IMPLICATIONS OF WATER SUPPLY AND SANITATION PROJECTS ON THE LIVELIHOODS OF SLUM DWELLERS IN KENYA: A CASE OF KOSOVO VILLAGE IN MATHARE CONSTITUENCY, NAIROBI COUNTY

BY

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DECLARATION

This research project is my original work and has not been presented for award of a degree in any other university.

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This research project has been submitted for examination with my approval as the candidate's supervisor.

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DEDICATION

To my beloved parents Peter Mulinge and Damaris Mulinge for sharing the little you had selflessly during my entire academic life, to you this work I dedicate.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
APHRC	African Population and Health Research Centre
ASALs	Arid and Semi-Arid Lands
CBOs	Community Based Organizations
CDF	Constituency Development Fund
GOK	Government of Kenya
HIV	Human Immune Virus
KMD	Kenya Meteorological Department
MDGs	Millennium Development Goals
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NGOs	Non Governmental Organizations
PPPs	Public Private Parastatals
SPSS	Statistical Package for Social Sciences
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WASH	Water and Sanitation for Health
WHO	World Health Organization
WSP	Water and Sanitary Program
EMCA	Environmental Management and control act
NWSC	Nairobi Water Sewerage Company

ABSTRACT

Providing adequate safe water and good sanitation can enhance people's livelihood options by making significant additions to good health, clean environmental conditions and generate income. However, there exists no comprehensive study that has ever focused on documenting the implications of water and sanitation projects on the livelihoods of slum dwellers in developing countries like Kenya. The study therefore, aimed to establish the implications of water and sanitation projects on the livelihoods of slum dwellers in Kenya where the focus was on Kosovo village residents in Mathare slums. The objectives of this study was to establish the influence of water pricing on the economic status of Kosovo slum dwellers, to determine the effect of safe water provision on the health of Kosovo slum dwellers, and to examine the influence of adequate sanitation provision on Kosovo slum environmental conditions. The research design adopted for this study was the descriptive research design. The targeted population for this study included all persons over the age of 18 in Kosovo village. The study selected a sample of 515 respondents using simple random sampling. Primary data collected in this project comprised of both qualitative and quantitative data. Questionnaires were self-administered with help of research assistants. Quantitative data collected was analyzed by the use of descriptive statistics using SPSS while qualitative data was analyzed using content analysis. The results were presented through percentages, means, and frequencies. The information was displayed by use of tables and in prose-form. The research found out that water and sanitation projects in slums had contributed positively towards improved livelihoods of the residents at the local level through safe water access, reduced water pricing and improved sanitation provision. The research project recommended that water and sanitation projects should be up-scaled in slums since they were felt to have significant implications on the livelihood of the residents. The study also recommended that other infrastructural facilities that complement provision of water and sanitation projects such as proper route networks and drainage channels should be constructed alongside such projects. The study also recommended all the personnel involved in the implementation of water and sanitation projects should be constantly trained on proper project management practices and community participation ensured to ensure sustainability of water and sanitation projects thus enhancing continued livelihood improvement.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The provision of safe drinking water and basic sanitation is one of the most critical challenges inhibiting sustainable development in developing countries. Sustainable development requires that people have access to safe drinking water supply services (Admassu M. et al, 2004). According to World Health Organization (2005) the access to clean water is the single most important global crisis of the 21st century. At the beginning of 2000, 1.1 billion (17%) people of the world's population were without access to improved water. The majority of these people live in Asia and Africa. With 60% of the world's population, Asia faces tremendous challenges providing clean potable water to a rapidly urbanizing population. According to the United Nations, almost half of the region's forecast 4.5bn people are expected to live in urban areas by 2020. A briefing note entitled *water for sustainable urban settlements* by UN-HABITAT (2010), observes that high rate of urban growth is most rapid in the developing world, where cities gain an average of 5 million residents every month. The exploding urban population growth creates unprecedented challenges, among which provision for water and sanitation have been the most pressing and painfully felt when lacking. Consequently, there is an enormous need for water investment to supply and support water use in major metropolitan areas to treat water and provide filtration services.

Providing water for productive uses can enhance people's livelihood options by making significant additions to household food security and nutrition, good health and generate income. The provision of safe drinking water and basic sanitation contributes to sustainable improvements in peoples' lives regarding their health and education situation, the preconditions for productive employment as well as for the eradication of extreme hunger and the empowerment of women (Hesselbarth, 2005). Similarly, Admassu M. et al, (2004) notes that water supply projects have impacts on people's lives, which extend far beyond the expected improvements to health and reduction in time spent collecting water. Hesselbarth (2005) argues that, assuring adequate clean water supply to a given settlement enables the households to engage in other activities, among them productive and income generating activities. Adequate clean water supply, does not only reduce water-related diseases but also impact positively on the

income of such people by reducing working time lost in water related diseases as well as reduced cost of medication for the water related diseases.

Lack of water prevents the realization of other basic human rights. Water is the driving force of sustainable development which includes environmental integrity and eradication of poverty and hunger; it is indispensable for human health and welfare (Ministerial declaration at the Kyoto world water forum March 2003). The United Nation also affirmed the right to water in November 2002, recognizing that the right to water is indispensable for leading a life in human dignity and a prerequisite for the realization of other human rights. It states that the human right to water entitles everyone to sufficient, safe acceptable, physically accessible and affordable water for personal and domestic use. Between 50 and 100 litres of water per person per day are needed to ensure that most basic needs are met and few health concerns arise (WHO, 2005).

The provision of water and sanitation services in deprived urban settlements is a challenge faced by many countries. The growth of towns and cities together with the rapid increase in urban populations has meant that informal areas are growing much more quickly than formal urban centres. Low levels of services such as water supply and sanitation are the result. The lack of these services threatens not only the health and the environment of people in informal areas, but also that of people living in formal urban areas (McGranahan, 2007; Mulenga et al., 2004). In Kenya, the water Act 2002 enacted in March 2003 was an attempt to recognize water as an important commodity for all. The act laid the foundation regarding governance arrangement by separating policy, regulation and service delivery.

The new water policy redefines the role of government to focus on policy and regulatory functions while delegating the implementation and provision of water resources to private sectors and community based groups such as water resources user associations and self help groups. To substantiate the fundamental role played by water in development, various developmental goals and plans have also had it included for instance, the Millennium Development Goal target 7c, intends to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. The *Kenyan vision 2030* also acknowledges the pivotal role of water in development by capturing it in environment (water and sanitation sector); the vision is to "Ensure water and improved sanitation availability and access to all by 2030. The scenario

described above points to the need to determine the implications of water projects on the livelihoods of slum dwellers specifically within the urban setting.

