DETERMINANTS OF THE FINANCING GAP IN WATER SUPPLY AND SANITATION UTILITIES: A CASE OF RUVUMA REGION IN TANZANIA

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CERTIFICATION

The undersigned certifies that, she has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation entitled: **"Determinants of the Financing gap inWater Supply and Sanitation Utilities: A case of Ruvuma Region in Tanzania''**submitted in partial fulfilment of the requirements for the award of the degree of Master of Business Administration Finance (MBA).

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Dr. Janeth Isanzu

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Date

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DECLARATION

I, **Maswe Nyamhanga**, declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as originally mine. It is hereby presented in partial fulfilment of the requirement for the Degree of Master of Business Administration in Finance (MBA).

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Signature

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Date

DEDICATION

This dissertation is dedicated to my beloved parents, my mother Christine Nyamhanga and My father Nyamhanga Chacha whose endless support and encouragement have been the foundation of my academic achievements. The dissertation also is dedicated to my beloved family and wife Eliza Magoti, your sacrifices and unwavering belief in me have made this journey possible. Iam forever grateful for your love and guidance.

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ABSTRACT

Financing gap is one of the key challenge facing most the water supply and sanitation utilities in Tanzania and across the world to achieve the Sustaibanle Development Goal 6 *clean water and sanitation for all.* The study investigated the determinants of the financing gap in water supply and sanitation utilities. The specific objectives were; to asses the influence of operation and maintenance (O&M) costs in water pricing, determine the influence of financial sustainability of the water projects and influence of the terms and conditions of the repayable sources of finance on Financing gap in water supply and sanitation utilities. The study adopted an explanatory research design and quantitative approach to establish the relationship between the varibles under investigation. A sample data of 100 respondents wete used, data were collected by the means of questionnaires and analysed by descriptive statistics and inferential statistcs through Multiple Linear Regression Analysis (MLRA) technique. The findings showed that, operation and maintenance costs,financial sustainability of the water supply projects and the terms conditions of the repayable sources of finances influence positively the financing gap in water supply and sanitation utilities. The study concludes and recommends that, since the O&M costs, financial sustainability of water projects and terms and conditions of the repayable source of finance influence the financing gap, water utilities should have a clear and accurate undersatanding of their O&M costs to minimize the gap, water projects should be financially sustainable and water utilities should stabilize at first in terms of their internal revenue and changes their operating model before opting to repayable source of finance in their efforts of minimizing financing gap.

Keywords:*Financing gap ,operation and maintenance costs , Financial sustainability of and ,Repayable sources of finances*

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CapEx	Capital Expenditures
CapManEx	Capital Maintenance Expenditures
CoC	Cost of Capital
COVID 19	Corona Virus Disease of 2019
CRW	Conditions of repayable finances in water supply Utilities
ENGC	Energy Costs
EST	Establishment Costs
ExDS	Expenditure on Support
ExIS	Expenditure on Indirect Support
FCP	Full Cost Pricing
FGW	Financing Gap of in Water Supply Utilities
FSW	Financial Sustainability in water supply Utilities
HIs	Household Investments
GoT	Government of Tanzania
M	Mean Average
MDF	Maximizing Finance For Development
MDBSs	Multilateral Development Banks
MLRA	Multiple Linear Regression Analysis
MRA	Multiple Regression Analysis
NGOs	Non-Government Organizations
NRW	Non-Revenue Water

NDC	Number of Domestic Connections
ODA	Official Developments Assistances
OpEx	Operation Expenditures
O&M	Operation and Maintenance
OMW	Operation and Maintenance costs in water supply
REPE	Repairs and Maintenance Costs
RA	Regression Analysis
PCR	Percentage of Cost Recovered
PPP	Public Private Partnership
SFP	Strategic Financial Planning
SD	Standard Deviation
SDG	Sustainable Development Goal
TR	Tolerance Rate
UWSPs	Urban Water Service Providers
UN	United Nations
USA	United States
WASH	Water, Sanitation and Hygiene
VIF	Variance Inflation Factor
3Ts	Tariffs, Taxes and Transfers

CHAPTER ONE

INTRODUCTION

1.1 Chapter Overview

This chapter presents the reader with background of the financing gap in water supply and sanitation utilities and water sector in general.The chapter identify the problem of the financing gap, states objectives of the study,research questions,scope and organization of the study.

1.2 Background of the Study

The financing gap in the water sector, particularly water supply and sanitation utilities, is a multi-faceted issue that needs serious global attention. Access to safe and reliable water supply is essential for public health and economic development. However, many water supply and sanitation utilities around the world experience significant financing gaps that hinder their ability to provide adequate services. Historically, the financing of water utilities has been largely dependent on government funding and tariffs. However, increasing urbanization, climate change, and population growth have placed additional stress on water systems, necessitating innovative financing solutions. Research by Smit et al. (2019) indicates that traditional financing models are often inadequate, leading to deteriorating infrastructure and service delivery.

The 2030 Agenda for Sustainable Development, which was adopted by all United Nations (UN) member states in 2015, includes a goal specifically devoted to clean water and sanitation for all (SDG 6). The primary objective of these sectors is to

ensure universal access to safe, dependable, sustainable, and affordable water and waste water services. Despite the UN member states' efforts to promote sustainable development of the water supply and sanitation services, there are currently no financing efforts in the water sector, particularly in water and sanitation utilities, to close the financing gap (Machete & Marques, 2021).

According to Bastemeijer (2019), the capital financing requirement to meet SDG target 1 alone is three times the total financial commitment. In order to provide universal access to basic water, sanitation, and hygiene services between 2015 and 2030, the World Bank calculated that it would cost an average of $28.4 billion per year, including $5.5 billion for urban water. Insofar as resources are directed toward the needs, they found this to be roughly consistent with the sector's present funding levels. It would cost an average of $86.9 billion annually (including $37.6 billion for urban water) to ensure that everyone has access to safely managed water and sanitation services. This is more than three times the amount currently spent. According to other estimates, the necessary yearly global operating and maintenance costs for sustainably managed water and sanitation will increase from $18.0 billion in 2015 to $128.8 billion annually (Libey et al., 2020).

In Tanzania the government (GoT) acknowledges that in order to meet its 2030 universal access to WASH targets, it will require around $1.2 billion per year. Only roughly $885 million of this is actually available. There is a large financial shortfall for this sector. In an effort to close the funding gap, the government is turning to non-traditional funding sources for the water industry, such as green bonds and commercial bank loans, which are repayable sources of funding subject to stringent

requirements. At the moment, some small water utilities find it challenging to secure funding for both new infrastructure development and rehabilitations (Origa et al., 2020).

Recent studies have identified various determinants contributing to the financing gap in water utilities. For example, Libey et al. (2020) and Smits et al. (2020) found that the failure of the water supply utilities to understand the nature of their costs in life cycle form (capital expenditures, operating and minor expenditures, capital maintenance expenditures, and other direct and direct costs) are the main determinants of the financing gap in the water utilities operations. Other scholars, such as Mahannty et al. (2020), examine the issue of the financing gap on the key variables such as the percentage of cost recovered (PCR), repairs and maintenance costs (REPR), establishment costs (ESTC), energy costs (ENGC), number of domestic connections (NDC), presence of industrial connections, and presence of commercial connections and connections per RS and NWR in India and found that, improving service delivery and reducing water energy costs to increase revenue can lower the funding gap.

Other studies have emphasized the efficiency of the water utilities to close the financing gap. For example, Hilbig and Rudolph (2020) found that the financing gap is due to the absence of sustainable financing and efficiency in water resources management. This finding looks similar to that of Christine et al. (2021) which revealed that water pricing, infrastructure financing, utility efficiency, and subsidies had a positive joint influence on financial sustainability, which later impacted the extent of the financing gap in water utilities.

According to Heidler et al. (2023), to minimize a wide funding gap, the water sector should conduct rigorous institution reforms that increase the water utility operating efficiencies rather than through increased commercialization and private sector participation. This view contradicts with that of Origa et al. (2020) who emphasized the presence of bankable projects and involvement of the private sector as determinants of the financing gap. Other literature, like Loftus et al. (2019) insisted on the financialization of the water service in water supply utilities and that water infrastructure should be transformed into financialization to enhance financial sustainability and close the gap.

There is no clarity on the variables driving the financing gap among these scholars. For example, due to the institutional framework of the water utilities in Tanzania, tracing costs in the form of life cycle costs to water utilities may be a challenge; likewise, the issue of financial sustainability of the water supply projects and the terms and conditions of the repayable source finance were not critically examined.

Finding out what causes the finance gap in Tanzania's Ruvuma region is the goal of this research dissertation. One of the most important steps in creating Tanzania-specific best practices is the investigation. By identifying obstacles, it will be possible to better focus both current and future funding sources on water infrastructure investment in the hopes of creating best practices and development plans tailored to Tanzania's water supply and sanitation utilities industry. The goal of the study is to improve knowledge of the primary elements that contribute to the financing gap in water infrastructure by reviewing the various works of literature.

For the goal of creating strategies to maintain water funding, sustainable water infrastructure investment necessitates the proper identification and analysis of the barriers to financing the sector. The study also intends to give government officials, the commercial sector, and any organizations or individuals working in Tanzania's water sector a thorough inventory of the main factors influencing the financing gap in water infrastructure. The study lays the groundwork for additional research on Tanzanian water infrastructure financing. Analysis of the efficacy of proposed barrier mitigation strategies depending on the barriers is a crucial subject that needs more research.

1.3 Statement of the Problem

Climate change, growing population demands, and poor infrastructure all contribute to the pressing worldwide water dilemma. There is a large funding gap that prevents water utilities from meeting the growing demand for safe and clean water, which limits their ability to deliver necessary services. Limited financial resources and ineffective managerial techniques frequently lead to less-than-ideal service delivery in developing nations, making this issue especially urgent.

The literature currently in publication indicates a lack of thorough knowledge of the factors that contribute to the finance gap, despite the vital role that water utilities play in both economic development and public health. Previous research has found a number of variables that contribute to this gap, such as ineffective pricing strategies and inefficient management of water resources (Hilbig and Rudolph, 2020; Christine et al., 2021). However, there remains a paucity of research that integrates these factors into a cohesive framework that can inform policy and practice.

Moreover, while some researchers, like Heidler et al. (2023), advocate for institutional reforms to enhance operational efficiencies, others, such as Origa et al. (2020), emphasize the need for private sector involvement and the development of bankable projects. This dichotomy highlights a critical gap in understanding the relative impact of these determinants and the pathways through which they influence financial sustainability in water utilities. The financing gap in water utilities not only impedes the provision of essential services but also exacerbates social inequalities, as marginalized communities often bear the brunt of inadequate access to clean water. Therefore, it is essential to identify and analyze the key determinants of this financing gap, taking into account the unique challenges faced by water utilities in different socio-economic contexts.

This research aims to fill using Full Cost Pricing theory the existing research gap by examining the interplay of various determinants, including operation and maintenance cost in water pricing, financial sustainability of the water supply projects and terms and conditions of the repayable source of finances infrastructure.

By doing so, this study seeks to contribute to the development of effective strategies for mitigating the financing gap in water utilities, ultimately enhancing service delivery and promoting equitable access to water resources. Furthermore, addressing the financing gap in water utilities is crucial for achieving sustainable development goals related to clean water and sanitation. This research will not only advance academic understanding but also provide actionable insights for policymakers and practitioners working to improve water utility operations and financial sustainability.

1.4. Objective of the Study

1.4.1 General Objective

This study sought to investigates the determinants to financing gap in water supply and sanitation utilities in Ruvuma region in Tanzania.

1.4.2 Specific research Objectives

i. To asses the influence of operation and maintenance (O&M) costs in water pricing on financing gap in water supply and sanitation utilities in Ruvuma region.

ii. To determine the influence of Financial Sustainability of the water Projects on financing gap in water supply and sanitation utilities in Ruvuma region.

iii. To assess the influence of conditions of the Repayable sources on Financing gap in water supply and sanitation utilities in Ruvuma region.

1.5 Reseach Questions

i. What is the influence of Operation and Maintenance Costs estimates in water pricing on Financing gap in water supply and sanitation Utilities in Ruvuma region?

ii. What is the influence of financial sustainability of the water projects on Financing gap in water supply and sanitation utilities in Ruvuma region?

iii. What are the influence of conditions of the repayable sources of finance on the Financing gap in water supply and sanitation utilities in Ruvuma region?

1.6 Significance of the Study

This research is significant as it aims to identify key factors contributing to the financing gap in water supply and sanitation utilities, using the Full Cost Pricing Theory to inform sustainable pricing practices. The findings provides valuable insights for policymakers, utility managers, and financial institutions to enhance funding mechanisms and sustainability of services in the Ruvuma Region.

1.7 Scope of the Study

The purpose of this research was to evaluate the factors that contribute to the financial gap in Tanzania's Ruvuma Region's water supply and sanitation utilities. The specific goals are to ascertain how the financial sustainability of water supply projects affects financing, evaluate how operation and maintenance costs in water pricing affect the funding gap, and to evaluate how the financing gap is impacted by the terms and circumstances of repayable sources of funding. The Full Cost Pricing Theory, which contends that prices ought to account for all operating, maintenance, capital, and environmental expenses associated with delivering a service, was applied in this study. This framework directed the examination of the relationship between price structures and the financing gap and provided guidance for suggestions on sustainable pricing practices in the area.

Ruvuma Region have three water supply utilities in charge of providing sanitation and water supply services, was the subject of the study. In order to examine trends in financing, pricing, and operating costs, the study examined data from the last five years. In order to reflect current changes in financial practices and policy that affect

water supply and sanitation utilities, this timeline was chosen. Key stakeholders, such as utility directors, managers, finance officials, and other senior officers of the water supply services in the Ruvuma Region, made up the target population. A thorough grasp of the elements affecting the finance gap was ensured by the diversity of stakeholders. Using a straightforward random sampling technique, a sample of 100 respondents was chosen to reflect various utility types and consumer demographics.

The study explored several key themes, including, Cost Recovery, analyzing how well utilities recover costs through pricing and the implications for financial sustainability. Financial Sustainability, Investigating the long-term viability of water supply projects and their dependence on effective pricing strategies and repayable finances examining the role of local and national policies in shaping pricing structures and financing options. A quantitative approach was be used with different questionnaires to gather data on pricing strategies, operational costs, and financing conditions. The study encountered limitations such as potential non-response from selected participants and challenges in obtaining accurate financial data from utilities. These limitations were acknowledged and discussed in the analysis. Ethical approval was be sought, and informed consent obtained from all participants. Confidentiality and anonymity was maintained throughout the research process.

1.8 Organization of the Study

The study has been organised into five chapters. Chapter one is an introduction Chapter Two covers a literature review where theoretical literature review, empirical

literature review, and their summaries in tabular form, as well as a research gap have been discussed. Chapter three of the study is on research methodology. Under this chapter, a study researcher introduces research philosophies, study approaches and design, study strategies, and choice methods. Chapter four is the Findings and Discussions of the Study. Chapter Five is the Summary, Conclusion, and Recommendations of the Study. Under this chapter, the researcher summarises the key the implications of the study, draws an overall conclusion, provides recommendations for the study, and suggests areas for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Chapter Overview

This chapter presents the definition of key concepts of the study, introduces the theoretical framework of the study, reviews the empirical literature of various scholarly works on each variable, summarizes, synthesizes, and evaluates previous related studies, and identifies research gaps. The chapter ends with the conceptual framework of the study and the operationalization of the variables under the conceptual framework.

2.2 Definition of Key Terms

2.2.1. The Financing Gap

Different scholars have defined the concept of the financing gap. Anderson et al. (2020) in their study, viewed the concept as the situation where various enterprises in an economy face difficulty in obtaining financing from various sources. Other scholars, such as Fay et al. (2021), interpreted the concept as the situation where the required investment needs in an infrastructure are higher than the current rates of investment or spending. The financing gap implies the difference between the investment level needed to achieve the Sustainable Development Goals and the current actual level of investments in the global water services sector (McCoy & Schwartz, 2023).

2.2.2 Operation and Maintenance Costs

The concept of operation and maintenance costs (O&M costs) has different

connotations for different scholars. Literature has viewed the concept of O&M costs as all costs associated with the activities necessary to deliver the services and keep the system in proper condition. Operation entails activities such as daily monitoring of the state of the system, its running, and its policies and running, while maintenance refers to condition assessment, servicing repairs, and even the replacement of some system components. O&M cost recovery is one of the big challenges to the financial sustainability of water supply services (Mohanty & Rout, 2022). The concept also refers to various cost components (monetary and non-monetary) such as electrical power, salaries, materials like water meters, pipes and fittings, chemicals, taxes, depreciation, and other expenses associated with the extraction of water from the sources and transportation to the consumers (Kapanski et al., 2020).

Other researchers, like Chaitkin et al. (2022), viewed O&M costs as the recurrent costs required to provide basic water, sanitation, and hygiene services. O&M costs are also interpreted from operation and maintenance funds (O&M funds) and tariffs charged to water customers. O&M costs are one of the components of the components of the water supply cost, which determines the tariff charged (water price) to provide sufficient O&M funds for the running of the water utility. Tariff is the water price set for cost recovery, sufficient revenue generation, equity, and sustainability, while the O&M fund is the fund generated from the water sold by the operator, which is expected to be the maximum of O&M costs (Muldianto et al., 2020).

