability of the project output. Below are the details of each indicator.

4.9.1 Functionality of the Project Output

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed on Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.27** .

Table 4.27 : Functionality of the Project Output

Statement	Frequency	Std. Deviation
All the water and sewer connections are functional at a given time	3.55	1.024
There is adherence to maintenance schedule for the project facilities	3.66	0.821

As shown in Table 4.27, the respondents agreed that there is adherence to maintenance schedule for all the project facilities with a mean of 3.66 and standard deviation of 0.821, and all the water and sewer connections are functional at a given time with a mean of 3.55 and standard deviation of 1.024. This gives an indication that for any project to be sustainable, functionality is a vital element of consideration. The findings agree with the study by Nabifwo and Kimutai (2018), that in order to attain sustainability of water and sanitation projects, the projects output ought to be functional.

4.9.2 Quality of the Project Output

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed on Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.28** .

Table 4.28: Quality of the Project Output

Statement	Frequency	Std. Deviation
The water and sewer connections met the required standards by the regulation authorities	3.94	0.866
In all the 12 number low-income settlements, similar quality of the connections for both water and sewers was maintained	3.76	1.066

As indicated in Table 4.28, the respondents agreed that the water and sewer connections met the required standards by the regulation authorities with a mean of 3.94 and a standard deviation of 0.866. In addition, the respondents also agreed that similar quality of water and sewer connections was maintained in all the 12 number low-income settlements with a mean of 3.76 and a standard deviation of 1.066. From the findings, it is clear that the quality of the project based on a specific standard allows for project sustainability. As echoed by Silvius and Schipper (2014), the quality of project output allows for use as it meets the required standards , hence sustainability is attainable.

4.9.3 Accessibility and Affordability of the Project Output

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed on Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.29** .

Table 4.29: Accessibility and Affordability of the Project Output

Statement	Frequency	Std. Deviation
The charges for water and sewerage are affordable	3.71	0.808
The payment facilities are available and accessible in all the 12 number low-income settlements	3.99	0.907
The water and sewer connection points are accessible to the communities	4.15	0.669

As shown in Table 4.29, the respondents agreed that the water and sewer connections were accessible to the communities with a mean of 4.15 and standard deviation of 0.669, and the payment facilities are available and accessible in all the 12 number low-income settlements with a mean of 3.99 and standard deviation of 0.907. In addition, the water and sewerage charges are affordable with a mean of 3.71 and a standard deviation of 0.808. This gives a clear indication that for projects to be sustainable, they ought to be accessible and affordable to the project beneficiaries as echoed by (Trémolet et al., 2010).

4.9.4 Reliability and Economic Gain of the Project Output

The respondents had been asked to respond the extent at which they agree with the below statements. The responses had been placed on Five-point Likert scale ranging from Strongly Agree (5); Agree (4) Neutral (3); Disagree (2) and Strongly Disagree (1). Findings are as shown in **Table 4.30.**

Table 4.30: Reliability and Economic Gain of the Project Output

Statement	Frequency	Std. Deviation
The organization's revenue collection has increased from low-income settlement areas due to implementation of water and sanitation project	4.33	0.696
There is minimal breakdowns of water and sewer connections	3.58	0.754
There is minimal downtime of both water and sewer connections before repair	3.60	0.821

As indicated in Table 4.30, the respondents agreed that the organizations' revenue collection has increased from low-income settlement areas due to implementation of water and sanitation project with a mean of 4.33 and a standard deviation of 0.696. This is a clear indication that there has been a mutual benefit from both the implementer and the project beneficiaries thus enabling sustainability. In addition, the respondents agreed that there are minimal breakdowns of water and sewer connections with a mean of 3.58 and a standard deviation of 0.754, and minimal downtime for any connection with a mean of 3.60 and standard deviation of 0.821. From the findings, it can be deducted that for any project to be deemed sustainable, reliability is an aspect of consideration based on United Nations (2016) report.

4.9.5 Triangulation of Quantitative and Qualitative data analysis on Sustainability of Water and Sanitation Projects

From the focus group discussions with the project beneficiaries, the respondents confirmed that,

"Though the project facilities are not always operational, in case of any failure or malfunctioning, we always get fast assistance in repairs from NCWSC. Besides, the services are affordable, and no one forces us to pay as we read the meters and post readings in the application from our mobile phones, on receiving bills we pay via Mpesa".