The *Kenyan vision 2030* points out that, Kenya is a water-scarce country with renewable fresh water per capita at 647 m^3 against the United Nations recommended minimum of 1,000 m3. Given that water is a scarce resource in the country, it raises the question of project design, planning and implementation strategies of water projects that can improve the livelihoods of the people. It is therefore necessary to determine the implications of water and sanitation project variables on the livelihoods of slum dwellers including their socio economic and cultural welfare as well as the environmental condition of their habitats.

1.2 Statement of the Problem

There have been some initiatives from governments and development agencies to improve the living conditions of the slum dwellers. These initiatives mostly include a range of urban upgrading activities such as infrastructure development, job market creation and resettlement to new housing developments among others.

Although, Mathare informal settlement has experienced implementation of various water supply and sanitation projects little is known about their implications to the livelihoods of the residents. This is due to the fact that assessment or else evaluation of the projects has never been done for whatever reason. Despite the importance of espoused on the improvement of slum settlements in Kenya and the world in general, World Bank (2000) observes that many governments, institutions, and project managers are reluctant to carry out impact evaluations because they are deemed to be expensive, time consuming, technically complex and because the findings can be politically, sensitive, particularly if they are negative. Further, where such evaluations have been carried out, most of them have been criticized because the results come too late, do not answer the right questions or were not carried out with sufficient analytical rigor. As such, there exists no comprehensive study that has ever focused on documenting the implications of water and sanitation projects on the livelihoods of slum dwellers in developing countries like Kenya.

The study set out to particularly determine the implications of water supply and sanitation projects on the livelihoods of slum dwellers in developing countries as a modest attempt to

bridge this gap. It was an effort to bring to light the influence and insights into implications of water supply and sanitation projects on the livelihoods of slum dwellers in Kenya where Kosovo Village residents, in Mathare was the context of focus.

1.3 Purpose of the Study

The study aimed to investigate the implications of water supply and sanitation projects on the livelihoods of slum dwellers in Kenya where the focus was on Kosovo village residents in Mathare constituency, Nairobi County.

1.4 Objectives of the Study

The objectives of this study were:-

i. To establish the influence of project water pricing on the economic status of Kosovo slum dwellers in Mathare constituency, Nairobi County.
ii. To determine the implications of safe water provision on the health of Kosovo slum dwellers in Mathare constituency, Nairobi County.
iii. To examine the implications of improved sanitation provision on Kosovo slum environmental conditions in Mathare constituency, Nairobi County.

1.5 Research Questions

The study set out to answer the following questions:

i. What is the influence of project water pricing on the economic status of Kosovo slum dwellers in Mathare constituency, Nairobi County?

ii. What are the implications of safe water provision on the health of Kosovo slum dwellers in Mathare constituency, Nairobi County?

iii. What are the implications of improved sanitation provision on Kosovo slum environmental conditions in Mathare constituency, Nairobi County?

1.6 Significance of the Study

This study is significant to both private and public stakeholders involved in the implementation of water and sanitation projects in the slum residences in Kenya. The information gained can be used to redesign, improve and eliminate projects or programs that are

poorly designed. In addition, such information can also be used to provide input to the appropriate design of future projects and programs.

The information obtained in this study will be significant to the policy makers/ministry of water and Local authorities as it would give a rational evaluation of water supply and sanitation projects and how they affect the livelihoods of slum dwellers. The study will point the implications of water supply and sanitation projects initiated within informal settlements with the view of assisting policy and decision makers adopt sustainable strategies towards water projects in informal settlements; given the fact that such projects receive immense donor funding from various local and international organizations. The study will seek to identify gaps and opportunities all geared towards implementation of successful water supply and sanitation projects that address the needs of the slum dwellers in all aspects and that ensure funds are utilized in the best ways.

The findings of this study will also be beneficial to the slum dwellers as it would highlight the views and opinions of the beneficiaries of such water projects so as to further understand their needs and get a clear perspective of how they perceive these water supply and sanitation projects and the areas they feel can be improved to raise their living standards. This is an important aspect of community participation in development projects where they are incorporated in the planning and implementation as well as operation of these projects with the aim of giving them a sense of ownership and collective responsibility. The views collected in this study will give much valuable insight to the policy and decision makers even as they identify critical areas that may have been ignored and disseminate funds for these projects.

It is further hoped that the study will highlight other important relationships that require further research; this would be in the areas of access, utilization and availability of water projects in developing countries like Kenya. As such, the results of this study would be invaluable to researchers and scholars, as it would form a basis for further research. The students and academicians will use this study as a basis for discussions on implications of water supply and sanitation projects on the livelihoods of developing countries like Kenya, the challenges faced and the possible solutions. The study will be a source of reference material for future researchers on other related topics; it will also help other academicians who undertake the same topic in their studies.

1.7 Limitations of the Study

The study was envisaged by the following limitations. Majority of respondents consisted of people with low literacy levels; some of them were unable to understand how the water and sanitation projects had affected their socio-economic livelihoods as well as their environmental condition. The researcher countered the problem by involving research assistants in carrying out the study such that the illiterate were assisted by the research assistants to understand the issues sought by the study.

1.8 Delimitation of the Study

This study was on water supply and sanitation projects and their implications on the livelihoods of slum dwellers in Kenya. This study was limited to Kosovo Village in Mathare constituency, Nairobi County. This involved collecting information from both male and female resident dwellers aged at least 18 years and have been living in the area before and after the implementation of the water supply and sanitation projects. This was relevant in collecting the data required as time and distance are the limiting factors that inhibit collecting the data from all the slums across the country. This study was undertaken in the month of January and February 2013.

1.9 Basic Assumptions of the Study

The study assumes that information from Kosovo village can be used to represent other informal settlements across the country giving a general scenario and platform of improving the livelihoods of slum dwellers throughout the country through implementations of sustainable water supply and sanitation projects.

The study further assumes that the respondents were honest, factual (objectivity) and trustworthy in their response to the research instruments.

1.10 Definition of Significant Terms

Development: Process of improving peoples' quality of human lives.

Implications: Refers to effects/outcome on the livelihood of the residents associated with the established water projects in the settlement.