2.2.3 Financial Sustainability of Water Supply Projects

Hilbig and Rudolph (2021) defined the concept of sustainable finance of water supply projects as the funding of priority investment projects with lasting impact without rendering more sunk costs, while Julius and Okech (2021), in their study of the joint influence of water pricing, infrastructure financing, utility efficiency, and subsidies on financial sustainability on water service providers in Kenya, viewed the concept of financial sustainability as the ability of the water utility to attain a full cost recovery and revenue stability having adopted an optimal water pricing mechanism. Other literature has defined the concept of sustainability based on the policy context as the financing to support water sector activities that contribute to the achievement of or improvement in at least one of the relevant sustainability pillars (Migliorelli, 2021).

The financial sustainability of the water supply projects refers to the financing mechanisms that minimise the financing costs and financing risks of the water supply projects. An ideal sustainable project financing model is one that considers the budget availability of the projects, methods of financing (internal or external sources of funding), financing of both working capital and fixed assets, maximising the use of project fund sources, the expected profit of the project, and the risk associated with the project (Lolagari et al., 2022).

2.2.4 Repayable Source of Finances

Repayable sources of finance are those private financing strategies that require repayment to the issuer in the form of interests, dividends, and capital. This form of

financing is favourable if the project under implementation has the capacity to pay back the investors (Machete & Marques, 2021). Repayable finances are commercial finances that need to be accessed by water utilities through intermediary institutions, blending, and well-established local capital markets. For water supply and sanitation, these forms of financing are constrained by the high risk profiles of investors for water supply projects, the weak creditworthiness of the water utilities, the small size of the projects, and a lack of bankable projects (Alaerts, 2019).

Repayable sources of finance can be termed both commercial finance and concessional finance, with the former referring to the form of repayable finance with an interest rate determined by capital markets rather than by governments. Commercial banks are the main financiers of this form of finance, characterised by shorter maturity, high and volatile interest rates, with concessional finance interest rates being low, longer maturity periods, and often accompanied by a grace period (Pories et al., 2019).

The study prefers the definitions of these key terms as referred to by scholars such as McCoy et al. (2023) where the concept of the financing gap is viewed as the funds missing in comparability with the actual requirement in the supply of water services. On O&M costs, scholars such as Muldianto et al. (2020) have ascribed the meaning of the concept in relation to the main theme of the study of the financing gap. For the financial sustainability of the water supply projects, the study conquers the definition of Lolagari et al. (2022), as it provides an in-depth insight on the key indicators for sustainable water supply infrastructure project financing. Pories et al. (2019) give an

attractive and wider meaning to the concept of repayable sources of finance in the water supply and sanitation financing aspects.

2.3. Theoretical Literature Review

2.3.1. Full Cost Pricing Theory

The theory of the full cost pricing (FCP) had its debut with the publication made by Hall and Hatch (Oxford-based economists) in 1939 (20th Century) entitled ‘’Price theory and Business behaviour. The concept was the result of the research survey made in 38 firms of which 33 where manufacturing firms. The theory of the Full Cost Pricing states that,’’the firm or entity should set price of product or service at full cost pricing,where the total production costs and other overheads of a product or service are indentifies and a percentage mark-up is added to create a profit margin to arrive at the total final price of the product or service’’ The price per unit is found by dividing the the finanl price by the units or volume produced. The key varibales stated in the theory are costs,price,profit margin/mark up which indicates the financial sustainability of the entity and production volume.

Sereno (2022) applied the full cost pricing theory to study Human Right to Water and Sanitation. It was concluded that, for the Full cost pricing theory to be relevant in areas where water resources is scarce,in those areas water charges should be adjusted gradually to reflect the real cost of this scarce resourecs . Water should be treated as both economic good and social good. As adjustment of the water charges may result to an affordability constraint,for individuals who are unabe to afford the Full Cost Price of water, the government must provide financial support though

subsidies to ensure that this essential servies (access to water and sanitation) is available to every one as human right. This is in conformity with United Nations Committee on Economic,Social and Cultural Rights, which recognises water as one of the most fundamental conditions for human survival and its Basic Human Right in its general comments No 15 and Resoultion No 64/292 of 2010.

Guan et al. (2023) used full cost pricing theory to conduct a longitudinal study of the relationship between the house prices and construction costs using Toda-Yamamoto Granger's Cauality test and Psarans Autoregressive Distributive Lag (ARDL) in Construction service industries in Auckland Newzealnd. A study found that, a full cost pricing theory is popular Pricin theory in Construction service industries whereby majority of the construction service industries prefers to set their prices at full cost price which includes total costs (Direct costs and indirect costs plus a standard mark up to indicate the return of return or profitability of the service. A typical pricing approach should be applied in water utilities as most of the water supply and sanitation utilities are construction service industries.

Ratnasih et al. (2022) also applied the full cost pricing supposition to conduct a comparative descriptive study of the multiple linear regression between the full costing method and the variable costing method. The study examined three variables, namely the full costing method, the variable costing method as independent variables, and selling prices as dependent variables. With cost accounting theories, a study found that full-cost pricing has a significant effect on the price of the product or service. Full cost pricing facilitates the correct tracing of factory overhead costs to

the cost drivers and absorbs the costs of a final product or service.

The full cost pricing theory has several strengths, and if implemented with high caution, it can enable water supply utilities to operate with high economic efficiencies and financial sustainability and leverage their revenue streams with external financing to close the financing gap in the sector. Full-cost pricing theory addresses pricing strategies where an entity sets the selling price of a product or service by including all the costs associated with its service or product and adding a mark-up to ensure a profit. The method ensures that all costs, both fixed and variable, are covered. In that case, the methods help ensure that there is financial sustainability as all production costs are recuperated, which is critical for the long-term sustainability of the water supply utilities (Bhimani et al., 2019). Economic efficiency is promoted in water utilities by adopting a full-cost pricing theory.

According to Hilton and Platt (2021), the full cost pricing theory incentivizes firms to continuously monitor and control costs, leading to more efficient operations and potential cost reduction. The price under this theory encourages better cost management and operation efficiencies.

The full-cost pricing (FCP) theory enhances environmental protection among water supply and sanitation utilities. The concept emphasises the recovery of environmental and resource costs in water resource management. This can lead to more sustainable water consumption patterns and a high awareness of the environmental impacts of water use. By absorbing the costs of environmental protection, water utilities, through FCP, comply with global environmental goals.

The environmental policies incorporated by the FCP aim at reinforcing international environmental agreements and alternative climate change policies of which Tanzania is a member (Tsani et al., 2020).

Drury (2021) propounded the strength of the Full Cost Pricing techniques on the ground that it is simple and straight forward. This makes the pricing techniques proposed by the theory an attractive option for entities such as water supply utilities, where most of them are small while others are medium in size. Pricing under the theory does not require sophisticated market analysis or demand forecasting, making it accessible for the majority of water supply and sanitation utilities.

The theory of full-cost pricing in water utilities is criticised as it seems not applicable to other grounds of water financing. Mitlin and Walnycki (2019), in their study, confirmed that utilities, by continuing to adopt the concept of full cost pricing as their model in water financing, will not be able to purchase sufficient quantities of water from water supply and sanitation utilities due to the high price. This practically undermines the global objective to achieve Sustainable Development Goal 6. Clean water and sanitation for all. The theory is also tossed with the criticism of affordability and equity that its implementation in water supply utilities can lead to higher prices, which may affect low-income households, considering that water is a basic human need. The FCP exacerbates affordability issues by creating higher tariffs, which cannot be afforded by low-income earners (ibid.).

Andres et al. (2021) Water utilities may eventually run into problems trying to win over the public and political leaders to the full cost pricing theory's definition of water price. In the long run, water corporations may face difficulties due to public

opposition to the full cost pricing theory. Scholars such as Cabrer et al. (2019) asserts that the theory has faced criticism since it calls for the accounting of a large range of costs, including both fixed and variable overheads and direct and indirect costs. This complicates the theory's implementation in terms of cost allocation. However, there are benefits to water that are hard to quantify, which makes it impossible to estimate the actual costs of water supply utilities for these services.

The pricing mechanisms addressed by full-cost pricing intend to promote water conservation. By reflecting the true costs, this can impact the demand for water as it can lead to reduced water consumption by the customers of the water utilities, resulting in low revenue collection and a widening of the financing gap. A reduction in revenue impedes the financial sustainability of water infrastructure projects and water utilities (Schneider et al., 2021). There is also concern in the other academic literature that the full cost pricing theory is not adequately accounting for environmental and social externalities; for example, the theory fails to internalise the environmental costs associated with water extraction and pollution (Berbel & Expoto, 2020).

2.3.2 Justifications of the Full Cost Pricing Theory

Full cost pricing (FCP) theory remains a popular theory in the water sector and utility financing mechanisms due to its practical and strategic benefits. Despite its limitations, several justifications support the use of the theory, particularly in the water sector. Due to its comprehensive cost recovery, the theory guarantees that all production and operating costs, both fixed and variable, are included in the pricing of

water services during tariff setting. It ensures that the water utilities cover their O&M costs and achieve sustainable financing (Bhimani et al., 2019). Other scholars, such as Drury, argue that full-cost pricing makes pricing simple and transparent in nature, and due to its simplicity, it is easy to apply in small industries. This is particularly practical in small water utilities like town or district water supply and sanitation utilities.

The theory of full cost pricing brings stable and predictable price estimates to the entities. This can be beneficial to both service providers and customers. The stability of prices facilitates financial planning and reduces uncertainties. Stability assists the entities in reducing price volatility (Kaplan & Atkinson, 2020). This is justifiable in water service industries where the tariff rates are stable and predictable by preparing a detailed business plan and having it approved by regulatory authorities before it comes into operation. Customers are aware of the tariff changes, and water utilities can plan accordingly.

According to Hongren et al. (2020), by implementing the full cost pricing model, the entity can conduct a comprehensive cost analysis and identify areas where costs can be reduced. This thorough cost structures understanding enhance better financial management and strategic decision making. This is justifiable for water utilities, as the implementation of full cost Full enables them to have comprehensive data on cost components like water production expenses, distribution and maintenance expenses, repairs, sanitation expenses, administration and personnel expenses, finance costs, and depreciation expenses of the water infrastructure in their business plans.

2.4 Empirical Literature Review

2.4.1 Operation and Maintenance (O&M) Costs

Libey et al. (2020) conducted a study of the life costs of four water supply and sanitation utilities in Kenya and found that the majority of the water supply and sanitation utilities experience a significant financing gap in their operations as a result of an underestimation of the life cycle costs. The life cycles of water supply services exist in both recurrent and development expenditures. Utilities must understand the required expenditures they are suppose to cover in full and compare their funding levels in order to narrow the financing gap and reach universal access to water for all. The life cycle costs exist in the form of capital expenditure (CapEx), operation and minor maintenance expenditures (OpEx), capital maintenance expenditure (CapManEx), cost of capital or debt service (CoC), expenditure on direct support (ExDS), and expenditure on indirect support (ExIS).

Improper analysis of total economic costs such as operation costs, debt service costs, depreciation taxes, environmental costs, and hidden costs by utilities and design of the effective fund subsidies required by the water supply utilities exacerbates the extent of the financing gap. Water utilities should design proper subsidies by employing an efficient mode of estimation in order to minimise the larger financing gap (Andres et al., 2019). About 53 small-scale water supply utilities in the Pan-European region experience a huge financing gap in their operations. It was found that the key driver of the financing gap is the mismatch between the sources of funds available and the ability to cover the recurrent costs.

The financial gap is determined by the minimum economies of scale associated with the scattered nature of these utilities. Some utilities, particularly small ones, are not given important consideration when it comes to the issue of public fund allocation (Smits et al., 2020). However, these studies did not empirically examine how the financial sustainability of water supply projects and the terms and conditions of the repayable source of finance determine the financing gap among water supply utilities. Further, studies such as those by Libey et al. (2020) applied the 3Ts funding model, which confined the traditional sources of financing and limited the water supply and sanitation utilities to external, repayable sources of financing such as concessional loans, innovative financing, equity, and bonds.

The centralised financial systems of the water supply and sanitation utilities and the improper setting of water tariff rates are key drivers of the financing gap in water supply systems. Government subsidies tend to be unfair, less efficient, unstable, and insufficient, while tariffs for O&M costs are poorly designed (Minero, 2019). A systematic literature review study analysis conducted by Minero (2019) from a survey of 53 cities in Mexico revealed that in aspects of the Sustainable Development Goals and financial performance, water utilities must have strong relationships with key stakeholders such as politicians and citizens that have significant effects on their operation decisions, such as tariff setting or any other financing plans they expect to adopt with the view of narrowing the financing gap or improving financial sustainability. There should be a fair allocation of financial resources to the water supply and sanitation utilities to improve efficiency and accountability.

Leckie et al. (2020) undertook a study on 36 Asian Pacific regions on investment needs to cover water supply O&M costs and financing capacities and found that the degree of operation efficiency and effectiveness use of the water infrastructural assets, efficiency use of public expenditure, and lack of accurate data to track the correct expenditure financial flows in the water sector as well as its capacity to attract private finance determine the financing gap in in water utilities. Smith et al. (2019) commented that water efficiency is the most important consideration and a stepping stone to adapt climate finance in the water sector to minimise the financing gap.

A study by Patterson and Doyle (2021) for 1791 water utilities found that the affordability of the customers to pay for the costs of the water supply and sanitation utilities influences the financial capacity of the water supply utilities and negatively widens the financing gap of the water supply utilities. The affordability gap is driven by five key attributes, such as poverty prevalence, tradition, household burden, minimum wage hours, and income dedicated to water services by households. Danert and Hutton (2020), in their study to examine the tariffs, transfers, and taxes as a common financing framework (3Ts) to cover operation and maintenance costs in water supply and sanitation services, found that the financing gap in water supply and sanitation utilities is due to a narrow interpretation of the tariff, which is the main financing mechanism of the operation and maintenance costs. It was further revealed that it is high time now for water supply and sanitation utility financing strategies to incorporate household investment (HI) to narrow the financing gap in water supply and sanitation utilities.

According to Danert et al. (2020), househod supply is the self-supply cost of water services by customers. These costs include paying for capital items such as sewer connections, and investments in onsite water and sanitation infrastructure. Inclusion of household investment costs enables water utilities to understand how their customers actually spend on water services, which facilitates the planning of policy decisions and the understanding of the affordability of the customers.

The constraints of accurate data in operation and maintenance costs and the financing framework for water financing significantly affect the ability to trace the actual financing flows in water supply and sanitation utilities. In most water utilities, it is difficult to establish with accuracy what amount of money is spent and by whom. This ends up being merely an estimation of water pricing. This limitation of data comes from the absence common harmonised water security modality and water-related financing flows among water supply utilities. The size of the financing gap is dependent on operating efficiency in the use of the existing resources, efficiency in the use of the of the public expenditure programme, and capacity to leverage a private source of finance or a repayable source of finance (Leckie et al., 2021).

O&M costs should be secured in all water utility financing mechanisms. If O&M costs are not fixed in all water financing sources, a high financing gap will continue to be experienced in water utilities. It should be effective and efficient in planning operation and maintenance costs to align with different financing outcomes in the water supply utilities. By adopting sustainable financing mechanisms and effective and efficient cost approaches, utilities are able to minimise the extent of the financing gap (Hilbig & Rudolph, 2020).

Pricing and valuing water are key concepts to be understood by policymakers and decision-makers in water management to plan accordingly on how effective, efficient, equitable and sustainable water financing will be designed. Misunderstanding of these key concepts drives water utilities into the vicious cycle of financing gaps (Grafton et al., 2023).

A study by Grafton et al. (2023) on the price and value of water disclosed that effective, efficient, and equitable water pricing and valuation are the key determinants of the financing mechanism, and if the concepts are misunderstood by the decision-makers, they may accelerate the widening of the financing gap. Valuing water enables policymakers to determine the financial value (operating costs) per unit of cubic metre volume produced. Water utility providers, users, and policymakers must also have a common understanding of why water is priced, what are the key economic concepts embodied in water pricing, who bears the costs and enjoys the benefits of water, and when the price of water is expected to change.

A descriptive study by Pories et al. (2019) on a sample of 10 foundational issues involving three variables of the governance of the water sector: service provider and supply of finance, found that, to narrow the financing gap, water utilities should ensure transparency, consistency, and accountability through effective governance, institutional policy, and regulatory issues. There should be technical and financial efficiency for water utilities to maintain creditworthiness, and the sector must focus on maximisation of finance from suppliers of finances.

Few percentages of water utilities are able to cover operation and maintenance costs globally; water supply utilities must practically exhibit that they are able to generate sufficient revenue through tariffs to cover operation and maintenance costs to create surplus access to other sources of finance, particularly with repayable terms and conditions, failure of which will create a financing gap in which they will depend on government grants, which are very limited due to stiff competition from other sectors of the economy, and official development assistance (ODA), which is likely to be uncertain (Ibid.).

Applying firm models and empirical descriptive techniques Andres et al. (2019) found that the extent of the financing gap is determined by the magnitude of subsidies because operation and maintenance costs for water supply and sanitation utilities are exaggerated by the pervasive subsidies, which are underestimated compared to the actual subsidies required. The cost of subsidies relating to operation and maintenance costs rises significantly in water supply and sanitation utilities compared with what is paid by the users or the cost reflective tariff. Water utilities operate with high inefficiencies, creating costs that remain unfunded with subsidies. Subsidies should be efficiently allocated, not pervasive, expensive, poorly targeted, non-transparent, and distortionary, to achieve the goal of universal access to water supply and sanitation services.