Based on the respondents from both the project implementers and project beneficiaries, it can be deduced that the water and sanitation output-based aid project is sustainable based on indicators of functionality, quality, affordability, accessibility, and reliability (United Nations, 2016).

4.10 Regression Analysis

The regression model was applied to predict the dependent variable (sustainability of the project) when independent variables (technological design orientation, community participation design orientation, network, and collaboration design orientation, and

monitoring & evaluation design orientation) change. The regression model is as shown by the equation below;

evaluation design orientation change is given by;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where; Y = sustainability of Water and Sanitation Projects; β_0=consant or intercept of the regression line; $\beta_1, \beta_2, \beta_3$ and β_4 represent the regression coefficients for predictor variables; X_1=Technological design orientation; X_2= Community participation design orientation; X_3=Collaboration and networking design orientation; X_4= Monitoring and evaluation design orientation; and ε = Error term.

The results were as presented in **Table 4.31**

Table 4.31: Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig
(Constant)	-0.065	0.289		-0.226	0.822
Technological Design Orientation	0.269	0.082	0.249	3.291	0.001
Community Participation Design Orientation	0.164	0.103	0.150	1.588	0.115
Collaboration and networking Design Orientation	0.151	0.117	0.125	1.284	0.201
Monitoring and Evaluation Design Orientation	0.400	0.105	0.385	3.809	0.000

From Table 4.31 shows that on consideration of the independent variables i.e technological design orientation, community participation design orientation, collaboration and networking design orientation, and monitoring and evaluation design orientation being at zero constant, the sustainability of water and sanitation projects will be -0.65. A negative

constant implies that the expected value of the dependent variable shall be less than 0 when the independent variables are set to 0 as echoed by Mugenda and Mugenda (2003).

The findings also indicate that considering other independent variables at zero, a unit increase in technological design orientation will lead to 0.269 unit increase in sustainability of water and sanitation projects, while a unit increase in community participation design orientation considering all other variables zero will lead to 0.164 unit increase in sustainability of water and sanitation projects. In addition, a unit increase collaboration and networking design orientation will result to 0.151 unit increase in sustainability of water and sanitation project when all other independent variables are constant; and unit increase in monitoring and evaluation design orientation, will result to 0.4 unit increase in sustainability of water and sanitation projects.

From Table 4.18 the regression model becomes;

$$Y = -0.065 + 0.269X_1 + 0.164X_2 + 0.151X_3 + 0.4X_4$$

The standard error of estimate ε is assumed to be negligible i.e $\varepsilon = 0$

From the findings, the magnitude of coefficients of independent variables denotes the strength of influence to the dependent variable as echoed by Taber (2018). Thus, monitoring and evaluation design orientation has a high influence on sustainability of water and sanitation projects with a coefficient of 0.4 while collaboration and networking design orientation has the least influence on sustainability of water and sanitation projects with a coefficient of 0.151.

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter covers summary of the findings, conclusions, and recommendations of the study. The findings are summarized in compliance with the study objectives that include the influence of technological design orientation, community participation design orientation, collaboration, and networking design orientation, and monitoring and evaluation design orientation on sustainability of water and sanitation projects.

5.2 Summary of Findings

A total of 160 questionnaires were delivered to the respondents of NCWSC from which 131 responses were obtained giving a response rate of 81.9 %. From the demographic data obtained, 59.5% were male while 40.5 % were female. The age of majority (27.5%) was between 30-34 years and on duration of working experience in NCWSC, majority (49%) of the respondents were between 6-9 years. In addition, on the highest level of education, 45.8% have diploma level while the rest have masters degree, degree, and certificate level.

From the focus group done on the project beneficiaries, there was good response rate from the 12 number low income settlements with each group having an average of 7 respondents.

Hence, the response rate from both the questionnaire and focus group respondents was good based on study by (Cooper & Schindler, 2013).

5.2.1 Technological Design Orientation and Sustainability of Water and Sanitation Projects

Based on the indicators of technological design orientation, that entail sewer and water design technology, information communication technology, billing system technology and

payment technology, the respondents agreed on the statements from the Five-point Likert scale with a mean ranging from 3.83 - 4.37. In addition, majority of the respondents' opinion was that the technological design orientations influence the sustainability of water and sanitation projects to a great extent with a frequency of 88 and a percentage of 67.2%.