Informal settlement/Urban Slums: Inhabited areas in towns and cities which have limited or lack access proper and adequate basic services such as water, sanitation, security, permanent and adequate structures and sufficient living space as defined by the UN Habitat. The areas have relatively poor infrastructure, poor roads and buildings.

Livelihood: Refers to economic, political and sociological measure of an individual or families' economic, political and social position in relation to others.

Poor: State of being unable to meet one's basic needs due to low income

Poverty: To mean a condition, that makes one to access necessities of life

Residents' Participation: Active involvement of slum dwellers in decision making for their agenda as well as being involved in access to safe water programs at different stages in a project cycle. It is measured through their involvement in project design, implementation, management and monitoring and evaluation of outcomes of water projects.

Social-economic status: the combination of education, gender issues and earning levels of people surrounding the water service provider

Water projects: Refers to any water supply to the residents in the settlement from water Kiosks, Piped water or water pumps.

1.11 Organization of the study

Chapter one has discussed the importance of this study to the slum dwellers as well as to the donors and project implementers. The chapter has identified the objectives and research questions as well as identified the constraints that will be anticipated throughout the research process as well as defining the various significant terms in the context of this study.

Chapter two is going to review the available literature regarding the research topic so as to give better understanding on the project. The chapter will also provide conceptual framework to show how Independent variables relate to Dependent variable.

Chapter three will present the methods and techniques that the researcher will employ in the study. Operational definition of variables will be done in this chapter so as to give a concept on how the variables will be measured.

Chapter four presents analysis, presentation and interpretation of data under the following thematic areas; influence of project water pricing on the economic status of the slum dwellers, implications of safe water provision on the health of slum dwellers and the implications of improved sanitation provision on slum environmental conditions.

Chapter five is the summary of the study followed by conclusion based on the results of chapter four. The recommendations and suggestions for further research based on the above conclusion are in the same chapter.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter deals with the available literature that has been reviewed for the study. The literature is mainly on water availability in informal settlements, water and sanitation projects and livelihoods of informal residents, economic effects of water projects, health implications of water projects, environmental sustainability implications of water supply and sanitation projects and conceptual framework.

2.2 Water Availability and Sanitation condition in Informal Settlements

The access to clean water is the single most important global crisis of the 21st century (WHO, 2005). Water crisis is a term used to refer to the world's water resources relative to human demand. The major aspects of the water crisis are allegedly overall scarcity of usable water and water pollution. Lawrence Smith, the president of the population institute, asserts that although an overwhelming majority of the planet is composed of water, 97% of this water mainly constitutes of salty water. The fresh water used to sustain humans is only 3% of the total amount of water on earth Hoevel (2005). Despite the vital role played by adequate safe drinking water in development, most towns and cities are still facing numerous water shortages. 27% of the urban dwellers in the developing world do not have access to piped water at homes. In developing countries' towns and cities water shortage is highly attributed to high rate of urbanization. The fast pace of urbanization is clearly evident by change in percentage of urban population from 29% in 1950 to approximately 51% in 2010 and expected to rise to 60% by 2030.

According to the UNDP's Human Development Report, in 2000, the population's access to safe water in SSA was only 44%, while the average for countries in East Asia and the Pacific (EAP) stood at 67% and in Latin America and the Caribbean was reported to be 65%3. Furthermore, it is amply clear that the challenge of providing basic water and sanitation persists as not much improvement has been made since the early 1990s. Even where water supply systems and sanitation facilities have been installed, they are still often inadequate, unsafe and in disrepair.

The high rate of urban growth is most rapid in the developing world, where cities gain an average of 5 million residents every month. The exploding urban population growth creates

unprecedented challenges, among which provision for water and sanitation have been the most pressing and painfully felt when lacking. The speed of urbanization of middle-income nations is highest and that of developed nation is lowest (Mazumdar, 1987). This increase of urban population has been at a rate that most municipal authorities are not able to provide enough housing, community facilities and other crucial infrastructural services to the rising population, resulting to formation of informal settlements. According to the investment programme for the Economic Recovery Strategy for wealth and employment creation March 2004, Kenya faces serious challenges with regards to provision of water services despite the efforts of investments provided in the past years by the government and development partners since existing facilities have continued to deteriorate and fail to meet the demand of the increasing population particularly in many rural areas and the very rapidly growing settlements of the urban poor.

The problem of adequate safe water provision is mostly felt in developing countries where many people have poor access to this important commodity. *Africa water and sanitation magazine (2008) edition* states that around the world 1.1 billion people lack water and 2.4 billion lack sanitation with 300 million of these living in Africa. Poor access to adequate water and sanitation is a main reason to stagnant development for many regions in Sub-Saharan Africa. Most countries in which a large proportion of the urban population lives in informal settlements are unlikely to meet the water-related MDGs (Dagdeviren and Robertson, 2009). The situation of water access is by day worsening in informal settlements since appropriate measures by relevant stakeholders such as local authorities and governments are not being put in place to address the existing and upcoming challenges. Although the number of slum-dwellers is predicted to reach over two billion by 2030, access to safe water in urban slums does not seem to be improving (Limido, 2011).

Developing countries face a broader set of risks than those in richer nations. In addition to the deficit in water infrastructure discussed above, these risks include the failure of governments to meet basic human needs for clean water and sanitation services, widespread water related diseases, inadequate expertise and institutional capacity, and major economic problems finding the capital necessary to deal with these problems. There are strong, yet not widely appreciated, links between energy and water. Water is required to produce and use energy, and substantial amounts of energy are used to clean, transport and use water. Some parts

of the world are heavily dependent upon hydropower as the primary means of fulfilling their energy needs. African governments, like most countries in the developing world, face a daunting task in their attempts to provide effective and equitable public services.

Appropriate regulatory frameworks and institutions at national level to oversee water and sanitation services provision are essential to operationalize national policies, protect property rights, and generate equitable returns on private investments through efficient tariff structures and levels, service standards, and expansion targets. When responsibility is delegated to local bodies for provision of services, an appropriate distribution of roles between national and local authorities is essential and should be clearly defined. Also, partnering with private sector will entail a stable and predictable regulatory regime that promotes essential values, such as independence in legislation, accountability, transparency and professionalism in the process.