Water supply and sanitation utilities experience a financing gap because they are not following an optimal cycle to realise their ambitious financial goals. At inception, water supply and sanitation utilities ought to define sustainable development goals strategies through the adoption of strategic financial planning (SFP), improving

operation efficiency by reducing operation and maintenance costs (O&M costs), mobilising domestic revenue through raising tariffs and user charges, taxes, and catalytic loans, and mobilising financing from multiple sources through leveraging commercial finances with blending (Goksu et al., 2019). Examining the financing situation of 140 in low and high 140 economies, Goksu et al. (2019) conclude that a rigorous reform is needed in policies, governance, institutions, and regulatory systems at the utility level (Utility Turnaround Framework) and Maximising Finance for Development (MDF) to close the financing gap.

2.4.2 Financial Sustainability of the Water Supply Projects

Financial sustainability is a popular term in various empirical literatures and within the practice of sustainability management and reporting. For the entity to be financially sustainable, it must guarantee that it will continue to operate without undergoing bankruptcy, maintain a constant flow of income in real terms, and meet the meet the minimum net income of its investors. The entity's financial sustainability is determined by four key attributes; firm profitability growth, entity solvency capacity, standardised earning risk exposure, and an acceptable return profile to its investors (Gleibner, 2022).

A cross-sectional study by Mohanty et al. (2020) found that the extent of O&M coverage by water supply utilities is the key impediment to the sustainability of urban water supply projects. This, in turn, enlarges the financing gap. Examining the energy costs, establishment costs, repairs and replacement costs, and chemical costs using a descriptive study across different years. Mahanty et al. (22020) revealed that

energy costs, chemical costs, and repairs and replacement costs significantly affect operation and maintenance costs, which in turn affect the financial sustainability of the water utilities.

A study of a sample of 30 respondents with variables of concession finance, leasing finance, financial sustainability, and public-private partnership in Nzoia water services projects Miroga and Otieno (2022) found that concessional and leasing finance influence the involvement of the public-private partnership in water supply projects, and with the engagement of public-private partnership arrangements, the financing gap will be reduced. The study applied inferential statistics of correlation and regression models, public values, and new public value governance theories; however, however the study did not reveal how financial sustainability directly influences the financing gap. The financing gap is a wider concept; it cannot be confined to private partnerships alone. The sample size utilised was not enough to suit the quantitative research approach.

McCoy and Schwartz (2023) found that the main determinant of the financing gap in water towards the achievement of the SDGs in water supply utilities is the complexity of the interpretation of the bankability of the water projects, the capacity to align the bankability of the water projects with key financing stakeholders, and the ability to tap private financing. Examining the six variables of investor type, water infrastructure asset type, phase of the project life cycle, financial instruments, enabling environment, and project modality with 47 sample respondents using a systematic literature review framework, McCoy and Schwartz (2023) concluded that the bankability of the water project depends on the risk-return profile that investors

in the water supply utilities are willing to accept. A project that has no clear business model from a cash flow perspective is deemed not bankable.

The extent of utilising innovative skills on the new sources of financial instruments for water supply projects, understanding the financial instruments applied in the past, their advantages and disadvantages, and whether they were successful or not, determines the pace of closing the financing gap. Water utilities have to conduct more financing studies rather than merely concentrating on identifying various projects, evaluating them, risk management, and continuing to depend on traditional sources of finance and repayable sources. Empirical systematic, quantitative, semantic, and narrative analysis research study of 139 sample papers found that more researchers have studied mostly four areas such as sustainable development, water management, public finance, project finance, and public finances, of which 25 concentrated on projects as a prerequisite to unlocking the financing gap in inwater supply utilities (Machete & Marques, 2021).

Water infrastructure financing has a significant influence on financial sustainability. The significance is due to the fact that government investment is still insignificant despite the sector's heavy capital investment. There is therefore a need for the governments of different countries to explore partnerships with communities and NGOs to explore the financing of the water sector. Loan financing should be reduced because the sector could be highly indebted (Julius et al., 2021). Using a mixed research design of 352 sample sizes with descriptive and inferential data analysis (correlation and regression models), a study by Christine et al. (2021) found that water pricing, price subsidies and revenue grants, utility efficiency, government

regulations, and project financing influence the financial sustainability of water utilities.

The government's investment in water infrastructure projects is still minimal compared to the required level of investment to achieve the universal sustainable development goals. The study considers the situation that financial sustainability is the function of four variables: water pricing, price subsidies and revenue grants, utility efficiency, and government regulations. The study didn’t explore how financial sustainability is linked to the financing gap, which is a critical financial crisis likely to impede the majority of the water supply utilities. Countries with low financial sustainability in water supply projects are those with little private financing in those infrastructural facilities. To reduce the water infrastructure financing gap, governments are urged to pursue policy reforms to create an enabling environment, paving the way for private financiers involvement in water supply services. There should be an increase in public taxation to raise more financial resources for water infrastructure projects and efficiently spend public development funds on water projects. The extent of subsidies with water prices determining the extent of cost recovery should be combined to unlock private financing for water projects (Fay et al., 2021).

With a tremendous global focus on environmental protection and conservation, the financing of water infrastructure should be embedded with green financing to minimise the huge financing gap. Financial institutions such as banks should be encouraged to develop various green financing products, such as green securities, green investments, climate finance, green insurance, green credits, and green

infrastructural bonds. The green finance policies of banks are to be successful if there are well-developed environmental and climate policies with favourable interest ates, risks, ssocial inclusion, and banking regulations (Akomea et al., 2022).

Drawing a sample of 2,449 world water projects funded by multilateral development banks (MDBs), a descriptive study by Heidler et al. (2023) revealed that the integration of sanitation services with other activities makes sustainable financing of the water supply and sanitation utilities from multilateral banks difficult, and this practice accelerates the financing gap. Water sanitation should be separated from other sectors and provided with water supply concurrently. The study investigates four key variables, namely territorial trends, technological choice, the distribution of financial burdens, and reforms to institutional arrangements. It further revealed that water supply and sanitation utilities should focus on efficiency through investment in technical and financial skills rather than concentrating on commercialization and private sector participation.

According to Dickin et al. (2020), the financing gap in water supply and sanitation towards the achievement of global sustainable development goals is largely contributed by the absence of green finance, climate policy, and the un funding of water and sanitation components in various water projects. A sample of 99 water projects selected in the descriptive study analysis related to water sanitation, climate policy, and financing showed that the majority of the global water projects implemented comprise a small percentage of the sanitation component. Therefore, as climate finance is planned, water sanitation financing should be part of it.

The unlocking of external sources of finance to ensure the sustainable financing of water infrastructure in order to minimise the vicious cycle of financing gaps in water utilities calls for the introduction of financing. Financialization will enhance financial sustainability as it will influence water projects in the future by reconfiguring them for wealth creation (profit-making). To minimise the financing gap between the current investment and the level of financing required by the water utilities, revenue generation from fixed water infrastructure assets should be transformed into financial commodities to guarantee the attraction of investment from institutional investors (Loftus et al., 2019).

Thematic analysis study of four utilities conducted by Koros et al. (2024) revealed that the prerequisite consideration to avoid the financing gap in financing water infrastructure projects is to establish a revolving fund and adopt the full cost recovery policy as the key purpose. The water tariff is considered the driver of financial sustainability. Funds should be mobilised from local users, including those with low incomes. This qualitative study examined four variables: user-owned urban water service producer's capacity, water policy link, operation and maintenance cost mechanisms, and risk asserted that non-public water utilities reduce the water supply service gap and are the means of financing. In order to finance major capital investments, for example, establishing a revolving fund targeted at low-income areas should be considered in Kenya.

The view of Keros et al. (2024) resembles that of Beecher (2021) whose study emphasised the concept of funding and financing and sustainability, that funding and financing are the means towards financial sustainability, that there should be optimal

balances in water utility projects for revenue sources (from funding sources and financing sources), and spending in both operation and maintenance costs and capital costs to drive water supply service to meet the demand of the growing population and comply with environmental standards.

2.4.3 Terms and Conditions of the Repayable Sources of Finance

Commercial finance contains a promising future for water supply financing, but this means of financing is limited by the high-risk profile perception of the financiers. Water projects are small in size, and the absence of creditworthiness of the water supply utilities seems to be challenging. Water utilities are urged to incorporate blended finance to allow financial institutions to scale up financing and improve local capital markets. Water utilities should demonstrate adequate capacity to absorb finance and prepare bankable projects to unlock financing potentials (Alaerts, 2019).

A study conducted by Heckel (2023) using social position theory, found that to avoid the financing gap of the water utilities from depending on government funding, they should adopt de-risking techniques such as the use of guarantees and blended finance to facilitate the mobilisation of public funds or aid to water utilities self-reliant borrowing. Water supply and sanitation utilities should act as debt emitters by demonstrating the ability and commitment to repay the debts. They should be able to prepare bankable projects and adjust tariffs so as to be able to repay their borrowings.

Commercial loans sometimes prove to be a difficult option for the water supply and sanitation utilities as the risk of lending to the sector is perceived as high by

commercial lenders. Lenders are reluctant to lend water utilities, and when they do so, they create high interest rates on the credit facilities they offer to water utilities. A tariff is the only source of finance that is not limited by fiscal constraints but suffers from affordability constraints. Applying concessional loans, appropriate financial strategies, and contributions from tariffs can help to close the funding gap in most of the water utilities (Fonseca & Frade,2019).

In Tanzania, access to commercial finance (repayable finance) has shown a growing interest in lenders lending water supply and sanitation utilities, but these lenders demand quality bank proposal projects (bankable projects), which demonstrate a clear profit realisation for water utilities. Lenders morale to finance water utilities in the country are disappointed with the bureaucratic conditions imposed by the Ministry of Finance. To close the financing gap in the water sector, utilities must prepare quality project proposals and involve and exploit more private sectors in financing water infrastructure (Origa et al., 2020).

Water utilities have started to leverage their traditional financing by issuing green bonds (one of the most repayable sources of finance) to fill the financing gap in their operations. But this raises concern about their current internal financial factors in terms of utility size, profitability, reserve risk levels, and assessment of debt affordability before tapping into this mode of financing. These internal attributes play a significant role before a water utility resorts to debt financing (Nguyen, 2022). By applying the Pecking Order theory and multivariate regression analysis, a study by Nguyen (2022) found that, in using repayable sources of finance like bonds,

consideration of internal conditions factors seems to be more determinant factors on the affordability of these finacing techniques than external factors.

Repayable sources of financing, such as bond financing, are usually accompanied by strict conditions, which sometimes prove difficult for the water utilities to adopt. A study by Posenau (2022) of 600 municipal water utilities in the United States using pecking order theory found that bond financing is likely to have tight bond contracts or strict agreements with bondholders. To comply with these conditions, water utilities might increase prices and cut down their spending to protect the interests of bondholders. This will eventually affect the provision of water supply services as a public good.

Adoption of repayable sources of finance in water utilities implies that water supply utilities now want to undergo financialization in their operations. There are growing arguments about the management of the financialization strategy in water utilities as one of the techniques for filling the financing gap. A study by Sanchez (2019) of six private regulated water utilities using the staggering difference-in-difference model in the UK found that, with the reform of water utilities to adopt financialization strategies, water utilities end up increasing their leverage level, level, average price of the water services, paying huge dividends to institutional investors, and managerial wages. This undermines the social aspect of water supply services. Water utilities become creditworthy first and foremost in order to leverage private capital. The government and donor partners should continue to play a much longer role in financing water supply services to enable access to water services in poor societies. Philanthropic-led funds need to be used with great care for the delivery of

water to poor societies. Results-based financing should be adopted to improve utility performance (Nagpal et al., 2020). The majority of the water utilities are not listed on the stock market, which limits their ability to access commercial capital. Some even get little funding from the government; this limitation on repayable sources of funds from capital markets to finance their operations widens their financing gap. The best option for such utilities is to improve their financial performance from their internal operations by increasing the collection of receivables to increase profitability, which is one of the most prerequisite conditions for accessing commercial finance (Wafula, 2019).

A study by Smits et al. (2020) in pan-European small-scale water utilities found that the application of commercial loans as one of the most repayable sources of finance requires water and sanitation utilities to borrow to finance the initial cost of capital investments. This implies that at some point in the future, the interest expenses on loans will accrue and need to be paid either from taxes or tariffs. It is anticipated that, during their operation, more benefits will be realised than the costs of the loans in water supply and sanitation services.

Table 2.1: Summary of the Empirical Literature Matrix

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
1	Libey et al .(2020), Kenya	Who pays for water? Comparing life cycle costs of water services among several low, medium and high -income utilities	Descriptive Analysis, Utility Business model Global,4 water supply utilities	Capital Expenditures, Operation and Minor maintenance Expenditures, Capital Maintenance Expenditures	Life cycle costs determines the funding gap. Underestimations of these costs widens the funding gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
2	Andres et al. (2020),USA	Doing More with Less Smarter Subsidies for Water Supply and Sanitation	Descriptive Analysis, Demand-side subsidies and Supply-side subsidies theory, sample of 1549 global global water supply utilities	Pervasive subsidies, expensive subsidies, poorly targeting subsides transparency subsidies and poorly design subsidies	Subsidies design drives financing gap inwater utilities	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
3	Smits et al. (2020), Denmark	Costing and financing of Small-Scale water supply and sanitation services	Framework analysis, Maximizing Development Finance (MDF Model) ,53 Pan European region of small scale water supply system utilities	Capital expenditures, Expenditure on operation and minor maintenance, Capital maintenance expenditure, Expenditure on direct	Mismatch between the source of funds and recurrent costs due to minimum economies of scale determines financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
				support and Expenditure on indirect support, Cost of Capital		repayable source of finances
4	Minero (2019), Mexico	Water utilities: is their sustained financial efficiency achievable? -the Mexican case	Framework analysis, Mexico Urban water management Model, sample survey of 50 cities	Sustainable Development Goals, Urban water utilities and financial performance of the Urban water utilities	Centralized subsidy financing model widens the financing gapof the water supply utilities	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
5	Leckie et al. (2020),France	Financing water security for sustainable growth in Asia and the Pacific	Descriptive Analysis, Costing models and projections, sample of 36 Asia -Pacific countries	Water utility Investment needs and Financial capacities	Water utilities operating efficiency (on existing resources and expenditure) accurate of data and capacity to tap of private finance determines financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
6	Patterson and Doyle (2021),USA	Measuring water affordability and the financial capability of utilities	Descriptive Analysis, Block group weight model, Sample of 1791 water utilities located in four USA States	Poverty prevalence, traditional, Household burden, Minimum wage hours and Income Dedicated to Water services	Affordability gap drives financing gap inwater supply and sanitation utilities	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
						repayable source of finances
7	Danert and Hutton (2020),	Shining the spotlight on household investments for water sanitation and hygiene (WASH): let us talk about HI and three Ts	Framework Analysis, Sample of 35 responses of national governments	Household Investment, 3Ts (Tariffs, Taxes and Transfers) and self-supply	Exclusion of Household Investiment in basic financing sources of water utilities contributes to financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
8	Hilbig and Rudolph (2020),	Sustainable water financing and lean cost approaches as essentials for integrated water resources management and water governance	Framework Analysis, PPP Model, Sample of 3 donor funded projects in South Africa and Namibia	Economic efficiency of water resources management, financing mechanisms (sustainable finance) and lean cost approaches	Sustainable financing and efficiency in water resources management determines the funding gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
9	Grafton et al. (2023),	The Price and Value of Water: An Economic Review	Document Analysis, Demand and Supply theory,	Price and value of water.	Proper pricing and valuing water provides a way forward to sustainable water management and sufficient revenue thereby reduce the financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
						of finances
10	Porie et al. (2019),	Mobilizing Finance for WASH: Getting the Foundations Right	Systematic Literature review analysis, Azure Model and Hybrid Annuity Model, Sample of 10 foundations issues	The governance of water sector, Service Provides and Supply of finances	The financing gapis being triggered by the misunderstanding of 10 foundations lying in governance, water service providers and supply of finances in the water sector	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
11	Goksu et al. (2019),USA	Reform and Finance for the Urban Water Supply and Sanitation Sector	Descriptive analysis, 140 high- and low-income countries,3Ts financing model and	Policy, Institutions and Regulatory Incentives, Water Utility Turnaround Framework, and Maximizing Finance for Development	The government must take actions of reforming the sector, water utilities reforms and financing reforms to close the financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
12	Mahannty et al.(2020), India	Factors Affection Operation and Maintenance Costs Recovery of Urban Water Supply: An evidence from Eastern Indian States	Descriptive statistics cs and correlation Analysis, Regression model, sample of 300 respondents	Percentage of Cost Recovered (PCR),Repairs and Maintenance Costs (REPR),Establishment Costs (ESTC),Energy Costs (ENGC),number of Domestic Connections	Improving service delivery and reduction of water energy costs increase revenue and lower the funding gap.	Financial sustainability of the water supply projects, and repayable sources of finance

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
				(NDC),Presence of Industrial Connections, Presence of Commercial Connections and Connections per NRW		
13	Miroga and Otieno (2022), Kenya.	Effect of Public Private Partnership on Financial Sustainability of Nzoia Water Services Projects Kenya	Regression and Correlation Data Analysis Techniques, The Public Value and New Public Governance theories, Sample of 30 staff in Water Supply Company	Concessional finance, Leasing finance and sustainability	Concessional and Leasing Finances influence the financial sustainability therefore water supply utilities should adopt PPP programs to enhance lease and concessional finance to minimize the funding gap	Operation and Maintenance costs in water pricing, terms and conditions of repayable sources of finance
14	McCoy and Schwartz (2023), Kenya	The water finance gap and the multiple interpretations of 'bankability'	Framework Analysis, Bankable Business Model,47 Sample of respondents including financiers	Investor type, water infrastructure asset type, phase of the project life cycle, financial instruments, enabling environment and project modality.	Bankability of the projects and extent of private financing determines financing Gap	Operation and maintenance costs and repayable sources of finance
15	Machete and Marques (2021), Portugal	Financing the Water and Sanitation Sectors: A Hybrid Literature Review	Hybrid methods (Systematic Literature review, semantic network and narrative analysis)	Sustainable development, water management and public finance, project finance and public finances	Water utilities embark new skills to other sources of finances and financial instruments to close	O&M costs in water pricing, and Financial sustainability of the water supply