From the focus group discussions, the respondents confirmed that they were trained on the use of "Jisomee" technology for billing and payment of water and sewer charges.

From the triangulation of both the quantitative and qualitative data analysis, it can be deduced that use of technology in water and sanitation projects in designing, information communication technology, billing and payment system is a vital aspect in enhancing sustainability (Ndubi et al., 2018).

On inferential analysis, the study established a positive and significant relationship between sustainability of water and sanitation projects, and technological design orientation with a magnitude of 0.636 with a p-value of 0.000 ($(r=0.636, p<0.05)$ at a confidence level of 0.05. In addition, on predicting the dependent variable, the findings established that, when other independent variables are at zero, a unit increase in technological design orientation will lead to 0.269 unit increase in sustainability of water and sanitation projects.

5.2.2 Community Participation Design Orientation and Sustainability of Water and Sanitation Projects

Based on the indicators of community participation design orientation, that entail a level of community involvement in project decision making, level of community representation and responsibilities given, level of training and capacity building to the community, and level of contribution by the community, the respondents agreed on the statements from the Five-point Likert scale with a mean ranging from 3.46 - 4.39. In addition, majority of the respondents' opinion was that the community participation design orientations influence the sustainability of water and sanitation projects to great extent with a frequency of 69 and a percentage of 52.7 %.

On the other hand, from the focus group discussions, the respondents agreed that they were involved throughout the project on decision making, labour provision and in progress and final completion meetings.

From the triangulation of both the quantitative and qualitative findings, it can be deduced that community participation design orientation through involvement in decision making, representation and responsibilities given, contribution of labour and funds, and training and capacity building allows for a sense of ownership and belonging thus enhancing sustainability (Alelah & Mueke, 2017).

On inferential analysis, the findings revealed that there was a significant positive relationship between community participation design orientation and sustainability of water and sanitation projects ($r=0.690$, $p<0.05$) at 0.05 confidence level. In addition, on predicting the dependent variable, the findings established that, when other independent variables are at zero, a unit increase in community participation design orientation will lead to 0.164 unit increase in sustainability of water and sanitation projects.

5.2.3 Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

From the collaboration and networking design orientation indicators, that entail partners involved in the collaboration, collaboration and networking for technical assistance, collaboration in co-funding of the project, and collaboration and networking for integration of projects in the same location, the respondents agreed on the statements from the Five-point Likert scale with a mean ranging from 3.49 – 4.63. In addition, majority of the respondents' opinion was that collaboration and networking design orientations influence the sustainability of water and sanitation projects to a great extent with a frequency of 70 and a percentage of 53.4 %.

From the focus group discussions with the project beneficiaries, the respondents confirmed

that they were collaborated on project matters, which in turn provided a platform for putting across matters arising and any unforeseen uncertainties regarding the project.

From the triangulation of both the quantitative and qualitative findings, it can be deduced that collaboration in projects allows for multiple benefits from the project outcome under changing environment as echoed by (Trémolet et al., 2010).

On inferential analysis, the study established a positive and significant relationship between sustainability of water and sanitation projects, and collaboration and networking design orientation with a magnitude of 0.678 with p-value of 0.004 ($r=0.678$, $p<0.05$) at a confidence level of 0.05. In addition, on predicting the dependent variable, the findings established that, when other independent variables are at zero, a unit increase in collaboration and networking design orientation will lead to 0.151 unit increase in sustainability of water and sanitation projects.

5.2.4 Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

Based on the monitoring and evaluation design orientation indicators, that entail integration of M & E practices in the project, allocation of finances for M & E, availability of M & E personnel, and co-ordination and schedules for M & E activities, the respondents agreed on the statements from the Five-point Likert scale with a mean ranging from 3.50 – 4.47. In addition, majority of the respondents' opinion was that M & E design orientations influence the sustainability of water and sanitation projects to a great extent with a frequency of 53 and a percentage of 40.5 %.

From the focus group discussions, the respondents confirmed that they were involved in assessing project progress. Thus, in case of any failure or malfunctioning of the project output, they report to NCWSC and are able to get assistance.

Triangulation of both the qualitative and quantitative responses gave a clear indication that M & E design orientation has a positive influence on sustainability of water and sanitation Output-based aid project .