Water supply and sanitation requires a participatory approach that aims at strengthening collaboration among the three key stakeholders, namely: governments (national government, local governments and municipalities), private sector (national and transnational businesses, formal and informal enterprises), and communities, NGOs, research centres and professional associations). PPPs are seen in this context as an effective means to establish cooperation between public and private actors and to bundle their financial resources, know-how and expertise to meet the challenges facing service provision. While this approach promises several benefits, experience shows that involving private actors in the provision of basic services needs to be carefully planned and monitored if the benefits of such a model are to be fully realized and the numerous potential drawbacks avoided. Meredith *et al* (2002) note that control systems are needed for cost, risk, quality, communication, time, change, procurement, and human resources. In addition, auditors should consider how important the projects are to the financial statements, how reliant the stakeholders are on controls, and how many controls existing. Auditors should review the development process and procedures for how they are implemented. The process of development and the quality of the final product may also be assessed if needed or requested. A business may want the auditing firm to be involved throughout the process to catch problems earlier on so that they can be fixed more easily. An auditor can serve as a controls consultant as part of the development team or as an independent auditor as part of an audit.

Over the years, provision of water for both domestic and irrigation use has been in the government domain. However, like in other projects, there is an experience in paradigm shift of focus to community based approach. In the case of Kenya, the introduction of Water Act 2002, introduced a revolutionary approach to water management in the country. It created the provision for water service providers (WSPs) who could be private, public or community so long as such entity had the capacity to provide water under the Water Regulatory Oversight Board (Rubbiik, George Masore: 2002). Equally important is the introduction of the Constituency Development Fund (CDF) Act in the year 2003 which emphasized on the projects to be funded under it as being community based project (CDF Act, 2003) This therefore means that Community based water projects would get a major boost from the Government through CDF.

Another way of to ensure proper supply of water and sanitation is through private public partnership (PPPs). PPPs in water supply and sanitation services imply the participation of a wide range of main actors and additional stakeholders (consumers, regulators, governments, NGOs, unions, environmental groups, and independent providers etc.), which are involved as contracting parties. Because of the complexity and quality of relationships among the contracting parties, successful PPPs require creating an enabling environment in which key roles and responsibilities are institutionally separated, clearly defined, and allocated among all actors.

The provision of water and sanitation services in deprived urban settlements is a challenge faced by many countries. The growth of towns and cities together with the rapid increase in urban populations has meant that informal areas are growing much more quickly than formal urban centres. Low levels of services such as water supply and sanitation are the result. The lack of these services threatens not only the health and the environment of people in informal areas, but also that of people living in formal urban areas (McGranahan, 2007; Mulenga et al., 2004). Successful local initiatives are sometimes documented as best practice and attempts are made to develop replicable models that can be promoted more widely. However, a best practice in one setting can be bad practice in another, and even highly relevant examples rarely provide the basis for directly replicable approaches. Moreover, the qualities needed to deliver improvements to local residents are not the same as the qualities needed to engage in international promotion or to attract the attention of the institutional promoters of best practice.

In Kenya, the problem of water scarcity is usually amplified in informal settlements as compared to middle and high income residential areas. Urban growth, combined with limited employment opportunities in cities, is leading to a more rapid increase in poverty in urban areas than in rural areas and urban slum population continue to grow: 69 percent of all households in Addis Ababa, 65 percent in Dar es Salaam and 50 percent in Kampala and Nairobi can be considered slum households (UN-Habitat, 2008). In Nairobi, Kenya, 60 per cent of the population subsists in slums and squatter settlements. The 60 per cent is crowded onto 5 percent of the total land without adequate shelter, clean water or decent sanitation (UN-Habitat, 2003). According to Estache (2006) urban dwellers in developing countries, especially in unplanned settlements, rely on a wide range of small-scale providers whose services are vital in the absence of alternatives. He further proposes solutions to the lack of safe water services in the slums of the developing world which include coordinated public sector interventions and expansion of public net work utility.

2.3 Water supply and sanitation Projects' Design and Implementation

Transferring a majority of urban water services to private operators is unlikely to be the chosen option for most developing countries. But having a few water supply PPPs in a country can still be very beneficial, by generating much-needed pressures to move the whole sector toward higher levels of performance. The public water utilities that have succeeded in improving performance are those that have applied sound commercial management principles, emphasizing financial viability, accountability, and customer service. Complacency is the worst enemy of public utilities, and it is rooted in the assumption that poor service has no consequences. That attitude makes it difficult for even the most skilled and best-intentioned public managers to introduce and sustain improvements in the face of the various groups that have vested interests in the status quo. In that sense, the actual contribution of water PPPs may be greater than that achieved in specific projects— through the introduction of a much-needed sense of competition and accountability in an erstwhile monopolistic sector. Many public water supply utilities in the developing world are also opening the door to the private sector through practices that fall short of delegated management but open the way for a new, broader approach for private sector involvement. These include other forms of providing operational expertise, such as performance-based service contracts, twinning, and subcontracting.

Considerations on the communities' capacity to support both project execution and long term operation of the project once the donor assistance is withdrawn should be put in place to avoid project failure. Operating and maintaining water services worldwide costs money but insufficient funds limits the purchase of spare parts and training provided to maintenance staff. In many projects however, affordability of the service is not factored into a scheme at the planning stage. Many schemes developed have been very expensive to maintain resulting in their collapse (Rockstrom, 2003). Water projects especially for low income population such as informal settlements should be designed in a way to ensure sustainability of the projects. Particularly, the maintenance cost of the project should be within budget limits of target population to ensure sustainability of such project even when donor funds have ceased. According to water and sanitation for health project (WASH, 2009) a sustainable water supply projects maintains or expands a flow of benefits at a specified level for a long period after external funding has been withdrawn.

Rockstrom argued that external support agencies have traditionally been reluctant to finance operation and maintenance activities, while governments often accord it low priority. Service users who are potential source of finance, do not typically view water as a commodity for sale and so may be unwilling to pay for it. Where consumers of water are willing and able to pay for the operation and maintenance costs, poor financial management systems often lead to these resources being inappropriately or inefficiently spent. This further reduces the viability of the water systems as assessed by Theodora Adomako (1998), Generation of funds by the consumers also depend on the ability and willingness to pay which is also coupled with socio-economic and political factors. Financing is key to increasing the coverage of water supply and the sense of ownership needed to keep the water systems functioning on a sustainable basis.

The problem of water access for the urban poor is obviously known and documented by different authors. Despite the low income levels in urban informal settlements the residents must be involved to support the water supply projects by contributing some financial and technical skills so as to ensure sustainability. This will involve demonstrating that support to water supply development can help to active sustainable livelihood within poor communities, and in so doing make a real contribution to poverty reduction (ODI, 2000). Financing by the poor forms part of the goal of cost recovery and is seen as a means of ensuring sustainability. Poor people will pay

often a sustainability part of their income if they can be assured a regular water supply (World Bank, 1993).