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
					the financing gap	projects
16	Christine et al. (2021),Kenya	Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability **Se**rvice	Demand and Price Model, Regression Analysis techniques, sample size of 352 respondents	Water pricing, infrastructure financing, utility efficiency and subsidies	Water pricing, infrastructure financing, utility efficiency and subsidies had a positive joint influence on financial sustainability	Conditions of the repayable source of finances
17	Julius and Kalunda (2021),Kenya	The Influence of Water Pricing on Financial Sustainability among Water Service Providers in Kenya	Regression Analysis Technique, Public Utility Pricing Theory and sample of 352 respondents	Water pricing and Financial sustainability	Water Pricing do not lead to Financial sustainability	Conditions of the repayable source of finance
18	Fay et al. (2021),France	Funding and Financing infrastructure: The joint use of public and private finance	Inferential and mathematical functions analysis, Public infrastructure funding financing model, Sample of 261 projects in the world	Public funding, and private financing	Combination of prices subsidies for services providers, nature of the projects and characteristics of social and institution environmental affects infrastructure financing	Conditions of the repayable source of finances
19	Heidler et al. (2023)	Multilateral development banks investment behaviour in water and	Descriptive Statistics Analysis, Sample of 2,449 Projects	Territorial trends, technological choice, distribution of financial burdens and reforms to	Institution reforms increases the water utility operating efficiencies rather than	O&M costs in water pricing, Financial sustainability of

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
		sanitation: Findings and lessons from 60 years of investment projects in Africa and Asia		institutional arrangements	through increased commercialization and private sector participation	the water supply projects and conditions of the repayable source of finances
20	Dickin et al. (2020),Sweden	Sustainable sanitation and gaps in global climate policy and financing	Descriptive Statistics Analysis, Sample of 7 countries	Climate policy and Climate finance	Absence of climatic finance, climate policy and underfunding of sanitation component contribute to financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
21	Akomea-Frimpong et al. (2022),Australia	Review of Studies on green finance of banks, research gaps and future directions	Content Analysis, Green Credit risk model,46 sample studies	Green finance products (bonds, loans, investments, climatic finance, infrastructure bonds, insurance, green securities and carbon finance	Green finance products supported with green financing policies will close the financing gap	O&M costs, conditions of repayable finances and financial sustainability of water projects.
22	Loftus et al .(2019),UK	The Political economy of water infrastructure: An introduction to Financialization	Trend analysis, Financing model of water infrastructure,4 private water supply and sewerage companies.	Privatization, nationalization, Water infrastructure and financialization, and municipalization	Water infrastructure should be transformed into financialization to enhance financial sustainability and close the gap	O&M costs in water pricing, and conditions of repayable finances
23	Koros et al.	Leaving No One	Thematic Analysis, User-	User-Owned UWSPs	High performance of	O&M costs in

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
	(2024),Kenya	Behind: Prospects for User-Owned Urban Water Utilities in Kenya	Owned Urban water utilities model,4 Sample of urban water utilities manager	Potential, Water Policy link, O&M Mechanisms, costs and risks and User-Owned UWSPs operation capacity.	few licensed water utilities, high ownership and control, small size ,public participation and regulatory improves utilities financial performance to close the funding gap	water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
24	Beecher (2021),USA	A universal Equity Efficiency Model for Pricing Water	Thematic Analysis, Pricing model	Scope economies, capacity value, public health, resource management and water security	Water financing gapcan be closed by designing a price model that that addresses multiple policy objectives	Financial sustainability of the water supply projects and conditions of the repayable source of finances
25	Alaerts (2019),USA	Financing for Water-Water for Financing. A Global Review of Policy and Practice	Thematic Analysis, Sample of 24 Emerging Market Developed Economic Countries.	Water supply, Climatic changes, Commercial financings and Policies	Incorporate blended finance allow financial institutions to scale up in financing and improve local capital markets,	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
26	Heckel (2023),Kenya	Water utilities as debt emitters: the commercialization of	Thematic Analysis,87 respondents from Water supply Companies.The	Debt emission, Commercial financing and Transformations of	Water supply utilities should close the financing gapby	O&M costs in water pricing, Financial

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
		development funding and services provision in Kenya's water sector	theory of Social Positioning and Normative Cycles	the water sector	becoming Debt emitters	sustainability of the water supply projects and conditions of the repayable source of finances
27	Fonseca and Frade (2019),Ethiopia,Rwanda and Uganda	Addressing the financing gain in the water sector in Ethiopia, Rwanda and Uganda	Framework Analysis, Sample of 3 East Africa Countries	Policies, institutions, strategies, demand and supply of financial resources (3Ts)	Applying concessional loans, appropriate financial strategies and contribution from tariffs can help to close the funding gap in most of the water utilities.	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
28	Origa et al. (2020)	USAID Tanzania Water Sector Assessment for Strategy Development	Statistical descriptive Analysis, Sample of 34 respondents from different organizations, PPP Models	GoTs Plans and national development priorities, goals and involvement of the private sectors	Absence of bankable projects, low involvement of the private sectors widen the financing gap	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances
29	Posenau (2022,USA California	Debt and Water: Effects of Bondholder Protection on Public	Statistical inferential (Regression analysis) analysis, Pecking order theory, sample 600 water	Bond issues, Covenant threshold, debt service, revenue, expenditures, Wages, employment,	Tight bond covenants (conditions) influences financing gap inwater utilities	O&M costs in water pricing, Financial sustainability of

S/N	Author, Year and Country	Title	Method of Data Analysis and Theory Used, Sample Size	Variables Covered by the Study	Study Findings	Variables not Covered by the Study (Research Gap)
		Goods	utilities	water sold and systems problems		the water supply projects
30	Nagpal et al, (2020),USA	Mobilizing Additional Funds for Pro-Poor Water Services.	Descriptive analysis, Sample of 14 organizations, Global Philanthropy led funds model, Solidarity Levy Model and Land value capture model	Capital Expenditures (CapEx), Operation Expenditures (OpEx),and Capital Miantenance Expenditures (CapManEx)	Government and donor capital should continue financing water utilities, Utilities should be creditworthy before tapping repayable finance,	Financial sustainability of the water supply projects and conditions of the repayable source of finances
31	Wafula (2019),Kenya	Average Collection Period and Financial Performance of Nzoia Water Services Company.	Regression and Correlation Analysis,48 respondents, Price discrimination theory	Average Collection Period, Profitability and Financial Performance	Financing gapis triggered by poor financial performance resulting from long average collection s of account receivables	O&M costs in water pricing, Financial sustainability of the water supply projects and conditions of the repayable source of finances

Source: Researcher (2024)

2.5 Operationalization of the Variables

2.5.1 Operation and Maintenance Costs

This variable was examined in two dimensions: revenue sufficiency and cost recovery. Revenue sufficiency was measured by four indicators, such as tariff coverage without depreciation, tariff coverage with depreciation, billing value, and surplus or deficit in operation. The dimension of cost recovery was measured by seven indicators, which were environmental and resource costs, the percentage of electricity cost coverage, the relevance of tariffs with O&M costs, the O&M coverage effect on investment cost coverage, the exclusion of some O&M in tariff settings, and the political effect on O&M costs.

2.5.2 Financial Sustainability of the Water Supply Projects

The independent variable of financial sustainability in the water supply was divided into three dimensions, namely, project availability, project viability, and project financing and measured by 11 indicators. Project availability was measured by one indicator which is the number of projects under implementation and number of projects planned to be implemented. Project viability was measured by five indicators of Payback period of the Project, Cash flow versus initial investment, Billing value of the Project area against O&M costs, Cash flow coverage of credit facility of the Project and Return of the Project and project bankability was measured by four indicators namely Availability of water, Project cash flow O&M coverage, Sunk costs of the Projects and Projects costs in tariff design

2.5.3 Terms and Conditions of the Repayable Sources of Finance

The variable was divided into three dimensions of Access to repayable finance, conditions of repayabke finance and crediworthness of the water utilities.These dimension were measured by eleven indicators where;access to finance was measured by two indicators of existing of repayable finances and planning of repayable finances the dimension of Conditions was measured by six Interests rates of repayable finances, grace period, Loan repayment period ,Collateral demand, Bureaucratic approval of repayable finances and Water utility stock listing while dimension of creditworthiness was measured by three indicators such ; Bond bankable projects, Operating model and limitation of high costs

2.6 Research Gap of the Study

Despite significant empirical literature on the financing gap, as summarised in empirical literature matrix Table 2.1 above, there is little clarity on what drives the financing gap for water supply and utilities. There is growing agreement in various empirical studies regarding the key determinants of financing gaps in water supply and sanitation utilities.

2.6.1 Empirical Gap

Libeyet al. (2020) and Mohannty et al. (2020), argues that,misunderstanding of the costs of water supply and sanitation utilities is the key driver of the funding gap. Utilities have costs in cycle form, which should be clearly understood. Some costs, such as energy costs, should be reduced and matched against the sources of funds to minimise the funding cycle and the funding gap.

Other studies concentrated on the importance of the continued support of the government and donor partners and proper subsidy design. For example, Minero (2019) in Mexico, found that the centralised subsidy financing model widens the financing gap of the water supply utilities. Nagpal et al.(2020) established that the government and donor capital should continue financing water utilities to minimise the financing gap. Andres et al. (2020) found that poor subsidy design drives financing gaps in in water utilities. Goksu et al.(2019) in USA, found that the government must take actions such as reforming the sector, water utility reforms, and financing reforms to close the financing gap.

In addition to costs and continued support from the government in the form of subsidies, other researchers emphasised the efficiency aspect as the main determinant of the financing gap in water utilities. Hilbig and Rudolph (2020) found that sustainable financing and efficiency in water resources management determine the funding gap. Heidler et al. (2023) were of the view that the funding gap is closed by conducting institution reforms to increase water utility operating efficiencies rather than through increased commercialization and private sector participation, while Wafula (2019) revealed that the financing gap is triggered by poor financial performance resulting from long average collections of account receivables. Leckie et al. (2020) confirmed that water utility operating efficiency (on existing resources and expenditure) and the accuracy of data and capacity to tap into private finance determine the financing gap.

2.6.2 Contextual Gap

The majority of the reviewed empirical studies have little coverage of what determines the financing gap in water supply and sanitation utilities in the Ruvuma region. They were conducted in different locations in different countries. Libey et al. (2020), Miroga and Otieno (2022), Christine et al.(2021), Julius and Kalunda (2021), and Wafula (2019) conducted their studies in Kenya; Mohanty et al.(2020) examined the issue in India; and Minero (2019) investigated the matter in Mexico. Other studies include Nagpal et al.(2020), Goksu et al.(2019), conducted in the USA; Akomea (2020) carried out the study in Australia and Dickin et al. (2020) conducted in Sweden. With little coverage on this problem in Tanzania, there is a need to conduct a study regarding the financing gap in Tanzania to acquaint interested parties with knowledge of the financing gap.

2.7 Development of Hypotheses

Table 2.7.1 show the results of the hypotheses for three variables namely operation and maintenance costs,financial sustainability of the water projects and terms and conditions of the repayable finances. The hypotheses were tested and the results were observed frm the Multiple regression Analysis as summerzed in the table below.

Table 2.2 Hypotheses Test Results

Hypothesis	Variable	Unsta.Beta	P-value	t-value	Decision
H_1	O&M Costs	0.244	0.002	3.134	Reject
H_2	Financial sustainability	0.295	0.015	2.468	Reject
H_3	Terms and Conditions of repayable	0.559	0.000	3.895	Reject

Source: Researcher (2024)

From the Table 2.7.1 above show the hypotheses test results of the three variables namely O&M costs, financial sustainability and terms and conditions of repayable finances. The first hypothesis (H_1) was that; There is no positive relationship between operation and maintenance and financing gap in water supply and sanitation utilities. The result shows that, for each unit change in operation and maintenance costs, the dependent variable of the financing gap changed by 0.244 units (unstandardized beta = 0.244), holding other variables constant, this depict that there a positive and moderate effect on the financing gap by operation and maintenance costs at $t(3)=3.134, p<0.05$ this implies that operation and maintenance costs influences the financing gap, this lead to a rejection of the null hypothesis that; *There is no positive relationship between operation and maintenance and financing gap in water supply and sanitation utilities*

The second hypothesis (H_2) was that; There is no positive relationship between financial sustainability of the water supply projects financing gap in water supply and sanitation utilities. The result shows that, for each unit change in financial sustainability, the dependent variable of the financing gap changed by 0.295 units

(unstandardized beta = 0.295), holding other variables constant, this depict that there a positive and moderate effect on the financing gap by operation and maintenance costs at $t(3)=2.468, p<0.05$ this implies that, financial sustainability of the water supply projects influences the financing gap. This lead to a rejection of the null hypothesis that; *There is no positive relationship between financial sustainability of the water supply projects and financing gap in water supply and sanitation utilities*

The third hypothesis (H_3) was that; There is no positive relationship between terms and conditions of the repayable finance and financing gap in water supply and sanitation utilities. The result shows that, for each unit change in terms and conditions of repayable finances, the dependent variable of the financing gap changed by 0.559 units (unstandardized beta = 0.559), holding other variables constant, this depict that there a positive and moderate effect on the financing gap by operation and maintenance costs at $t(3)=3.895, p<0.05$ this implies that terms and conditions of the repayable finance statistically influences the financing gap. This lead to a rejection of the null hypothesis that; *There is no positive relationship between terms and conditions of the repayable source of finances and financing gap in water supply and sanitation utilities*

2.8 Conceptual Framework of the Study

The conceptual framework in Figure 2.1 depicts the relationship between the dependent variable (the financing gap) and three independent variables, as well as its measurable indicators.

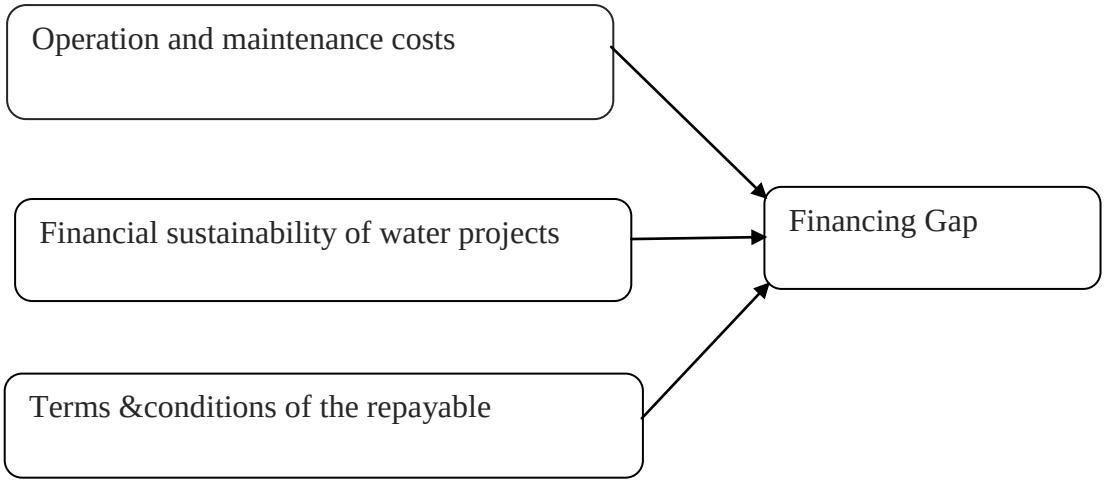

Figure 2.1: Conceptual Framework .Source: Researcher (2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Chapter Overview

This chapter provides clarifications of the core research paradigms and methods that were adopted in the study in order to answer the research questions identified. It highlights the research process, including the target population, sampling procedures and size, selection of the participants, data collection, and analysis techniques.

3.2 Research Philosophy

Research philosophy refers to the researcher's thoughts and beliefs, which guide the overall process of investigating research phenomena, including the selection of the research problem, designing the research questions, determining the nature and reality, knowledge methodology, and value of research work (Khatri, 2020). This study was guided by a positivist research philosophy. According to Mauthner (2020), under positivism philosophy, researchers have been believing that the research measurement instruments are understood because they are objective and neutral, and their correct application yields truth and facts.

The reasoning behind application of Positivism philosophy under the study was due to objectivity and clear hypothesis testing. The philosophy emphasizes objectivity and the use of observable, empirical evidence to minimize bias and encouraged encourages the formulation of clear, testable hypotheses, allowing researchers to determine causal relationships and assess the validity of theories (Bryman, 2019). The philosophy also enhance replicability as it designed to be replicable, which

strengthens the credibility and reliability of finding (Saunders et al., 2019). It favored the use of quantitative data, which can be analyzed statistically, facilitating objective conclusions (Creswell & Creswell, 2019).

3.3 Research Approach and Design

The researcher employed a deductive research approach. Under this approach, conclusions conclusion was logically derived from a set of theory-derived premises. The approach involved making inferences or conclusions based on the ground that, when things that came before the study are true based on evidence, obviously the conclusions drawn are true (Saunders et al., 2019). Deductive research philosophy was the choice of study because it facilitated the testing of the hypotheses formulated for research questions. The approach enabled the researcher to conduct comparability because the degree of consistency of the research items was maintained. (Casula et al., 2021).