On inferential analysis, the study established a positive and significant relationship between sustainability of water and sanitation projects, and monitoring and evaluation design orientation with a magnitude of 0.715 with a p-value of 0.000 ($r=0.715$, $p<0.05$) at a confidence level of 0.05. In addition, on predicting the dependent variable, the findings established that, when other independent variables are at zero, a unit increase in monitoring and evaluation design orientation will lead to 0.4 unit increase in sustainability of water and sanitation projects.

5.3 Conclusion

From the research, it can be concluded that technological design orientation had a significant and positive influence on sustainability of water and sanitation projects. This was achieved based on the following; There was use of modern water and sewer connection design technology, use of information communication systems in reporting, modern billing and payment technology was being utilized for both charging and payment of water and sewerage bills, and finally, training of the technology in use was done for both implementers and beneficiaries.

On the second objective, from the research findings, community participation design orientation had a positive and significant influence on sustainability of water and sanitation projects. This was attained based on; Community involvement in decision making; Community representation and responsibilities given; Community contribution through labour provision and co-funding of the project; and Training done to the community on operation and management of the project.

On the third objective regarding the influence of collaboration and networking design orientation on sustainability of water and sanitation projects, it was established a positive and significance influence based on; Nature of partners in collaboration; Technical

assistance offered through collaboration and networking; Co-funding of projects and Integration of the projects in the same geographical location.

Finally, on the fourth objective, it was established that monitoring and evaluation design orientation influenced sustainability of water and sanitation projects positively and significantly based on the indicators such as; Integration of M& E practices in the project; Allocation of finances for M &E practices; Availability of personnel for M & E; and Coordination and scheduling of M & E activities.

5.4 Recommendations

Based on the study findings, it is recommended that;

1. In project designing, under changing environment based on the customer demand and new regulations, consideration ought to be made on the use of modern technologies that are user friendly to both the implementers and project beneficiaries, and are compatible with other existing systems for water and sanitation projects to allow for sustainability.

2. Community should be involved at all the stages of the project cycle from project initiation, planning, implementation, and monitoring of water and sanitation projects. This creates a sense of belonging and ownership in the projects while tapping from the local expertise enabling sustainability of the projects.

3. In designing for collaboration and networking, both local, national and international partners ought to be considered for their contributions on funding, technical expertise, and integration of projects to allow for sustainability of water and sanitation projects based on clear guidelines on the duration and depth of involvement.

4. In designing for monitoring and evaluation for water and sanitation projects, there ought to be allocation of finances for M & E activities from the project budget and available personnel who have knowledge and expertise to execute the M& E

activities and adherence to M & E schedules at all the project stages to minimize any faults that can hinder the sustainability of projects.

5.5 Suggestions for Further Studies

Further studies should be done on the influence of Project Design Orientations on sustainability of water and sanitation projects in other regions in Kenya, to make a comparison for any consistency.

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APPENDICES

APPENDIX 1: TRANSMITTAL LETTER

Lydia N. Munene,
P.O Box 51431 - 00100,
Nairobi.

Dear Respondent,

RE: ACADEMIC RESEARCH

I am a student at the University of Nairobi currently undertaking a research study to fulfill the requirements for the award of the degree of Master of Arts in Project Planning and Management on " Influence of Project Design Orientations on Sustainability of Water and Sanitation Output-based Aid Project by Nairobi City Water & Sewerage Company" to gather information relating to the influence of sustainability of water and sanitation projects.

I humbly request that you fill the attached questionnaire. Kindly answer all questions as completely, correctly, and honestly as possible. Your response will be treated with the utmost confidentiality and will only be used for academic purposes.

Thank you in advance for your co-operation.

Yours sincerely,

Lydia Munene

APPENDIX 2: RESEARCH QUESTIONNAIRE

Instructions

Please complete this questionnaire as honestly and objectively as possible. Tick your options in the appropriate box and fill in the blank spaces provided for questions where elaborate answers are required. Please use the space at the back of this questionnaire if you need more space for your responses. The responses you give will be treated with the utmost confidentiality.