Stakeholders' participation in development has its origin in the fact that people have need for self reliance. Arguments for stakeholders' participation in projects have to lead to the inclusion of participation as a crucial means of allowing the poor to have control over decisions (Chambers, 1997). This is echoed by Stanley (2003) who observes that stakeholders must be empowered through active participation for financial sustainability of their projects. The general principles of participatory approach include encouraging stakeholders to take responsibility and promote participation for all (Stanley, 2003). Okafor (2005) observes that when stakeholders participate in their own projects, they are empowered to improve efficiency, greater transparency and accountability which in turn enhance service delivery and improved management and sustainability of the project.

2.4 Economic effects of Water Supply and Sanitation Projects

Water is an important resource for economic development of any given community. Combating poverty is the main challenge for achieving equitable and sustainable development and water plays a vital role in relation to economic growth, (Reba, 2003). He continues to argue that poor access to water contributes to hunger and food insecurity. A close examination and analysis of the millennium declaration confirms the central role of water and sanitation in sustainable development and the major contribution that expanded access to safe drinking water and adequate sanitation can lead to poverty alleviation. According to Hesselbarth (2005), the provision of safe drinking water and basic sanitation contributes to sustainable improvements in peoples' lives regarding their health and education situation, the preconditions for productive employment as well as for the eradication of extreme hunger and the empowerment of women. Fox and Liebenthal (2006) argues that water, sanitation and hygiene are essential for achieving the MDGs- and hence for alleviating global poverty. An investment in the water sector is an investment in all the MDGs. The impact of water sector investments directly targeted at poor consumers is anything but subtle (UN-Water, 2009). Around the world poor people place a high priority on drinking water.

Table 2.1: Nairobi Water and Sewerage Tariffs

Customer Category	**Consumption lock (m3)**	**Current Tariff(Kshs./m3)**	**Approved Tariff bill (Kshs/m3)**
Domestic/Residential,	0-10	12.00	18.71
Commercial/Industrial	11-30	18.00	28.07
Government Institutions and schools	31-60	27.50	42.89
	≥60	34.50	53.80
Water Kiosks	0-10		
	11-30		
	31-60	10.00	15.00
	≥60		
Bulk sale to WSPs for resale	0-10		
	11-30		
	31-60	15.00	26.57
	≥60		

Athi Water Services Board (AWSB), 2010.

The disparities in water pricing that exist between different the common water sources in Nairobi low-income settlements namely; piped water, water kiosks and water vendors can have

significant implications on economic status of the residents. There is a huge difference in amount saved between buying water from water from water vendors which trades from 20 to 30 Kshs per 20litres whereas the same amount of money in piped water can afford approximately 2000litres. The table above shows water tariff structure for Nairobi City Water and Sewerage Company Limited (NCWSC) which is the main water and sewerage provider in Nairobi County.

The burden of water accessibility includes time spent in the collection process. Over two thirds of households globally fetch water from outside the home: In terms of resources, different studies have shown that the search for water may take 2-4 hours daily, travelling distances of over 3 Kilometers and carrying load of between 20-25 Kilograms and technically the function of women and children (Alaci 2004 in Alaci and Alehegn 2009). The time and energy can be used in economically activities. For instance, the saved time can be utilized in other activities such either productive (economic), domestic (such as looking after children, cooking and cleaning), personal (socializing), or development and management related e.g. attending meetings, carrying out group work and participating in community activities (Alaci and Alehegn 2009). Therefore providing people with a reliable and easy accessible water supply has the potential of increasing the income of households.

Sustainable development can only be achieved if we first succeed to get people out of poverty. People privileged enough to live in more prosperous parts of the world rarely have to confront the consequences of water scarcity. For many people living in informal settlements however, the stay is very difficult. Inadequate access to water forms a central part of people's poverty, affecting their basic needs, health, food security and basic livelihoods. Improving the access of poor people to water has the potential to make a major contribution towards poverty alleviation, (UNESCO, 2003). Water is a consumption need which must be paid for with revenue gained from economic activities (or in time spent collecting it), and is an asset which can produce certain types of income in contribution with other assets (Clarke, 1998). Increased scarcity of water greatly experienced by slum dwellers, reduce household capacity to combine water with other assets in order to produce income. In some cases, children (Particularly girl children) may spend more time collecting water (and/or spending more of it) as a result of improved access (Nicol, 1997).

According to WHO (2009) the basic contention, supported through a wide range of case studies is that water management is a good investment, not only can it contribute to poverty alleviation, but can do so in ways that are affordable and in many cases, generate wealth. Furthermore, it has a greater potential to promote the health of local communities which in turn will contribute importantly to poverty alleviation. Hesselbarth (2005) observes that improved water quality will reduce the health risks and also the costs of preventing and treating ill family members. Furthermore, the reduction of working days lost to water-related diseases will also have a positive impact on the household's income situation. Many water project investments in the city of Nairobi have in one way or another improved on the economic status of many Nairobi dwellers who not only benefit from the supply of clean and safe water for drinking but also it becomes a source of employment and income to the same. An example of such project is "Maji na Ufanisi" working with locals of Kibera to provide them with clean and safe community water, as a community project way World Bank (2000).

Another dimension in which adequate water provision can have significant economic influence is on food security. Urban agriculture is one livelihood strategy that the urban poor use in combination with other strategies (Mougeot, 2005). Urban agriculture in informal settlements includes food production, processing and marketing and related activities such as recycling and productive use of the urban waste and waste water. Urban agriculture can respond to the food needs of the local population, help set up income generating activities that are accessible to the urban poor (including youth and women) and help improve the environment (urban greening, waste and wastewater management).

The Kenya's Vision 2030 has also highlighted importance of adequate water and improved sanitation to give way to sustainable development. The vision for the water and sanitation sector is "to ensure water and improved sanitation availability and access to all by 2030". Kenya is a water-scarce country with renewable fresh water per capita at 647 m^3 against the United Nations recommended minimum of 1,000 m3. This compares unfavorably with the neighboring countries of Uganda and Tanzania which have per capita levels of 2,940 m3 and 2,696 m3 respectively. Kenyans' access to water and sanitation is relatively poor compared to countries such as Malaysia. It is critical to note that Kenya's fresh water per capita has been declining and is projected to reach 235 m3 by 2025 unless effective measures to address the

challenges are implemented. Water which is a natural resource should be well managed if the MDGs have to be achieved, (Fox and liebenthal, 2006). Additional supply and more efficient management of Kenya's and commercial enterprises will therefore be necessary to achieve the economic, social and political priority projects suggested by vision 2030.