Jilcha (2020) defined research design as the choice made by the researcher relating to the research approach. The study applied an explanatory research design to investigate the determinants of the financing gap in water supply and sanitation utilities, with a total sample size of 100 respondents selected through a simple random sampling technique. The design suited the study because it was easier for researchers to apply descriptive techniques such as frequency distribution to some demographic variables and conduct tests of the variables (Baldwin, 2022). The design provided a chance for researchers to test for correlation of the data and perform predictive role of the variables (Mõttus et al., 2020).

3.4 Research Strategies

This Study employed survey research strategy. The choice of this strategy was due to its easiness and cost effective for the researcher. Because of the larger sample selected to represent the target population the strategy lead to the valid findings of the study (Booker et al., 2021). Under survey strategy, researcher was able to collect and quantify the collected data using structured questionnaire items and statistically analysed the data to describe patterns about responses. The researcher was able to test the hypotheses and interpreted the meaning of the data in finding sections from various the statistical tests (Creswell & Hirose, 2019).

As recommended by Taherdoost (2021) researcher followed due procedures in survey research strategy including, understanding the aim of the study, designing techniques of data collection and sampling techniques, testing the research instruments, conduct pilot tests modify the tests, select samples, train research assistants, conduct survey, gather and analyse the data.

3.5 Research Choice Methods

The study used a quantitative research method. The method suited the study because it produced numerical data and helped the researcher establish the cause-and-effect relationship between the variables that underpin the subject of the study. The method allowed the use of mathematical and statistical methods to analyse the variables (Ahmad et al., 2019). Under quantitative research, it was very easy for researchers to decide what type of respondents should be asked the questions, modify questions and quantify the responses from participants, analyse the data using statistical techniques,

and conduct interviews in an unbiased and objective manner. The method matches the positivism and deductive research approaches employed (Mohajan, 2020). According to Gagani (2019), the principles of quantitative research methods are in congruence with the positivism theoretical stance that reality is always there, waiting to be discovered by scientific methods through appropriate measurement techniques.

3.6 Study Area

A study was conducted on water supply utilities in the Ruvuma region. The water utilities in this region are Songea, Mbinga, and Tunduru Water Supply and Sanitation Authorities. The study area was of high interest to the researcher because water supply services in these areas are still lagging behind due to high financing gap. The total daily water demand of the area is 26,891 m^3/day, while their total installed water production capacity is 19,468 m^3/day. This implies that there is shortage of water. The water network extension of the area serviced by these water utilities is 620 km, with a connection of 25,042 customers.Their areas of responsibility have a served by the water utilities.Utilities in this region experience huge financing gap, high operation and maintenance costs,water projects are not providing adequate return on investment and they are not largely financing their operation with repayable sources of finance.

3.6.1 Justification for Choosing Study Area

Ruvuma region faces significant challenges related to outdated or insufficient water infrastructure, which directly impacts operational costs and pricing. Examining these

factors can provide insights into the financing gap and potential solutions. Many communities in Ruvuma experience inconsistent water supply, highlighting the need for a focused study on the financial aspects that underpin these service delivery challenges. The Tanzanian government has identified improving water access and sustainability as a priority. Studying the Ruvuma region aligns with national goals and can inform policy decisions aimed at closing the financing gap in water utilities.

Findings from the Ruvuma region could lead to practical recommendations that can be implemented not only locally but also in other similar regions facing financing challenges. There may be a scarcity of research specifically focusing on the financing gap in water utilities within the Ruvuma region. Conducting this study has filled an important knowledge gap and contribute to the academic and practical understanding of water financing in rural settings. By focusing on this region, the research explored innovative financing models that could be adapted to similar contexts, offering valuable lessons for other regions in Tanzania and beyond.

3.7 Study Population

Population is the group of items, units, or objects that are under study. During the study, part of the population was sampled, from which data was collected, and a conclusion was drawn for the entire population (Bhatt, 2020). The population of interest under this study consists of all directors, managers, and senior officers of three 3 Water supply and sanitation utilities in the Ruvuma region. Water utilities in the study area have 133 staff, as categorised below.

Table 3.1: Population Distribution

Category	No	% of total population
Directors	6	5
Managers	19	14
Senior officers	108	81
Total	**133**	**100**

Source: Field Data (2024).

The Table 3.1 above summarizes the total population and the percentage for each demographic category. The overall total of 133 represents the total population being studied, ensuring clarity in understanding the distribution across different demographic dimensions. The population of interest distribued as depicted Table 3.1 above were larger percentage (81%) were senior officers that is 108 respondents came fom senior officers,19 managers making 14% of the popumation and finally directors comprises small number of the population that is 6 making 5% of the entire population.

3.8 Sampling Strategies

Researchers used sampling strategies to create representative samples from bigger populations by selecting a smaller number of units from each community (Haute, 2021). Probability sampling strategies were employed by the researchers in this investigation. This method counts the population and ensures that every member has an equal chance of being chosen because all sampling units are equally representative of the population (Rahman et al., 2022). Using a basic random sampling technique, all study subjects were assigned equal weight within the target population. This method was chosen by the researchers because it allowed them to

obtain accurate and comprehensive responses from the respondents under the probability sampling strategy. The sampling techniques were also preferred by the study because they ensured that no systematic biases occurred in the sample selection process. A random number generator was assigned to the total population to select the sample of 100 participants (Mweshi & Sakyi, 2020).

3.9 Sample Size

Sampling is the act of a researcher carefully choosing, through probabilistic or non-probabilistic means, the number of individual items from the population of interest for the study. Sample size refers to the number of individual items or cases chosen for the study to yield the information that will represent the entire population of the study (Mweshi et al., 2020). The total population consisted of 133 respondents, which include water utility, directors, managers and senior officers in the water supply and sanitation utilities of Ruvuma region.

A Confidence level of 95% was set. This means that, researcher was 95% certain that the sample data reflected the population of the study area. More over researcher set a margin of error of 5% as the the amount of error that was acceptable in the results. Since the margin of error was smaller, the sample size preferred by the researcher was to be larger in size. Finally sample size was calculated based on Taro Yamane's (1967) simplified formula for sample size calculation as described hereunder;

$n=N/[1+[N\ (e)^2]]$ where:n-is the sample size determined ,N-is the population under the study

e-is the level of precision or margin of error or probability of error. From the formular above,

N =133, e=0.05

$$= \frac{133}{1+133(0.05)2}$$

n= 99.8

Since it was not possible to have a fraction of respondent the value of 99.8 sample size was rounded to the nearest whole number which lead to have sample size of n=100

3.10 Sample size Distribution

Thus a sample size of the population under this study comprised 100 respondents The sample size has been distributed on prorate basis (Proportion). Basing on prorata basis, 5 of the sample size are directors,14 managers and 81 senior officers as distiributed in the table in Table 3.2.

Table 3.2: Sample size Distribution

Category	No	% of total population
Directors	5	5
Managers	14	14
Senior officers	81	81
Total	**100**	**100**

Source: Field Data (2024)

The Table 3.2 above summarizes the total sampling size and the percentage for each demographic category. The overall total sample of 100 represents the total sample size of the study. The sample size of interest distribued as depicted in the Table 3.2 above where larger percentage (81%) were senior officers (81) respondents came fom senior officers,14 were managers making 14% of the sample and finally directors comprises small number of the sample that is 5 making 5% of the entire population.

3.11 Variables and Measurements

A study applied a five-point Likert scale ranging from 1 strongly disagree to 5 strongly agree to measure the financing gap (dependent variable and three independent of O&M costs in water pricing, financial sustainability of the water supply projects, and terms and conditions of the repayable sources of finance). 40 indicator item statements were used to measure the variables of the study to determine the influences of the financing gap in water utilities.

One dimension (access to finance) with eight indicator item statements was used to determine the level of financing gap water supply utilities (Vethaghanastri Gunasagar et al., 2022). Examples of item statements are: ’Our utility experience financing gap because it has not acquired loans, bonds, or bought shares from the stock exchange market because of the unfavourable conditions associated with these repayable sources of finances" (access to finance); ‘’Our water utility experience financing gap because it doesn’t have bankable projects acceptable to financial institutions on hand for soliciting funds’’ (access to finance)

Two dimensions (revenue sufficiency and cost recovery) with eleven (11) indicator items were used to measure the O&M costs in water pricing (Mulewa et al., 2024; Julius et al., 2021).. For example, in the item statement that ‘’Our daily operation is likely to be affected by high electricity expenses that are not fully covered by existing tariff rates (cost recovery), Low investment (water network expansion) from internal revenue collection is due to high O&M costs (revenue sufficiency).

Financial sustainability was measured by three dimensions (project availability, project viability, and project financing), with eleven indicators and item statements used to measure the financial sustainability of the water supply projects (Mawia Julius & Kalunda, 2021). Examples of item statements were: Currently, we have a water supply project completed or under implementation (project availability); the billing value from the current customer connections made in the project area is not sufficient to cover the O&M costs of the project area (project viability); and some of the O&M costs of the project area are covered by the revenue collection from other areas or zones of the water utility (project financing).

The variables of the terms and conditions of the repayable source of finance were measured by three dimensions: repayable finance access to utilities, repayable finance conditions, and creditworthiness. Ten indicator item statements were applied to measure the variables of the terms and conditions of the repayable source of finance in water supply utilities (Oshora et al., 2021). Examples of indicator statements "Currently, we have or have acquired a repayable source (a loan, bond, or equity share) of finance for our utility financing’’ (repayable source of finance availability); we are reluctant to acquire the repayable source of finance in our water

supply utility because of high interest rate charging'' (Terms and Conditions of Repayable Finance); and we face difficulties in acquiring the repayable source of finance in our water supply utility because of collateral demand by financiers (financial institutions)" (Creditworthiness.

Table 3.3 : Variables and Measurements

Variable	Type of Variable	Code	Indicators Summary Descriptions	No of Indicators	Source	Scale type
Financing Gap	Dependent Variable	FGW1	FGW1: Funds for O&M costs	7	Vethaghanastri Gunasagar et al. (2022)	Likert Scale
		FGW2	FGW2: Underestimate of tariff			Likert Scale
		FGW3	FGW3:O&M costs against cash flows of Projects			Likert Scale
		FGW4	FGW4: Return on water supply Projects			Likert Scale
		FGW5	FGW5: Conditions of Loans, Bonds and Shares			Likert Scale
		FGW6	FGW6: Extent Account Payables			Likert Scale
		FGW7	FGW7: Acceptability of water projects by financiers			Likert Scale
O&M costs in water pricing	Independent Variable	OMW1	OMW1: O&M tariff coverage without depreciation	11	Julius et al . (2021),Mulewa et al .(2024).	Likert Scale
		OMW2	OMW2: O&M tariff coverage with depreciation			Likert Scale
		OMW3	OMW3: Billing value coverage of O&M costs			Likert Scale
		OMW4	OMW4: Surplus or deficit reporting			Likert Scale
		OMW5	OMW5: E&R costs coverage			Likert Scale
			OMW6: Electricity costs coverage			Likert Scale

Variable	Type of Variable	Code	Indicators Summary Descriptions	No of Indicators	Source	Scale type
		OMW6	OMW7: Relevant of tariff with real O&M costs			Likert Scale
		OMW7	OMW8:O&M costs coverage effect on Investment			Likert Scale
		OMW8	OMW9: O&M costs coverage effect on Account payable settlement			Likert Scale
		OMW9	OMW10: Exclusion of O&M costs in tariff setting			Likert Scale
		OMW10	OMW11: Political pressure effect on financing gap			Likert Scale
		OMW11				Likert Scale
Financial Sustainability of the water supply Projects	Independent Variable	FSW1	FSW1: Project implemented or under implementation	11	Julius et al. (2021)	Likert Scale
		FSW2	FSW2: Plan to implement Project			Likert Scale
		FSW3	FSW3: Payback period of the Project			Likert Scale
		FSW4	FSW4: Cash flow versus initial investment			Likert Scale
		FSW5	FSW5: Billing value of the Project area against O&M costs			Likert Scale
		FSW6	FSW6: Cash flow coverage of credit facility of the Project			Likert Scale
		FSW7	FSW7: Return of the Project			Likert Scale
		FSW8	FSW8: Availability of water			Likert Scale
		FSW9	FSW9: Project cash flow O&M coverage			Likert Scale
		FSW10	FSW10: Sunk costs of the Projects			Likert Scale
		FSW11				Likert Scale

Variable	Type of Variable	Code	Indicators Summary Descriptions	No of Indicators	Source	Scale type
			FSW11: Projects costs in tariff design			
Conditions of the repayable source of finances	Independent Variable	CRW1 CRW2 CRW3 CRW4 CRW5 CRW6 CRW7 CRW8 CRW9 CRW10 CRW11	CRW1: Existing of repayable finances CRW2: Planning of repayable finances CRW3: Interests rates of repayable finances CRW4: Grace period CRW5: Bureaucratic approval of repayable finances CRW6: Collateral demand CRW7: Bond bankable projects CRW8: Water utility stock listing CRW9: Operating model CRW10: Limitation of high costs CRW11: Loan repayment period	11	Oshora et al. (2021)	Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale Likert Scale

Sources:FieldData,(2024)

3.12 Data Collection Methods

The study used the questionnaire technique as a means of data collection. The technique suited the study as it provided the researcher with an opportunity to collect a large amount of data from a larger sample, saved time, minimised the cost of the study, and obtained accurate data. The method made the process of analysing data easier, and in most cases, it involved people instead of the researcher (Taherdoost, 2021). In this technique, the researcher used a short explanation of 40 statements about the specific variables and five questions to gather data on demographic variables from all 100 respondents. The questions were designed in chronological order, and the instrument fit the study because it enabled the researcher to reach many respondents who were spread over a wide study area. The techniques provided a room for researchers to design short statements concerning the research topic and variables of interest, and respondents were required to respond to them in an easy way (Mazhar et al., 2021).

3.13 Reliability and Validity of the Research Instruments

The researcher conducted a test of reliability and validity to determine whether this study yielded beneficial results. Reliability is an indicator of the stability of the research instrument in measuring the values in repeated measurements under the same scenario using the same instrument, while validity refers to whether the measuring instrument measures the behaviour or quality it intends to measure. It is unveiled by the academic literature that both phenomena of reliability and validity must be tested, as an instrument may be reliable but not valid, but when a measuring instrument is reliable, it is likely to be valid, and likewise reliability alone is not

sufficient to reflect the desired quality of the measurement (Sürücü & Maslakçi, 2020).

In this study, the reliability and validity of the research instrument (questionnaires) were determined using Cronbach's alpha value as an estimator of reliability and validity using Coefficient Alpha. The value of Cronbach's alpha (internal consistency) was expressed as a number ranging from 0.00 to 1.00 using statistical software. The value of 0 indicated no consistency in measurement, and 1 indicated perfect consistency in measurement. The acceptable interval was set to range from 0.7 to above (Adeniran 2019). The ranges of the Cronbach's value were intervalized in Table 3.4.

Table 3.4: Reliability Interval Ranges

Cronbach's Alpha	Internal Consistency
Above 0.9	Excellent
0.8-.09	Good
0.7-0.8	Acceptable
0.6-0.7	Questionable
0.5-0.6	Poor
Less than 0.5	Unacceptable

Source: Researcher (2024).

3.13.1 Test results of Relibility and Validity

Items that seemed to affect the reliability of the data were deleted, and the analysis remained with 30 items. The results of the reliability test for the three independent variables using Cronbach's alpha value were as shown in Table 3.5.

Table 3.5: Reliability Statistics Results

Variable Name	Variable Code	Cronbach's Alpha	No of Items
O&M Costs	OMW	0.754	9
F Sustainability	FSW	0.741	10
T Conditions	CRW	0.762	11

Source: Compiled by researcher (2024).

The result from Table 3.5 shows that all variables under study had a reliability Cronbach's value of more than 0.7, which indicates that questionnaire items were stable and consistent over time, as they were able to yield the same results if a particular measurement was repeated in different contexts.

3.14 Data Analysis Methods

Data analysis is the act of organizing, sorting, coding and categorising the data to formulate hypotheses and work upon them. Since this study is quantitative, parametric methods using both descriptive and inferential data analysis were applied (Nasir & Sukmawti, 2023). The researcher carried out procedures such as data data gathering ,cleaning and coding, descriptive study techniques and infrerential statistics.

3.14.1 Data Coding

Structured questionnaires were designed to collect data from your sample of 100 respondents. Ensure the questions were designed to capture relevant quantitative metrics related to operational costs, pricing, financial sustainability, and terms and conditions of repayable finances. Values of data were entered in statistical software

(SPSS) where missing values, outliers, and inconsistencies were checked. The missing or outliers were addressed by removal, imputing, or correction of data as appropriate. Coding of key variables under study were made such that Operation and Maintenance costs in water supply utilities was coded as OMW, financial sustainability of the water supply projects was coded as ‘’FSW) and Terms and Conditions of the repayable finance in water supply utilities were assigned code of ‘’CRW) as well as financing gap (dependent variables) of water supply utilities was coded as FGW. Each variable was divided into statements and responses were rate using Five Likert Scale such that 1- Strongly disagree2-Disagree,3-Neither agree nor disagree, 4-Agree, and 5- Strongly disagree . For demographic variables categorical responses such as Age, Gender, Level of education, Marital Status, Staff occupation/cadre were categorized using numbers 1,2,3 4,5 and 6 to facilitate quantitative analysis were used.

3.14.2 Descriptive Statistics

Researchers used a range of descriptive statistics techniques. Techniques such as measures of central tendencies (Mean and Standard deviation) frequency distribution tables, and measures of dispersions such as standard deviations were calculated to describe distribution of the the sample data selected. The descriptive statistic data analysis enabled the researcher to combine data that were grouped into attributes or variables to describe the typical values and spread of values for the data set. Statistic techniques such as mean, standard deviations, and indicators of the distribution such as frequency of values were analysed by the use of descriptive analysis (Guetterman, 2019).