Section A: Respondent's Biodata

1. Gender Male ☐ Female ☐

2. Age

Below 24 years ☐ 25-29 Years ☐ 30-34 years ☐
35-39 Years ☐ 40-44 Years ☐ Over 44 Years ☐

3. What is your education level (state the highest level)?

Certificate ☐ Diploma ☐ Bachelor's Degree ☐
Master's Degree ☐ Other (Specify) ☐ _____

4. Working experience in Nairobi Water & Sewerage Company (NCWSC)?

Less than 2 years ☐ 2-5 years ☐ 6-9 years ☐
Over 10 years ☐

Section B: Technological Design Orientation and Sustainability of Water and Sanitation Projects

5. Below are statements on influence of technological design orientation on sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company. Please indicate the degree to which you agree with the statements using the scale: Strongly Agree (5); Agree (4); Neutral (3); Disagree (2) and Strongly Disagree (1)

Statement	**5**	**4**	**3**	**2**	**1**
The choice of designs for water and sewer connections was based on modern technology					
Similar connection design technology was applied to all the 12 number low-income settlements in Nairobi					
Project team embraced use the of information systems for communication and reporting of the project progress					
Use of information communication systems enhanced accountability throughout the project cycle					
The project employed modern billing system for charging use of water and sewer services					
The billing system in place is compatible with other systems for reporting and payment					
Payment technology for sewer and water connection was made available to the project beneficiaries					
Uniform payment technology was applied in all the 12 number low-income settlements in Nairobi					
Payment technology applied was customized to fit the users in the 12 number low-income settlements in Nairobi					
The project beneficiaries were trained on the application payment technology					

Section C: Community Participation Design Orientation and Sustainability of Water and Sanitation projects

6. The following statements relate to influence of community participation design orientation on sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company. Please indicate your level of agreement with the statements in relation to the project, using the scale: Strongly Agree (5); Agree (4); Neutral (3); Disagree (2) and Strongly Disagree (1)

Statement	**5**	**4**	**3**	**2**	**1**
The communities were involved in selecting the designs of water and sewer connections					
The communities were involved in selecting location points for water and sewer connections					
The communities were represented in the project progress meetings					
The communities were given responsibilities during project implementation					
The communities contributed part of labour in project implementation					
Part of funds for operation and maintenance of the project were contributed by the communities through water and sewer charges					
NCWSC gave training to the communities on how to operate and manage the project					
All the communities from the 12 no. informal settlements were represented during the training period					

Section D: Collaboration and Networking Design Orientation and Sustainability of Water and Sanitation Projects

7. The following statements relate to influence of collaboration and networking design orientation on sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company. Please indicate your level of agreement with the statements in relation to the project, using the scale: Strongly Agree (5); Agree (4); Neutral (3); Disagree (2) and Strongly Disagree (1)

Statement	**5**	**4**	**3**	**2**	**1**
The collaborated partners were from local, national and international levels					
The partners in collaboration were involved in all the stages of project cycle					
Collaboration and networking was done for technical assistance prior to project implementation					
Technical assistance offered through collaboration and networking was for all fields of the project					
Benchmarking tool was applied for enhancing technical assistance in collaboration and networking					
There was collaboration in co-funding of the project					
The collaboration for co-funding for the project was done nationally through world bank and locally through commercial loans					
Through networking and collaboration, there was integration of projects in the same geographical location					
Networking and collaboration for the project integration enabled reduction of project cost					
Networking and collaboration for projects integration necessitated growth of the individual low-income settlement					

Section E: Monitoring and Evaluation Design Orientation and Sustainability of Water and Sanitation Projects

8. The following statements relate to monitoring and evaluation design orientation on sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company. Please indicate your level of agreement with the statements in relation to the project, using the scale: Strongly Agree (5); Agree (4); Neutral (3); Disagree (2) and Strongly Disagree (1)

Statement	**5**	**4**	**3**	**2**	**1**
Monitoring and evaluation practices were embedded in the project document					
Monitoring and evaluation activities were executed in all the stages of the project					
Finances were allocated from the project budget for monitoring and evaluation practices					
The allocated finances were adequate for monitoring and evaluation activities throughout the project cycle					
The personnel for monitoring and evaluation were externally outsourced					
Monitoring and evaluation personnel had knowledge and skills required for execution of M & E activities					
Monitoring and evaluation activities were coordinated by the project manager					
Monitoring and evaluation activities were implemented as scheduled					
There was adequate time allocated for monitoring and evaluation activities					
Monitoring and evaluation activities were uniform in all the 12 number low-income settlements of Nairobi					