Various studies carried out in different residential settings suggest that improved water generates substantial economic benefits, mainly by saving time and energy. According to a research by Were et. al, (2006), done in western Kenya highlands; safe water is widely recognized as both a fundamental human need and a key input into economic activity. There is a potential that provision of modest amount of water to smallholder famers can enhance household economic production, save labour time for women and girls, and improve family health. According to Urban Agriculture Magazine (2009), vegetables from the sacks are used for consumption or they are sold, thereby increasing a household's access to cash for other needs and for education of the children. Families that are producing vegetables are able to prepare a full meal two to three times a week. On average, each household also increases its weekly income by 5 USD. Given that house rental in Kibera costs around 6 USD/month, this additional cash represents an important source of income. Households with access to three or more sacks have estimated revenue of around 33 USD per month, which is more than the average monthly income per family.

Francis and Verhagen (2005) carried out a study in Banaskentha District western India on economic and gender benefits from domestic water supply. The study was carried out in two villages, the enterprise and control village. In the enterprise village there was domestic water supply while in the control village there was no domestic water supply. The study made the following findings. That water collection was time consuming and on average a household spent nearly five hours a day on collecting water. This is because their piped water was poor supply and usually broke down for long periods of time. The findings also show that women from enterprise village spent more time in income generating activities than women in the control village. Such activities included; expenditure savings activities, - including working on their own land and income generating activities, - either by hiring themselves out as daily wage laborers or through doing micro- enterprise work.

They also found that if water supply was improved, such women spent only one hour per day collecting water, the time saved could be used either for income-generating activities or for domestic, social and developmental activities. To further substantiate these findings, data use collected on how women would allocate time savings from an improved water supply. It was found that the women would allocate 72% of the time savings to income generating activities provided that sufficient economic opportunities were available. This engagement in income generating activities would have a positive impact on poverty reduction. Although many studies on water projects have found positive impacts/effects on the livelihood of the intended population, most of the projects were carried out in rural settings. This study will therefore take a different direction to investigate whether water projects in urban informal settlements trigger any significant social-economic implications to the residents were such projects have been carried out.

2.5 Health Implications of Water Supply and Sanitation Projects

For many years the domestic water sector has focused on the achievement of health benefits through supply improvements, based on the premise that more and better water can help to improve the health of individuals. This approach has been consistent with the provision of improved supplies by governments and other agencies as part of a strategy of meeting the basic needs of the poor. Poor health caused by poor water supply quality, insufficient sanitation and unsafe hygiene behaviour was regarded as both a symptom and cause of poverty. At the global policy level, safe water supply and sanitation have been closely linked to better health whilst at the household level, establishing these links has proven far harder. These methodological difficulties have lead to reservations about the practicality of the emphasis on health impacts. With the development of international aid in the post-war decades, donor agencies invested increasing sums in water supply programs in developing countries. To evaluate their programs, they were willing to pay for epidemiological studies to measure that impact. The results of a number of these and subsequent studies have surprised the authors by failing to show any difference in diarrhoea incidence between households whose drinking water contained large faecal bacteria and others who drank water of microbiological quality' (Cairncross, 1992).

The disease burden from unsafe water, sanitation and hygiene (WSH) is estimated at the global level taking into account various disease outcomes, principally diarrhoeal diseases. The

risk factor is defined as including multiple factors, namely the ingestion of unsafe water, lack of water linked to inadequate hygiene, poor personal and domestic hygiene and agricultural practices, contact with unsafe water, and inadequate development and management of water resources or water systems. In the less developed countries, 4000 young children still die every day from the consequences of diarrhoeal diseases, and yet this suffering is largely preventable in view of the estimate by the World Health Organization (WHO, 2005) that 88% of all diarrhea cases are caused by unsafe water supplies, inadequate sanitation and insufficient hygiene practices.

According to 2009 United Nations World Water Development Report 3; majority of urban population lack of convenient sanitation and safe water supply in cities leads to serious health problems. The report further states that, many slum dwellers die each year as a result of inadequate drinking water and sanitation services. After heavy rain, storm water washes human waste, mainly from informal settlements lacking minimum facilities, into the open drinking water sources of the poor. This contaminated drinking water results in cholera epidemics, faecal-oral diseases such as diarrhea, and outbreak of malarias (UN-Water, 2009).

Providing sustainable access to safe water supply and basic sanitation together with hygiene education can bring about a major reduction of water-related health risks and child morbidity and mortality. Water-related diseases are the most common cause of death and illness among the poor population in developing countries and children under 5 are particularly affected. Of the 1.8 million deaths per year due to diarrhea, over 90 percent are of children under 5 (Hesselbarth, 2005). An improved water source together with better sanitation (Which includes disposal of effluents and excreta) is one of the most important contributors to better human health. It is estimated that 80% of all communicable diseases are water-related and hence constitute a major portion of health care expenditure. Benefits of improved water services and sanitation therefore include averted health related costs, which is again to the economy as a whole (G.O.K, 2005).

A reduction in maternal mortality depends strongly on the water supply and sanitation situation. A contributory factor to poor maternal health is contaminated water and poor hygiene, leading to infection and slow postnatal recovery. Good water supply facilities will support fewer miscarriages from heavy water transport and safer home birth. At the same time a better general

health condition due to reduced health risks linked to insufficient water and sanitation will also have a positive impact on maternal mortality (Hesselbarth, 2005). A report from Malaysia suggests that the rate of miscarriage among women in the state of Malacca increased 400% as the result of water shortages during a period of severe disruption of the local water system. These increased miscarriages appeared to be the result of water carried by women who could not find, or afford, anyone to help them.

Insufficient water supply and sanitation can also lead to a number of different diseases. Hesselbarth (2005) observes the following diseases to be as a result of insufficient water supply and sanitation; Arsenic contamination in drinking water has been recognized as an important health risk, in particular in Bangladesh. Increased levels of salt in the drinking water, in some cases associated with salination of soil and water resources, can lead to kidney problems. Eliminating stagnant, standing water around the households and water points can contribute to reducing the incidence of malaria, in particular in dry areas with few natural mosquito breeding places. She further observed that, reducing the incidence of water-borne, water-washed and water-based diseases through improved services and hygiene behaviors will have a positive impact on reducing the susceptibility to other illness. For people living with HIV/AIDS, water, sanitation and hygiene is extremely important in reducing the incidences of opportunistic infections.