3.14.3 Inferential Statistics

In order to investigate how one or more variables, predict another variable, Multiple Linear Regression Analysis (MLRA) was used in the study. Key outputs such as the F-Statistic and its significance level, the p-value of ≤0.05 to ascertain whether the model systematically accounts for variance in the dependent variable (financing gap) under study, and the R2 value to gauge the extent to which independent variables account for variance in the dependent variable in the model were examined by the researcher in order to evaluate the regression analysis. The model may have considered the residuals for random errors and outliers, as well as the significant coefficient for each of the three independent variables (Guetterman, 2019). A researcher used multiple linear regression analysis (MLRA) to examine the relationship between the study's independent variables and make predictions because there were multiple of them. The MLRA was guided by the following mathematical experession;

$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\ldots\ldots\ldots\ldots\ldots\ldots\ldots\beta_nX_n$

Where;

Y= Dependent variable (Financing gap),X_s = Independent variable, β_0 = The Y-intercept (The value of Y where X=0, β_1, β_2, β_3 = The coefficients of the independent varaibles (X_1,X_2 and X_3), X_1 = Operation and maintenance costs in water pricing, X_2= Financial sustainability of the water supply projects, X_3 =Terms and conditions of the repayable source finances

Before conducting multiple linear regression analysis (MRA), the researcher tested five basic assumptions to determine if the selected parametric linear regression analysis technique suited the study. The assumptions tested by the study include

normality, linearity, homoscedasticity (heteroscedasticity), multicollinearity, and outliers. The results of the test of these assumptions are detailed and described in the findings, results, and discussion chapter.

3.14.4 Analysis of Variance (ANOVA)

Analyis of Variances ANOVA was used to determine whether the regression model as a whole significantly predicts the outcome variable. It compares the model with all predictors to a model with no predictors (the mean), testing the null hypothesis that all regression coefficients are equal to zero. It was used to break down the total variance in the dependent variable into components attributable to different sources, such as the regression model and the residuals. This facilitated an understanding of how much of the variability in the dependent variable (Financing gap) explained by the predictors. By this analysis techniques researcher was able to extend to look at the significance of individual

3.15 Data Cleaning Process

Data cleaning is the process of identifying and removing imperfect, incorrect, incomplete, inaccurate, or irrelevant parts of the data. The process involved the identification of incorrect, invalid, or duplicate entries in the data set. It was the step conducted before data analysis, where data were pre-processed and transformed into normal values. During the study, the researcher understood that the cleaning of data makes them quality; this quality was determined by the extent to which the data meet specific needs (Oni et al., 2019). During the data cleaning process, the frequency descriptive statistics were run in statistical software, where all the data items of the

variables under study appeared, and the identification of the outliers and missing or invalid data were detected and corrected as normal.

3.16 Ethical Consideration of the Study

Sobocan et al. (2019) viewed ethics as the consideration of right and wrong doings that may be embodied in principles such as beneficence, justice, fairness, laws policies, and codes. The need for attention to ethics in research must consider their impact on the lives of the subject in question and the appropriateness of the method used. Ethics is the branch of philosophy that deals with the moral conduct of people and guides the norms or standards of behaviour of people and their relationships with each other.

Under this study, the researcher understood that he should protect the dignity of the subject and publish well-researched information, which is an imperative in the ethical consideration of the research. The ethics consideration under this study was guided by the two philosophical standpoints of teleological and deontological views. While the former holds that the ends served by the research justify the means and that the benefits of research findings should be compared against the cost of acting unethically, the latter implies that the ends served by research can never justify the use of research, which is unethical, but they are considerations that make an action or rule right besides the goodness or badness of its impacts (Thorpe, 2024).

This study adhered to ethical practices, including obtaining a prior official introductory letter from the Open University of Tanzania for access to data from the respondents.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Chapter Overview

This chapter presents the analysis and interpretation of the raw data to provide descriptive results of the study. The chapter shows how respondents responded to various research questionnaires. Demographic data results and various descriptive and inferential statistical tests were clearly summarised and presented in the chapter. The chapter also shows the key findings of the study and correlates the findings with previous scholarly works in the discussion section.

4.2 Demographic Results of Resondents

The demographic variables under study were age, gender, level of education, marital status, and occupation or grade of the respondents. The data set of the demographic was entered in software with defined codes where: age was coded as (1 = 18–25 years, 2 = 26–35 years, 3 = 36–45 years, and 4 = 46 and above years), gender was coded as (1 = male and 2 = females), level of education was coded as (1 = certificate, 2 = diploma, 3 = bachelor degree, and 4 = master degree), marital status was coded as (1 = single, 2 = married, 3 = separated, 4 = widow, and 5 = divorced), occupation/cadre was coded as (1 = engineer, 2 = accountant, 3 = economists, 4 = procurement specialist, 5 = auditor, 6 = marketer, and 7 = other. Table 4.1 show the demographic results of respondents.

Table 4.1: Demographic Results of Respondents

Age	**Frequency**	**Percent**	**Cumulative Percent**
18-25 years	11	11	11
26-35 years	38	38	49
36-45 years	38	38	87
46 years and above	13	13	100
Total	100	100	
Gender	**Frequency**	**Percent**	**Cumulative Percent**
Female	38	38	38
Male	62	62	100
Total	100	100	
Education level	**Frequency**	**Percent**	**Cumulative Percent**
Diploma	14	14	14
Bachelor degree	72	72	86
Master degree	14	14	100
Total	100	100	
Marital status	**Frequency**	**Percent**	**Cumulative Percent**
Single	28	28	28
Married	70	70	98
Separated	1	1	99
Widow	1	1	100
Total	**100**	**100**	
	Frequency	**Percent**	**Cumulative Percent**
Engineer	16	16	16
Accountant	29	29	45
Economist	14	14	59
Procurement	17	17	76
Auditor	9	9	85
Marketer	15	15	100
Total	**100**	**100**	

Source: Field Data (2024).

4.2.1 Implications of the Demographic Results

Age: show that the majority of the respondents in the sample have an age range of 26–35 years and 36–45 years, which makes a total of 76% (38% of which 26–35 years and 38% for 36–45 years) of the sample. This shows that most of the respondents are of maturity age. Mature respondents often more tech-savvy and may prioritize modern solutions like smart water management systems. They might

advocate for innovations in water delivery and management. May emphasize the reliability and quality of existing services, focusing on infrastructure maintenance and sustainability. Their needs could lead to calls for increased funding in these areas.

Gender: As depicted in Table 4.1, male respondents comprise 62% of respondents, while female respondents make up a total of 38% of respondents. This result tells us that the gender ratio of the majority of water supply utilities is still unequal.This implies that, Gender disparities in access to resources may lead to unequal service provision. Addressing these disparities can reduce the financing gap by ensuring that all demographics are served adequately. For example Women often play critical roles in community advocacy. Their involvement can mobilize support for funding initiatives and help align financing with actual needs

Education: In the context of education, the results in Table 4.2 show that most of the respondents in water utilities have a bachelor's degree level, which is 76% of the sample. This indicates that the majority of the respondents who responded to the questionnaires have sufficient education and expertise in their respective professions.This implied that, higher education levels made greater awareness of water issues and financing mechanisms, enabling individuals to advocate effectively for improved services and funding

Marital status: The results in Table 4.1 further show that 70% of the participants were married. This implied that, Incorporating marital status as a demographic variable in analyzing the financing gap in water utilities provided a nuanced

understanding of how household dynamics affect water usage, payment behavior, and advocacy. For example Married respondents, especially those with children, may have heightened awareness of water quality and availability issues, leading to more vocal advocacy for better funding and services.

Occupation/Cadre: In the occupation aspect, the results show that most of the respondents were accountants, which is 29%, followed by procurement specialists (17% and engineers (16% Marketers earn 15% each, and economists earn 14%. This result implies that the majority of the participants had adequate knowledge of the financing gap for the water supply utility. Understanding the implications of respondents' cadre, such as economists and accountants, in the context of the financing gap in water utilities allows for a more informed analysis of the challenges and opportunities within the sector. By leveraging their expertise, stakeholders can develop more effective financing strategies, promote sustainable practices, and ultimately work towards closing the financing gap in water utilities.

4.3 Decriptive Results

4.3.1 Operation and Maintence Costs

The first objective of the study was to assess the influence of operation and maintenance costs on the financing gapb with the average mean of .The results of the respondents on the impacts of the operation and maintenance costs on financing gap is summerized in Table 4.3.1

Table 4.2: Descriptive results of O&M Costs

Question Statement	M	SD	Decision
Tariff coverage on O&M costs	3.95	0.97	Low responses
O&M cost Coverage including depreciation	4.24	0.83	High responses
Revenue generation from Billing	4.14	0.8	Low responses
Deficit or Surplus in Presence or absence of Grants	4.17	0.8	High responses
Environmental and Resource cost coverage	4.07	0.81	Low responses
Effect of electricity expenses and its coverage	4.14	0.78	High responses
Relevance of tariff in use against current O&M costs	4.18	0.67	High responses
Water network expansion with internal revenue	4.22	0.79	High responses
Extent of debts in relation to tariff in use	4.24	0.73	High responses

M= Mean, SD=Standard deviation, Mean Average=4.15

From Table 4.2 aboves results show that, when respondents asked on tariff coverage on O&M costs and revenue generation from billing,respondents reacted with low responses at (M= 3.95,SD=0.97, and M=4.14,SD=0.80) which is below the average mean of 4.15, but when asked on O&M cost coverage including depreciation,respondents reacted with high responses at (M = 4.24,SD = 0.83) this implies that with an increases O&M costs including depreciation expenses in water supply and sanitation utilities, widen to the financing gap. This result also shows that depreciation expenses are the critical component of O&M costs, which, if not considered,this may lead to a larger financing gap in the water supply utilities.

When asked on absence of government support in terms of grants O&M cost respondents showed high responses results at (M= 4.17,SD = 0.80) which is above the average mean of 4.15. This also gives evidence that the government should not totally abstain from continually supporting the financing of water utilities. The effect of high electricity expenses resulted high responses at (M= 4.14,SD = 0.78) this

implies that, electricity expenses affect O&M costs for water supply and sanitation utilities, which widens the financing gap in the water sector. The results provide evidence that a larger percentage of the utilities O&M costs constitute electricity expenses, and it is one of the key O&M cost components that drives the financing gap.

Respondents also showed a high responses on the relevance of the existing tariff at (M = 4.18,SD = 0.67),this is above thea mean (M=4.15) which signifies that, the majority of the water supply and sanitation utilities operate with outdated tariffs, which impacts their operation financing. Participants also showed a high responses at (M=4.22,SD=0.79) this is also higher than average mean (M=4.15).This finding reveals the reality that O&M costs consist of a large percentage of the water utilities is spending, and the costs contribute more to the financing gap in water utilities due to the underestimation of low consideration from various sources of finances. Similarly, when asked on the extent of debts (Account Payables) in relation to tariff in use participants responded with high responses at (M=4.24,SD=0.73) this is above the mean (M=4.15) ,this signifies that the increase of account payables in water utilities is due to low tariff which fail to cover O&M costs.

4.3.2 Financial Sustainability of the Water Supply Projects

The second objective of the study was to determine the influence of Financial sustainability of the water Projects on financing gap in water supply and sanitation utilities.The results of the respondents on the impacts of the financial sustainability of the water supply projects on financing gap is summerized in Table 4.3.2

Table 4.3. Response Results on Financial Sustainability

Question Statement	M	SD	Decision
Existence of completed water projects	3.88	1.04	Low responses
Planning in place to implement water projects	4.17	0.92	High responses
Pay pack period to recover investment	4.10	0.89	Low responses
Project cash flows to cover the initial investment	4.11	0.87	Low responses
Billing value of the project area to cover O&M costs	4.00	0.89	Low responses
Project cash flows to cover loans granted for project	4.13	0.77	High responses
Return on investment (Negative or Positive?)	4.19	0.69	High responses
Availability of water in Project area	4.18	0.88	High responses
Full coverage of O&M costs from the project area	4.15	0.82	High responses
Values of some costs of the projects during preliminary stage	4.31	0.72	High responses

M= Mean, SD=Standard deviation, Average Mean=4.122

From the table 4.3.2 Whe participants asked on the planning in place to implement water supply projects there were high responses at (M= 4.17,SD= 0.92) at higher rates compared to the mean average (M=4.122). This results revealed that there is high awareness among the participants that water supply and sanitation utilities projects and their sustainability determines the extent of financing gap. When asked with the statement that if the grant financed the project, it could be a loan, the cash flow generated from the project area could not be sufficient to settle the monthly repayment, participants showed high responses at (M = 4.13,SD= 0.77)this is above the mean average (M=4.122). This implies that the project area is not generating cash

flows sufficient to pay for the for the initial investment which ultimately exacerbates the financing gap conditions in water utilities.

Findings from table 4.3.2 further show that,that the return generated by the water infrastructure investment is low compared to the required return, as respondents also reacted with a high responses above the mean M=4.122 at (M=4.19,SD= 0.69) when asked with the statement that, "Return on Investment (Revenue-Initial Investment Cost)/Initial Investment Cost of the Project may currently stand at a negative value." Evidence from the findings also indicates that there is still a still a scarcity of water supply services in the project are this hamper revenue collection from the project area and increase financing gap . For example, at a (M= 4.18,SD = 0.88)

Further, respondents also showed high responses on the statement that, full cost recovery of O&M in projects area which signifies low financial sustainability increase on financing gap at (M= 4.15,SD= 0.82), high responses also observed when respondents to rate the initial cost of the projects during preliminary stage. They gave high responses at (M=4.31,SD=0.72 which was above the mean (M=4.122).This implied that high financing gap is also attributed by some initial costs incurred by water utilities during preliminary stage which makes projects unsustainable and eventually increase in financing gap.

4.3.3 Terms and Conditions of the Repayable Finances

The third objective of the study was to assess the influence of conditions of the repayable sources on Financing gap in water supply and sanitation utilities. The results of the respondents on the impacts of the operation and maintenance costs on

financing gap is summerized in Table 4.3.3

Table 4.4 Descriptive results of Terms and Conditions of Repayable Finances

Question Statement	M	SD	Decision
Existence of repayable finance source (Loan, Equity, Bond)	3.92	1.021	Low responses
Planning in place for repayable finance source of finance	4.17	0.92	High responses
Impacts of high interest rate on acquisition of repayable finances	4.12	0.83	Low responses
Impacts of grace period on acquisition of repayable finances	4.12	0.87	Low responses
Approval procedures on acquisition of repayable finances	4.00	0.85	Low responses
Difficulties to acquire of repayable finances due to collateral	4.13	0.76	Low responses
Presence of the bankable projects	4.18	0.67	High responses
Listing status of a water Utility in Stock Exchange Market	4.24	0.79	High responses
Operating model of water Utility (Business on Non-Business)	4.23	0.71	High responses
Extent of revenue generation against repayable finance servicing	4.38	0.70	High responses
Repayment and repayment period f of repayable financing	4.28	0.62	High responses

M=Mean, SD=Standard deviation, Average Mean=4.16

From Table 4.3.3 aboves results showed that, water utilities have shown high interest in acquiring any form of repayable finance. This has been evidenced by the finding of the statement that ‘’We are planning to acquire a repayable source (a loan, bond, or equity share) of finance for our utility financing in the future’’ where the respondents showed high responses at a (M= 4.17,SD = 0.92) above the average of M=41.6

Moreover, the findings indicate that water supply and sanitation utilities are currently not constrained by interest rates, grace periods, bureaucratic procedures for loan approval, or collateral demand from financiers. When participants were asked on the issue of interest rate,grace period,approval procedures and collateral demand on their acquisition demand their responses were low at (M= 4.12,= 4, and M = 4.13, and SDs of 0.83,0.87,0.85 and o.76) respectively; these were all below the weighted average M = 4.16.

The findings further revealed that the majority of the respondents of the water supply utilities were concerned about their projects bankability, models of operation, revenue stems from tariffs, and high loan repayments, which act as barriers to their financing. For example, when asked with the statement of bankable projects existence respondents reacted with high responses at (M = 4.18,SD = 0.67) which is above the mean (M=4.16) . Findings from Table 4.3.3 also show that,most of the utilities are not listed in Stock Exchange Market a conditions which constraint their operation to the access of repayable finances. Results show that at (M=4.24,SD=0.79,)participants reacted with high responses that,they are not able to access repayable finances since they are not listed in Stock Market Exchange.

Results also indicates that they are not operating on commercial basis,since when asked on the business operating model the respondents responded with the (M= 4.23 SD = 0.71) meaning that their they are not operating model on commercial basis which makes the culture of business as usual and eventually increase the financing gap and failure to abide with the terms of repayables finances. Similarly, when asked

with the statement that'' Extent of revenue generation against repayable finance servicing'' responses were also high at (M=4.38,SD=0.70).

4.4 Correlation Analysis Results

To determine the nature (positive or negative), strength (strong, moderate, and weak relationship), and degree of significance by the p-value of their relationship, as shown in Table 4.5, a bivariate correlation analysis test was conducted for the study variables of Financing gap (Dependent variables), O&M costs, Financial sustainability of the water supply projects, and Terms and conditions of the repayable source of finances. The statistical measure of the correlation between the two variables was determined to be the Pearson correlation coefficient (r). According to the study's rules, variables move in the same direction if the correlation coefficient is positive and in the other direction if the correlation value is negative. Additionally, a correlation of zero indicates that there is a relationship between the variables.