Section F: Sustainability of Water and Sanitation Projects

9. The following statements relate to sustainability of water and sanitation output-based aid project by Nairobi City Water & Sewerage Company. Please indicate your level of agreement with the statements in relation to the project, using the scale: Strongly Agree (5); Agree (4); Neutral (3); Disagree (2) and Strongly Disagree (1)

Statement	**5**	**4**	**3**	**2**	**1**
The project goals/ objectives were met as scheduled					
The processes of the project implementation were done effectively and efficiently					
Concluded project outputs met the required standards by the regulation authorities					
In all the 12 number low-income settlements, similar quality of the project outputs was maintained					
The charges for water and sewerage are affordable					
The payment facilities are available and accessible in all the 12 number low-income settlements					
The project outputs ensured maintenance of the environmental stability					
The project improved health standards of living in the low-income settlements					
The organization's revenue collection has increased from low-income settlement areas due to implementation of the sanitation project					
There is adherence to operation and maintenance schedule for the project facilities					

APPENDIX 3: KEY INFORMANT FOCUS GROUP GUIDE

1. How did technological design orientation influence sustainability of water and sanitation output-based aid project for low-income settlements in Nairobi?

2. How did community participation design orientation influence sustainability of water and sanitation output-based aid project for low-income settlements in Nairobi?
3. How did collaboration and networking design orientation influence sustainability of water and sanitation output-based aid project for low-income settlements in Nairobi?

4. How did monitoring and evaluation design orientation influence sustainability of water and sanitation output-based aid project for low-income settlements in Nairobi?

5. Is the Water and Sanitation Output-Based Project by NCWSC is sustainable or not based on functionality, affordability, quality, reliability and accessibility of the project output?

APPENDIX 4: INTRODUCTORY LETTER

UNIVERSITY OF NAIROBI

OPEN, DISTANCE AND e-LEARNING CAMPUS
SCHOOL OF OPEN AND DISTANCE LEARNING
DEPARTMENT OF OPEN LEARNING
NAIROBI LEARNING CENTRE

Your Ref:

Our Ref:

Telephone: 318262 Ext. 120

REF: UON/OdeL/NLC/31/159

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
NAIROBI

3rd June, 2020

TO WHOM IT MAY CONCERN

RE: LYDIA MUNENE - REG.NO. L50/85451/2016

The above named is a student at the University of Nairobi, Open Distance and eLearning Campus, School of Open and Distance Learning, Department of Open Learning pursuing a Masters course in Project Planning and Management.

She is proceeding for research entitled "*Influence of Project Design Orientations on Sustainability of Water and Sanitation Output-Based Aid Project by Nairobi City Water & Sewerage Company*"

Any assistance accorded to her will be appreciated.

UNIVERSITY OF NAIROBI ODEL CAMPUS
P.O. Box 30197,
NAIROBI
NAIROBI LEARNING CENTRE

CAREN AWI
CENTRE ORGANIZER
NAIROBI LEARNING CENTRE

APPENDIX 5: RESEARCH CLEARANCE PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 857513

Date of Issue: 15/June/2020

RESEARCH LICENSE

This is to Certify that Ms.. Lydia Nduku Munene of University of Nairobi, has been licensed to conduct research in Nairobi on the topic: Influence of Project Design Orientations on Sustainability of Water and Sanitation Output-Based Aid Projedt by Nairobi City Water & Sewerage Company for the period ending : 15/June/2021.

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APPENDIX 6: TURNITIN CERTIFICATE

INFLUENCE OF PROJECT DESIGN ORIENTATIONS ON SUSTAINABILITY OF WATER AND SANITATION OUTPUT-BASED AID PROJECT BY NAIROBI CITY WATER & SEWERAGE COMPANY, KENYA

ORIGINALITY REPORT

15%	5%	1%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	pdfs.semanticscholar.org Internet Source	2%
2	Submitted to Kenyatta University Student Paper	1%
3	Submitted to University of Nairobi Student Paper	1%
4	Submitted to KCA University Student Paper	1%
5	Submitted to City University Student Paper	1%
6	Submitted to Saint Paul University Student Paper	1%
7	Submitted to Mesa State College Student Paper	<1%
8	erepository.uonbi.ac.ke Internet Source	<1%