People living in overcrowded urban environments characterized by inadequate safe water provision face more diarrhoeal diseases in comparison to areas with adequate safe water provision. Studies by African Population and Health Research Centre (APHRC, 2002) show that the prevalence of diarrhea among children below the age of 3 is around 40% in Kibera, whereas it is much lower in Nairobi as a whole (13%) and at national level in Kenya (17%). A study by Roodman (2006), the main domestic slum water sources found to be highly contaminated with faecal matter. Total coliforms were found in 100% of water samples from shallow wells, while 97% of these samples from shallow wells were positive for thermo tolerant coliforms. Three out of the four samples from deep wells were positive for total coliforms, while two of the four samples were positive for thermo tolerant coliforms. None of the samples from taps were positive for either total or thermo tolerant coliforms.

According to Roodman (2006), the presence of thermo tolerant coliforms in water indicates faecal contamination, facilitated by the proximity between the wells and pit latrines; the study suggests that the pit latrines were a major source of contamination of the wells with faecal matter. However, contamination through surface roof during rains is also possible as indiscriminate excreta disposal particularly by children was also common, thus increasing the presence of disease pathogens in the water. Safe adequate water provision to a given settlement should impact positively as far as the health aspect of the population is concerned. On contrast, if a settlement faces serious problems of unsafe, inadequate water provision and poor sanitation, poor health implications are significantly manifested into the population residing in it. This study is therefore going to study whether water projects in informal settlements cause any positive health effects to the targeted population.

2.6 Environmental Implications of Water Supply and Sanitation Projects

The unsustainable exploitation of natural resources is often due to insufficient or inadequate water supply and sanitation. The wider policy environment has moved towards self-financing and cost recovery on water projects, where greater emphasis is placed on community financing as a means of ensuring cost recovery. Insufficient or inadequate water supply and sanitation is very often associated with an unsustainable exploitation of natural resources. Improved water management, including industrial pollution control and water conservation is a key factor for maintaining ecosystem integrity. Adequate treatment and disposal of excreta and both household and industrial wastewater contribute to less pressure on freshwater resources. Furthermore, improved sanitation reduces flows of human excreta into waterways and reducing the respective health and environmental risks. Furthermore, water, sanitation and hygiene is important for improving the lives of slum dwellers, by reducing the risks of contracting water-related illnesses, relieving the burden on women and opening opportunities for small-scale enterprises.

In most informal settlements scarcity of water leads to inadequate sanitation facilities hence poor human waste disposal methods such as fly toilets. These urban poor are also understood to be the biggest suffer group of urban society and major victims of all types of environmental pollution and other epidemic due to their living in pathogen-prone neighborhoods, with cramped conditions, in shacks and limited access to basic civic services like safe and

adequate water supply, sewerage and drainage, sanitary toilets, solid waste disposal facilities (Hardoy et al. 1997). Inadequate water provision in informal settlements prevents good hygiene practices, a fact that compromises the quality of environment in these neighborhoods. Many people living in poor urban areas experience that they practice personal hygiene such as brushing teeth, bathing the body although not as frequent as it is desired. Lack of resources, such as water, results in poor hygiene levels; toilets cannot be washed and there is not enough water to shower (Mahasneh and Sawsa 2001).

The poor environmental and housing conditions under which slum-dwellers live exert a heavy disease burden on residents, particularly on children, because they are vulnerable to infectious diseases (African Population and Health Research Centre, 2002a; Timaeus and Lush, 1995). For example, the prevalence of diarrhoea among children aged under three years in Nairobi slums (31%) was found to be more than double that of Nairobi as a whole (13%), and considerably higher than the rates for other urban areas (19%) and rural areas (17%). The United Nation Habitat (2006) have described sanitation and hygiene challenges in slums in terms of poor basic services results in lack of access to sanitation facilities or safe water sources. This is due to the lack of waste collection services, a poor rain water drainage system and poor infrastructure.

Messias (2001) argues that the quality of environment is lowered mostly due to mismanagement of funds, insufficient waste disposal systems, overpopulation or overcrowding, inadequate planning as well as other human practices. He further noted that people living in areas with poor sanitation and hygiene conditions are more prone to illness. Many diseases are associated with inadequate water resources, sanitation and hygiene. In Kenya, the National Environment Management Authority (NEMA), through Environmental Management and Co-ordination Act, 1999 was charged with the responsibility of ensuring a clean and healthy environment. The Act prohibits the discharge of any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or dumping into the aquatic environment. Despite this legal provision many of informal settlements in Nairobi discharge human and solid waste into nearby streams and rivers. This has greatly worsened the state of pollution making the water unhygienic and unfit for livable environment. The resultant sanitation has severe threat to the environment and natural water supplies leading to bacterial contamination in surface water resources.

Nevertheless, with introduction of water projects in some informal settlements within Nairobi, eco-toilets have been established thereby solving problems associated with human waste disposal. Given that the eco-toilet technologies require little water, they are best placed to provide alternative option of proper human disposal especially in informal settlements where water may be scarce.

2.7 Conceptual Framework

A conceptual framework refers to the main structure or skeleton that not only gives form and shape to the whole system, but also supports and holds together all the other elements in a logical configuration. In this research, the conceptual framework is the concise description of the phenomenon under study accompanied by visual depiction of the variables under study (Mugenda, 2008). The independent variables in this study include economic effects, health implications, and environmental implications, while the dependent variable is livelihoods of slum dwellers.

When responding to shocks, as well as during life transformations, households deploy their assets in different combinations to try to meet livelihood goals (Bharwani et al., 2008; Moench, 2005). The idea of water as an 'economic' good has been the driving force behind this change. Water availability is affected by natural water availability (natural capital) and water infrastructure (physical capital), as well as social capital. It is also influenced by institutions, as discussed below. Water productivity is affected by water infrastructure and other physical capital, as well as financial, natural, and human capital. The capitals then mediate between production and livelihood outcomes. The extent to which production is converted to livelihood outcomes depends in part on the assets available to households and the strategies they employ. From the foregoing, the implications of water supply and sanitation projects on the livelihoods of slum dwellers in Kenya can be investigated by assessing the economic effects, health implications, and environmental effects of such projects.