Table 4.5: Correlation Intervals

	Intervals				
Value	0	0.25	0.5	0.75	1
Strength	No relationship	Weak	Moderate	Strong	Perfect

Source: Researcher (2024).

From Table 4.6, the Pearson correlation coefficient between O&M costs and the financing gap stood at r = 0.913, the correlation coefficient between financial sustainability and the financing gap stood at r = 0.941, and the terms and conditions

of repayable finances stood at r = 0.953. This depicts that there is a strong positive relationship between independent variables (O&M costs, financial sustainability of the water supply projects, and terms and conditions of the repayable finance) and the dependent variable (the financing gap).

Table 4.6: Correlation Matrix Results of the Variables

Correlation is significant at the 0.01 level (2-tailed).

		Gap	O&M Costs	FSustainability	TConditions
Gap	Pearson Correlation	1	0.913	0.941	.953**
	Sig. (2-tailed)		0.000	0.000	0.000
	N	100	100	100	100
OM Costs	Pearson Correlation	0.913	1	0.896	0.917
	Sig. (2-tailed)	0.000		0.000	0.000
	N	100	100	100	100
FSustainability	Pearson Correlation	0.941	0.896	1	0.966
	Sig. (2-tailed)	0.000	0.000		0.000
	N	100	100	100	100
TConditions	Pearson Correlation	0.943	0.917	0.966	1
	Sig. (2-tailed)	0.000	0.000	0.000	
	N	100	100	100	100

Source: Researcher (2024).

4.5 Mulitple Linear Regression Test Results

4.5.1 Model Fitness Tests

For practical application of the Multilple Regression Analysis (MLRA) used by this study a Model Fitness Test was conducted through Analysis of the Variances (ANOVA) to assess whether the chosen model of Regression was reliable ,interpretable and accurately represents the relationships among the variables in the data set. This also helped researcher to determine the appropriateness of the

model,validate the assumptions of the model and draw statistical inferences of the study. Results from the Table 4.7 below shows that, that the model fits the data well explaining the larger proportion of the variation to the extent of 23.330 which is 92% leaving unexplained variability (variance of the residuals of 1.960 which is 8%. This indicates that, the model is statistically significant to explain the dependent variable of financing gap. Further more the F-value $F(3,96)$=380.878,$p<0.05$, this indicates the model is statistically significant.

Table 4.7: Model Fitness Test by ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23.330	3	7.777	380.878	0.000
	Residual	1.960	96	0.020		
Total		25.290	99			

Source: Researcher (2024).

4.5.2 Normality Assumption Test Results

The test of normality was conducted using the Skewness and Kurtosis tests. The null hypothesis (Ho) of these tests was established that ‘’if the Skewness value is within the range of ±2 and the Kurtosis value is within the range of ±7, the data set were normally distributed ’’ Otherwise, the alternative hypothesis that the data set is not normally distributed was accepted. The skewness value was applied to determine the degree of symmetric distribution of the data in relation to the mean, and kurtosis was applied to determine how far the data moved away from or close to the mean. Since skewedness and kurtosis are mostly different from zero, acceptable ranges were established by researchers at ±2 and ±7 for skewedness and kurtosis, respectively

(Demir, 2022). Table 3.6 shows the results of skewness and kurtosis. Since the values are within the ranges of ±2 and ±7, the null hypothesis was accepted and the data set followed a normal distribution.

Table 4.8: Normality Tests Results

	O&M Costs	Sustainability	Conditions
Skewness	-1.744	-1.371	-1.512
Std. Error of Skewness	0.241	0.241	0.241
Kurtosis	4.190	2.627	2.951
Std.Error of Kurtosis	0.478	0.478	0.478

Source: Researcher (2024).

4.5.3 Linearity Assumption Test Results

The procedure for carrying out the linearity test involved looking at the correlation between each independent variable and dependent variable. An association between the independent and dependent variables is linear when the P-value is greater than 0.05 (Julius & Kalunda, 2021). The equation for regression is considered to be linear if Y is a linear function of the parameters. The independent variables of O&M expenses, the water projects' financial viability, and the terms and conditions of the repayable sources of financing are said to have a linear relationship with the dependent variable of the funding gap, according to the null hypothesis (Osborne, 2019).

The results from Tables 4.9 to 4.11 showed that all the variables (O&M costs, financial sustainability, and terms and conditions of repayable finances) have a

significant relationship with the financing gap at $p<0.05$, but the deviation from linearity is greater than 0.05 ($p > 0.05$), which indicates that there is a linear relationship between the financing gap and the three independent variables under study.

Table 4.9: Test Results Between Financing Gap and O&M Costs

			Sum of Squares	df	Mean Square	F	Sig
Gap*OM Costs	Between Groups	Combined	21.271	17	1.251	25.532	0.000
		Linearity	21.063	1	21.063	429.789	0.000
		Deviation from Linearity	0.209	16	0.013	0.266	0.998
		Within Groups	4.019	82	0.049		
Total			25.290	99			

Source: Researcher (2024).

Table 4.10: Test Results Between Financing gap and Financial sustainability

			Sum of Squares	df	Mean Square	F	Sig
Gap*Sustainability	Between Groups	Combined	22.982	18	1.277	44.89	0.000
		Linearity	22.408	1	22.408	786.593	0.000
		Deviation from Linearity	0.574	17	0.034	1.185	0.295
		Within Groups	2.308	81	0.0289		
		Total		25.290	99		

Source: Researcher (2024).

Table 4.11: Test Results Between Financing Gap Conditions of Repayable Finances

			Sum of Squares	df	Mean Square	F	Sig
Gap* Conditions	Between Groups	Combined	23.391	20	1.170	48.645	0.000
		Linearity	22.972	1	22.972	955.490	0.000
		Deviation from Linearity	0.418	19	0.022	0.916	0.566
		Within Groups	1.899	79	0.024		
Total			25.290	99			

Source: Researcher (2024).

4.5.4 Homoscedasticity Assumptiontest Results

In homoscedasticity assumptions, it is assumed that the variance of errors should be constant across all levels of the independent variables, that is, the error terms (residuals) follow a normal distribution with a mean of zero and constant variance. If there is a non-constant variance, the problem of heteroscedasticity exists (Osborne., 2019). The test of this assumption was conducted by the Breuesc-Pagan test, which is statistical software with the null hypothesis that the residual does not change with the increasing value of the dependent value, and with a p-value > 0.05, the data are homoscedastic. This was conducted by running the regression analysis (RA) of three independent variables (O&M costs, financial sustainability, and terms and conditions of the repayable finance) against one dependent variable of the financing gap.

The correction of heteroscedasticity was made in the data set by applying the natural logarithmic transformation (lnY) to all variables as dependent variables and regressing against the three independent variables. Researchers opted for this

methodology as logarithmic transformations reduced the scales on which the variables were measured (Astivia et al., 2019). Table 4.12 shows the results of the homoscedasticity test. Since the p-value > 0.05, there was homoscedasticity in the data set.

Table 4.12: Homoscedasticity Test Results

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.814	3	0.605	415.003	0.102
Residual	0.140	96	0.001		
Total	1.954	99			

Source: Researcher (2024).

4.5.5 Multicollinearity Assumption Test Results

Multicollinearity, on the other hand, assumes that there is no intercorrelation among independent variables. The existence of the correlation ship between the predictors was termed collinearity. The study applied the tolerance rate (TR) and variance inflation factor (VIF) to detect if there was a multicollinearity problem among the predictors in the regression model. The study was based on the rule of thumb that if TR is < 0.1 and VIF is <10, there is no problem of multicollinearity (Christin et al., 2021). A researcher tested for stepwise regression to remove the problem of multicollinearity that seems to appear in the variables. Under this model, the Z-values were applied as independent variables, and at each step, some of the

independent variables with the smallest probability of F were entered while those with the problem were removed (Rose & McGuire., 2019).

Table 4.13: Multicollinearity Test Results

Variable	Collinearity Statistic	
	Tolerance	VIF
Operation and maintenance (O&M) costs	0.074	2.373
Financial sustainability of the water projects	0.066	5.265
Terms and conditions of repayable finances	0.053	8.976

Source: Researcher (2024).

4.5.6 Outlier Test Results

Outliers are values or data points that are far outside the norm of the variable and have a disproportional influence on the estimates of the parameters. They are contaminants or unusual variables that affect the normality of the variable. In this study, it was assumed that the regression model was free from outliers (Osborne et al., 2019). The study tested for the existence of outliers by analysing the frequency of each variable to detect dubious values and correcting them to turn the data into a normal situation for statistical analysis.

4.6 Multiple Regression Model Summary

Multiple Linear Regression Analysis (MLRA) was conducted to determine how independent variables (operation and maintenance costs, financial sustainability of water projects, and terms and conditions of repayable finance) relate to and predict the dependent variable (financing gap). The result from Table 4.14 of Multiple Linear Regressions showed that there is a strong positive correlation of 92.2% (R =

0.960) between the three independent variables and the dependent variable of the financing gap. It was further found that the model had a good fit since 92.2% of the variance in the dependent variable (R2 = 0.922) was explained by the three independent variables.

Table 4.14: Multiple Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.960	0.922	0.920	0.143

Source: Researcher (2024).

4.7 Regression Coefficients

Table 4.15 summarises the results of the regression coefficients. The result shows that, for each unit change in operation and maintenance costs, the dependent variable of the financing gap changed by 0.244 units (*unstandardized beta = 0.244),* holding other variables constant. Operation and maintenance costs at Beta = 0.225 (*standardised Beta = 0.225*) depict a positive and moderate effect on the financing gap. The t-value of 3.134 and the p-value <0.05 (p-value = 0.002) indicate that operation and maintenance costs are statistically significant and have an influence on the financing gap.

Further results show that, for each unit change in the financial sustainability of the water supply projects, the dependent variable of the financing gap changed by 0.295 units (*unstandardized beta = 0.295),* holding other variables constant. The financial sustainability of the water projects at Beta = 0.274 (*standard beta = 0.274*) depicts a

slightly stronger positive effect than operation and maintenance costs on the financing gap. The t-value of 2.468 and the p-value <0.05 (p-value = 0.015) indicate that the financial sustainability of the water projects is statistically significant and has an influence on the financing gap.

Moreover, the findings showed that, for each unit change in terms and conditions of repayable finances, the dependent variable of financing gap changed 0.559 units (*unstandardized beta = 0.559),* holding other variables constant. Terms and conditions of repayable finances at Beta = 0.482 (*standardised beta = 0.482*) have the strongest positive effect of all three predictors on the financing gap. The t-value of 3.89 and the p-value <0.05 (p-value = 0.000) indicate that the terms and conditions of repayable finances are statistically significant and have an influence on the financing gap.

Table 4.15: Multiple Linear Regression Coefficients Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	-0.442	0.140		-3.157	0.002
	O& M Costs	0.244	0.078	0.225	3.134	0.002
	FSustainability	0.295	0.120	0.274	2.468	0.015
	TConditions	0.559	0.143	0.482	3.895	0.000

Source: Researcher (2024).

Thus the results of the Regression reults can be described in the Multiple Linear Regression model as;

$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+e$

Where;

Y= Dependent variable (Financing gap),X_s = Independent variable, β_0 = The Y-intercept (The value of Y where X=0, β_1, β_2, β_3 = The coefficients of the independent varaibles (X_1,X_2 and X_3), X_1 = Operation and maintenance costs in water pricing, X_2= Financial sustainability of the water supply projects, X_3 =Terms and conditions of the repayable source finances,e=Random error.

$Y=-0.442+0.244X_1+0.295X_2+0.559X$

4.8 Discussion of Findings

4.8.1 Operation and Maintenance costs

The study's first objective was to evaluate how the operation and maintenance costs of water pricing affected the financing gap for the Ruvuma region's sanitation and water supply utilities. The results indicate that the finance gap and operation and maintenance costs have a significant positive association (r=0.913).The findings indicated that there is statistical significance in this connection ($\beta = 0.244$, $p<0.05$). This suggests that there is a 0.244 increase in the funding gap for each unit increase in operation and maintenance expenses.These results corroborate the research by Libey et al. (2020), which discovered that water utilities need to examine their funding levels and comprehend the necessary expenses they must fully cover in order to narrow the financing gap to achieve the universal access to water for all.

Furthermore, the finding is supported by Grafton et al. (2023), who find that operating costs indicate the financial values of water and that water should be priced and valued in an effective and equitable manner to enhance sustainable financing mechanisms. The findings also align with the empirical results from Pories et al.

(2019), which revealed that water utilities should ensure that they are able to narrow a high financing gap by ensuring that they cover operation and maintenance costs at a high percentage by generating sufficient revenue through tariffs to create surplus. This situation will facilitate the water utilities access to other sources of repayable finances rather than depending on government grants with limited competition from other sectors of the economy and official development assistance, which is likely to be uncertain.

Low operation and maintenance cost coverage through tariffs leads to an increase in the financing gap for utilities and ultimately creates a high account payable, operating deficit, failure to cover electricity expenses, procurement of water chemicals, and less investment in water infrastructure expansion. Minero (2019), in his studies, supported these findings that improper tariff setting or design leads to poor cost coverage and widens the financing gap.

Depreciation also seems to be a key cost that needs high attention during tariff setting, as it ends up creating high water losses and increasing operation and maintenance costs, which contribute to the financing gap. As revealed by Leckie et al. (2021), utilities should have accurate data on depreciation expenses to be able to estimate actual cash flows during tariff setting, as most of the utilities do not have accurate data relating to operation and maintenance costs, including depreciation expenses.

4.8.2 Financial Sustainability of the Water Projects

The second objective of the study was to determine the influence of the financial

sustainability of the water projects on the financing gap in water supply and sanitation utilities. The findings depict that the relationship between the financial sustainability of the water supply projects and the financing gap is strong and positive in nature ($r = 0.941$). This relationship is statistically significant ($\beta = 0.295, t=2.468, p<0.05$) This implies that for every unit increase in the financial sustainability of the water supply projects, the financing gap also increases by 0.295.

Most of the water supply projects are not financially sustainable, a condition that exacerbates the financing gap for most of the water supply and sanitation utilities. $\beta = 0.295$ indicates that a unit change in financial sustainability significantly affects the financing gap at $p<0.05$. The findings align with the study by Mohanty et al. (2020), which found that the extent of O&M coverage by water supply utilities is the key impediment to the sustainability of the urban water supply projects, which in turn enlarges the financing gap. Energy costs (electricity expenses), chemical costs, and repair and replacement costs significantly affect operation and maintenance costs, which in turn affect the financial sustainability of the water utilities.Furthermore, water supply projects are not bankable, which affects the financial sustainability of the projects and widens the financing gap in the operation of the operation of water utilities. Operation costs tend to outweigh the revenue cash flow collection in the project areas. A study by McCoy and Schwartz (2023) supports this proposition with the view that the financing gap in inthe utilities to achieve the SDGs in water supply utilities is the complexity in interpretation of the bankability of the water and the capacity to align the bankability of the water projects to key financing stakeholders to tap private financing.

Lack of financial sustainability of the water project has accelerated the tremendous increase in financing gap by water utilities since there is no clear matching between the sources of revenue financing the projects and the project costs (operation and maintenance costs and capital costs). This has led to so-called balance sheet financing instead of project financing from various financiers. The findings of Beecher (2021) confirm this finding that funding and financing are the means towards financial sustainability and that there should be optimal balances in water utility projects for revenue sources (from funding sources and financing sources) and spending in both operation and maintenance costs and capital costs to drive water supply service to meet the demand of the growing population and comply with environmental standards.

4.8.3 Terms and Conditions of the Repayable Finances

The third objective of the study was to assess the influence of the terms and conditions of the repayable sources on the financing gap in water supply and sanitation utilities in the Ruvuma region. The findings showed that there is a strong positive relationship between the terms and conditions of the repayable sources of finances and the financing gap ($r = 0.953$). This relationship tends to be statistically significant ($\beta = 0.559, t=3.895, p<0.05$), with a unit increase in the terms and conditions of the repayable source of financing driving a significant increase in the financing gap to the extent of 0.559.

Repayable finances such as bonds require water utilities to comply with their debt covenants or conditions, which proves difficult for some water utilities to abide by.

Bond financing requires the development of bankable projects and the listing of water utilities in a well-developed financial market. No water utility has resorted to bond financing due to the strict conditions of this mode of financing. Adoption of green bond or equity financing implies that water supply utilities want to embark on the financialization of their services. This mode of financing seems to be difficult since most of the utilities are not listed in stock markets.

The risk of undermining water supply services as a basic need for societies also hinders this effort. This finding is in line with Wafula (2019), findings that the majority of water utilities are not listed in the stock market, which limits their ability to access commercial capital. Sanchez (2019) also supported the finding with the view that, with the reform of water utilities to adopt financialization strategies, water utilities end up increasing the leverage level, the average price of the water services, paying huge dividends to institutional investors, and raising managerial wages. This undermines the social aspect of water supply services.

Insufficient revenue streams from the traditional sources of finances hinder the water supply utility's capacity to leverage its financing sources with its repayable sources of finances. Basic sources of finances (tariffs, taxes, and transfers) play a pivotal role in unlocking other forms of repayable finances. Nguyen (2022) supported this finding with the assertion that water utilities have started to fill their existing financing gap by leveraging their traditions financing by issuing green bonds (one of the most repayable sources of finance), but the action is concerned about their current internal financial factors in terms of utility size, profitability, reserve risk levels, and assessment of debt affordability before tapping into this mode of

financing. A condition of building a stable financial condition from the traditional sources of finance by the water utilities before tapping other repayable sources was also evidenced from Nagpal et al.'s (2020) findings that water utilities should be creditworthy first and foremost in order to leverage private financing from repayable sources of finance. This will put them in a better position to deliver this important service, even to poor societies.

Loan and bond financing, on the other hand, require a bankable project proposal. The majority of the water utilities have no bankable projects on hand acceptable to these investors. Projects are small in size, less profitable, and involve huge initial costs (sunk costs). This finding is evidenced by Origa et al. (2020), who found that lenders have shown a growing interest in lending water supply and sanitation utilities, but these financiers demand quality bank proposal projects (bankable projects), which demonstrates a clear profit realisation for water utilities.

CHAPTER FIVE

SUMMARY,CONCLUSION AND RECOMMENDATIONS

5.1 Chapter Overview

This chapter provides a summary of the study, implications of the study, conclusion, recommendation, limitations and limitations, and highlights the areas for further research. The conclusion reiterates the importance of the study and helps the reader of this research draw a connection between the existing knowledge and the real situation in the operation of the water supply utilities. Recommendations, on the other hand, inform readers of the study to focus on interventional strategies for addressing the financing gap in the water sector. Under this chapter, the researcher has suggested that these areas be rescheduled and tested regarding the existing problem of financing gaps in different locations.

5.2 Summary of the Study

Generally, the study aimed at investigating the determinants of the financing gap in water supply and sanitation utilities in the Ruvuma region of Tanzania. It specifically aimed at assessing the influence of operation and maintenance (O&M) costs in water pricing on the financing gap, the influence of financial sustainability of the water projects on the financing gap in water supply and sanitation utilities, and the influence of the conditions of the repayable sources on the financing gap in water supply and sanitation utilities. Utilising a quantitative approach, the data were collected through questionnaires of 100 respondents at Songea, Mbinga, and Tunduru water supply and sanitation utilities. The data were analysed through

descriptive statistics and multiple linear regression analysis techniques. The study applied an explanatory research design.

The key finding of the study indicates that the relationship between O&M costs and the financing gap is positively strong ($r = 0.913$ and $p<0.05$). This implies that O&M costs influence the financing gap; a unit change in O&M costs in the operation of the water supply utilities leads to a change in financing at $\beta = 0.244$. The study also found that there is a strong positive relationship between the financial sustainability of the water supply projects and the financing gap ($r = 0.941$ and $p<0.05$). This signifies that the financial sustainability of the water supply projects influences the financing gap of the water utility. A unit change in the financial sustainability of the water projects in the operation of the water supply utilities leads to a small change in the financing gap at $\beta = 0.295$.

It is further found that the terms and conditions of the repayable finance have a significant influence on the financing gap in the water utility operation. The relationship between the terms and conditions of the repayable finance and the financing gap is positively strong ($r = 0.953, p<0.05$). A unit change in the repayable finance leads to higher changes in the financing gap at $\beta = 0.559$. This implies that the terms and conditions of repayable finance have a significant influence on the financing gap.

5.3 Implications of the Study

This study offers theoretical and practical implications in various aspects, ranging from policy formulation to the industrial nature of the water utilities to finance

practitioners and academic researchers.

5.3.1 Implications to the Policy Makers of the Water Sector

Understanding the determinants of the financing gap paves the way for policymakers in the water sector to incorporate the issue of the financing gap with policy issues like policy development and regulatory frameworks, environmental sustainability, social equity access by designing appropriate tariffs, public-private partnerships, aligning with Sustainable Development Goals (SDGs), and integrated water resources management in the water financing gap. In summary, this understanding enables enable policy makers to develop effective policies, allocate water resources efficiently, and eventually build resilient and sustainable water infrastructure.

5.3.2 Implications to the Water Supply and Sanitation Utilities

Water supply and sanitation utilities make informed decisions by understanding the determinants of the financing gap in their operations. Understanding the determinants of the financing gap enables water utilities to develop a strategic financial plan. enhance access to funding, improve operation efficiencies and cost management, identify areas that need improvement for their service delivery and infrastructure, and engage key stakeholders in water service delivery.

5.3.3 Implication to Practitioners

The knowledge of the factors influencing the financial gap in water utilities provides finance practitioners with critical insights to develop effective financial strategies, improve investment opportunities through carrying out thorough risk assessments,

improve financial planning and management, allocate budgets to the most critical areas of the water utilities, and tap into innovative financial instruments, including blended finance and climate financing. This leads to sustainable financing for water utilities and better-managed water utilities capable of delivering sustainable water services to societies.

5.3.4 Implication to the Academics and Researchers

Understanding the determinants of the financing gap stimulates academic research, leading to the formulation of new theories and models in the literature in the discipline of economics and finance of water resources suitable to be adopted by the water utilities. Education programmes in academic institutions can be tailored to acquire professional personnel in the water sector, identifying and addressing the financing gap likely to face the sector.

5.4 Conclusion

Based on the study findings, it is obvious that operation and maintenance costs (O&M costs) in water pricing influence the financing gap in in water supply utilities operations. Operation and maintenance costs indicate the real value of water resources for the users. There should be a clear understanding of the real operation and maintenance costs of water in water pricing in order to determine the revenue requirement during tariff setting. Underestimation of operation and maintenance costs will end up creating a high financing gap and impede the attainment of global sustainable development goals.

The financial sustainability of the water supply projects is a key attribute that impacts the financing gap. Water supply projects are to be viable and cover their operation and maintenance costs from the cash flows they generate from the projects. Projects should be financially sustainable, generate sufficient cash flows for future generations, and be acceptable to various financiers. The terms and conditions of the repayable finances also seem to influence the financing gap in the water sector. The conditions of the repayable finances can be unlocked if there is a change in the operating model of the water utilities. There should be a clear business model that should be adopted by the water utilities, whether they opt for service-oriented, commercial, or social business entities. Utilities should financially stabilise in terms of internal revenue generation before embarking on repayable sources of finance. There should be a well-developed domestic financial market for the water utilities to undergo financialization.

5.5 Recommendations

In light of the findings noted by this study, a researcher would like to recommend that;Operation and maintenance costs should be clearly reflected in water pricing. As the regulated tariff acts as water pricing and the basic source of revenue for water utilities, it should be updated to reflect the real operating costs of the water utilities to close the financing gap for most water supply utilities. Water supply and sanitation utilities should change their operating models. The old concept that they are merely service providers is out of date. They should embark on a social business model and continue to be granted tax exemptions in some operations, such as sanitation services, minor and major water projects, electricity expenses, chemicals, water

metres, and water-related materials. Water is a basic need; it should not be provided on a purely commercial basis.

The government should not be totally abstaining from supporting the financing of water supply and sanitation utilities in major investments. The government has a key role to play in non-monetary subsidies such as electricity expenses, water metres, and chemicals. Water supply projects should be financially sustainable. They should not involve high initial sunk costs, which are unproductive in nature. They should bring financial sustainability to water supply providers and benefits to society in general. Repayable sources of finance are an alternative source of finance to unlock the financing gap. But this financing model should be exercised with due care to avoid jeopardising the social aspect of water supply services. Water utilities should stabilise their internal revenue flow tariff and watch their operating cost coverage capacity before tapping into the repayable sources of finances.

5.6 Limitations of the Study

The study focused on three variables: O&M costs, financial sustainability of the water projects, and terms and conditions of the repayable sources of finance and their influence on the financing gap in water utilities. However, the financing gap for water utilities is a multifaceted issue. If the researcher has adequate time, other aspects such as public funds allocation to water utilities, the enabling environment of financialization, the institutional framework, water production volume, and consumption patterns in the water supply utilities could be examined to find their influences on the financing gap in water utilities.

5.7 Suggested Areas for Further Research

The study concluded that the terms and conditions of the repayable source of funding, the operation and maintenance costs, and the financial viability of the water supply project all had an impact on the financing gap in water supply utilities. More research in other areas, such as revenue allocation and generation from other sources, such taxes, should be conducted to establish their impact on the financial gap among water supply utilities. This will broaden the study's scope. Additional empirical research in the areas of institutional frameworks, water production and consumption patterns in water supply and sanitation utilities, and enabling environments for financialization should be added to the study in order to further explore their effects on the financing gap in the water sector and the attainment of Global Development Goals.

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APPENDICES

Appendix I: Questionnaires

DETERMINANTS OF THE FINANCING GAPIN WATER SUPPLY AND SANITATION UTILITIES. A CASE OF SOUTHERN ZONE WATER UTILITIES, TANZANIA

This dissertation questionnaire collect data on the determinants of the Financing Gap in water supply and sanitation utilities in Ruvuma region , Tanzania. It has been divided into four sections; section A deals with data gathering relating to demographic information of the respondents, section B collect data relating to estimates of the operating and maintenance costs in water pricing in water utilities, section C collect data relating to financial sustainability of the water projects in water supply and sanitation utilities and section D collect data relating to terms and conditions of the repayable source of finances in water utilities.

SECTION A: DEMOGRAPHIC INFORMATION

Personal details ***(****Put a in appropriate box****)***

1. Age (Years)

i. 18-25 years ☐

ii. 26-35 years ☐

iii. 36-45 years ☐

iv. 46 years and above ☐

2. Your gender/sex.

i. Female ☐

ii. Male ☐

3. Level of education ☐

i. Certificate

ii. Diploma ☐

iii. Degree ☐

iv. Musters/specialist ☐

4. Your marital status is

i. Single ☐

ii. Married ☐

iii. Separated ☐

iv. Widow/widowed ☐

v. Divorced ☐

5. Staff occupation/cadre…….

i. Engineer ☐

ii. Accountant ☐

iii. Economists ☐

iv. Procurement specialist ☐

v. Auditor ☐

vi. Marketer ☐

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A: ESTIMATES IN OPERATIOJ AND MAINTENANCE COSTS IN WATER PRICING (TARIFFS)

Note: 1=Strongly disagree,2=Disagree,3=Neither agree nor disagree,4=Agree,5=Strongly disagree

S/N	Statement	1	2	3	4	5
1	The current tariff do not fully cover the operation and maintenance (O&M) costs (O&M costs) in our water supply and sanitation utility even when depreciation expenses are excluded					
2	The current tariff fully do not fully cover the operation and maintenance costs including depreciation expenses in our water supply and sanitation utility					
3	Our billing value does not generate sufficient revenue to cover the full O&M costs					
4	Once our Utility has not reived any government grant we likely to report deficit or loss in our financial statements					
5	Our current tariff do not cover some of the costs such as environmental costs and resource costs					
6	Our daily operation is likely to be affected by high electricity expenses which are not fully covered by existing tariff rates					
7	Our current tariff is out of use compared to the real					

	O&M costs in our water utility					
8	Low investment (Water network expansion) from internal revenue collection is due to high O&M costs					
9	High debts (Account payables from suppliers) is due to low tariff estimates to cover the full O&M costs					
10	Some O&M costs such as administration costs resulting from clustering and supervision costs were not considered in tariff setting					
11	Political pressures interfere with normal operation of our utility eventually contribute to financing deficit/gap of our water Authority					

SECTION B. FINANCIAL SUSTAINABILITY OF WATER SUPPLY PROJECTS

Note: 1=Strongly disagree,2=Disagree,3=Neither agree nor disagree,4=Agree,5=Strongly disagree

S/N	**Statement**	**1**	**2**	**3**	**4**	**5**
1	Currently we have water supply project completed or under implementation.					
2	We are planning to implement water supply projects in the future.					
3	The payback period (time it will take for the project to recover initial investment/grants used for the project) of the project will almost be more than 10 years					
4	The current cash flow generated from the project even for the 5 years to come will not be sufficient to cover initial investment/grant used to finance the project					

5	The billing value from the current customer connections made in the project area is no sufficient to cover the O&M costs of the project area.					
6	If the grant financed the project could be a loan, cash flow generated from the project area could not be sufficient to settle the monthly repayment					
7	Return on Investment (Revenue-Initial investment cost)/Initial investment cost of the project may currently stand at negative value.					
8	There still scarcity of water in the project area due to high, operation and maintenance costs, and low revenue collection from the project area					
9	Some of the O&M costs of the project area are covered by the revenue collection from other areas/zones of the water utility					
10	Some the costs incurred initially during the commencement of the projects have not added any value to the project					
11	The project costs have not been considered during tariff setting.					

SECTION D: TERMS AND CONDITIONS OF THE REPAYABLE SOURCE OF FINANCES.

C: TERMS AND CONDITIONS OF THE REPAYABLE SOURCES OF FINANCE

Note: 1=Strongly disagree,2=Disagree,3=Neither agree nor disagree,4=Agree,5=Strongly disagree

S/N	Statement	1	2	3	4	5
1	Currently we have or we have acquired repayable source (Loan, Bond or Equity shares) of finance for our Utility financing					
2	We are planning to acquired repayable source (Loan, Bond or Equity shares) of finance for our Utility financing in the future.					
3	We are reluctant to acquire the repayable source of finance in our water supply utility because of high interest rate charging.					
4	We are discouraged to acquire the repayable source of finance in our water supply utility because of short grace period					
5	We are not able acquire the repayable source of finance in our water supply utility because of long bureaucratic procedures					
6	We face difficulties to acquire the repayable source of finance in our water supply utility because of collateral demand by financiers (Financial institutions)					
7	Our water utility fails to finance its operation by bonds because of we do not have bankable					

	projects					
8	We are not able finance our water utility by shares because utility are not listed in stock exchange					
9	Our water utility is not able to finance the its operation by repayable source of finance because our business operating model is not operating in commercial basis.					
10	Our water utility is not able to acquire the repayable source of finance due to low revenue from tariffs, no guarantee constant government grants or donor funded					
11	Our utility is not able to finance its operation by repayable source of finance due to high principal repayment with short repayment period.					

D: FINANCING GAP

Note: 1=Strongly disagree,2=Disagree,3=Neither agree nor disagree,4=Agree,5=Strongly disagree

S/N	Statement	1	2	3	4	5
1	Funds available are insufficient for Operation and Maintenance Costs of our Water Utility					
2	Insufficient funds for Operation and Maintenance Costs are due to underestimate of Water Pricing during tariff setting					
3	Does your Utility faces a Financing Gap because the Operation and Maintenance Costs of the ongoing or completed Projects are more than the Cash flows Generated from the Projects.					
4	Does your Utility experience Financing Gap because of the Negative Return generated from Completed Projects?					
5	Does your Utility experience Financing Gap because it is not able acqure Loans,Bonds or buy shares from the Stock Exchange Market because of the unfavourable conditions associated with these repayable source of finances?					
6	Does your utility experience Financing Gap because it faces to contract					

	addition commercial finance because of huge Account Payables?					
7	Does your Utility experience Financing Gap because it don't have bankable projects on hand for soliciting funds from financial institution and international financial institutions like IMF,World Banl,AfDB, and other donors?					

Thank you for your continued cooperation

Appendix 2: Research Clearance

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

THE OPEN UNIVERSITY OF TANZANIA

Ref. No OUT/PG201802051 **28th December, 2023**

Managing Director,

Songea Water Supply and Sanitation Authority,

P.O.Box 363,

SONGEA.

Dear Director

RE: RESEARCH CLEARANCE FOR MR. NYAMHANGA MASWE, REG NO: PG201802051

2. The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

3. To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. Nyamhanga Maswe Reg. No: PG201802051)**, pursuing **Master of Business Administration (MBA)**. We here by grant this clearance to conduct a research titled **"Determinants of the**

Financing Gap in Water Supply and Sanitation Utilities: A Case of Ruvuma Region Tanzania". He will collect his data at your office from 29th December 2023 to 31st January 2024.

4. In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha

For: VICE CHANCELLOR

JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA
HALMASHAURI YA WILAYA BUKOBA
(Barua zote ziandikwe kwa Mkurugenzi Mtendaji)

Unapojibu tafadhali taja:

Kumb. Na. BDC/BDC/E.1/77/12 19/10/2023

Mkuu wa Chuo,
Chuo kikuu Huria Tanzania,
S. L. P 23409,
DAR ES SALAAM.

YAH: **RUHUSA YA KUFANYA UTAFITI MR. NURDIN SADIKI TUNUTU, REG NO. PG201901381**

Kichwa cha habari hapo juu cha husika.

2. Ofisi ya Mkurugenzi imepokea barua yako ya tarehe 13/10/2023 yenye Kumb. Na.OUT/PG201901381 ukimuombea mtajwa hapo juu kufanya utafiti katika Halmashauri ya Wilaya Bukoba.

3. Kwa barua hii napenda kukufahamisha kuwa kibali cha kufanya utafiti kinatolewa kwako atafanya utafiti juu ya ***"Examining the Socioeconomic Impacts of Alcohol Production and Consumption on Community Wellbeing"*** katika Halmashauri ya Wilaya Bukoba kuanzia 16/10/2023 hadi tarehe 16/11/2023.

4. Wakati anafanya utafiti wake, anatakiwa kuzingatia Sheria, Kanuni, Taratibu na Miongozo inayoongoza Utumishi wa Umma.

5. Tambua Ofisi haitasita kumuachisha utafiti mara moja pindi atakapoonekana kwenda kinyume na maadili ya Utumishi wa Umma. Aidha ofisi haitahusika na gharama zozote juu yake.

6. Nashukuru kwa ushirikiano wako.

S.Kyamani
Kny: MKURUGENZI MTENDAJI

KNY: MKURUGENZI MTENDAJI
HALMASHAURI YA WILAYA BUKOBA
S.L.P 491
BUKOBA

Nakala: Mr. Nurdin Sadiki Tunutu
Chuo kikuu Huria Kwa taarifa.

" : Watendaji wa Kata wote,
Halmashauri ya Wilaya ya Bukoba. – Mpokee na kumpa ushirikiano.

EK/AR