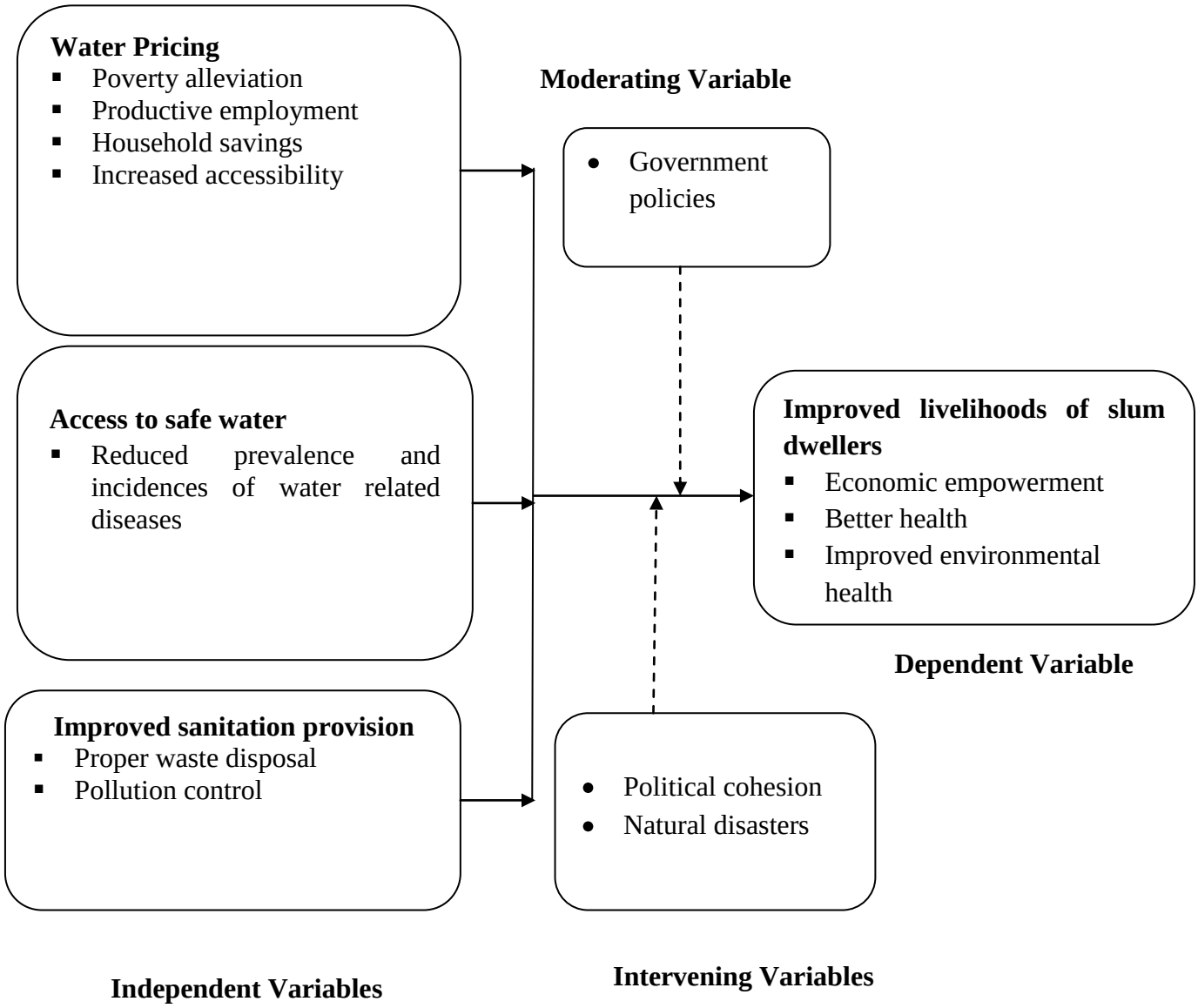

Figure 1: Conceptual Framework

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methods and techniques that the researcher employed in the study. In particular, the chapter will describe the research design, study area, sampling size and sampling techniques as well as the data collection tools and methods used. Data analysis and tools of presentation will also be examined in the chapter.

3.2 Research Design

Orodho (2003) defines a research design as the scheme, outline or plan that is used to generate answers to research problems. Research design provides an operational frame within which the facts are placed, processed through analyzing procedures and the valuable research output is produced. Further Donald (2006), notes that a research design is the structure of the research, it is the ‘‘glue ’’ that holds all the elements in a research project together.

The research design adopted for this study was the descriptive survey design. The research employed a mixed strategy of both qualitative and quantitative methods. The phenomenon under investigation was implications of water supply and sanitation projects on the livelihoods of slum dwellers in informal settlements. The study focused on the implications of water supply and sanitation projects on the livelihoods of dwellers of Kosovo village within the wider Mathare informal settlement in Nairobi, Kenya. This method concerns the intense investigation of problem solving situations in which problems are relevant to the research problem. The underlining concept was to select several targeted cases where an intensive analysis identified the possible alternatives for solving the research questions on the basis of the existing solution applied in the selected case study. The study attempts to describe and define a subject, often by creating a profile of group of problems (Cooper and Schindler, 2003). Thus, Kosovo village within the wider Mathare informal settlement in Nairobi was the focus of the study which provided a natural setting on which data was collected.

3.3 Target Population

The target population is defined as the particular entity of people, objects or units to which a researcher can reasonably generalize his or her research findings (Mugenda and Mugenda, 2012). According to Ngechu (2004), a population is a well defined or set of people, services, elements, events, group of things or households that are being investigated. The target

population under study was 5,153 residents of Kosovo Village in Mathare Division. The targeted population for this study included all persons over the age of 18 years in Kosovo village. This is because any water development project is meant to benefit the entire community and as such all residents would have been affected in one way or the other. The target population included both males and females who have been in the settlement before and after the water projects were implemented as they will be in a better position to describe the situation before and after the implementation of the water development projects.

3.4 Sampling Procedure and Sample Size

Sampling techniques provide a range of methods that facilitate to reduce the amount of data need to collect by considering only data from a sub-group rather than all possible cases or elements. At the time of conducting research, it is often impossible, impractical, or too expensive to collect data from all the potential units of analysis included in the research problem. A smaller number of units, a sample, are often chosen in order to represent the relevant attributes of the whole set of units, the population. Since the samples are not perfectly representative of the population from which they are drawn, the study cannot be confident that the conclusions will generalize the entire population. Sample of respondents were drawn from the beneficiaries of the water projects in Kosovo Village. Where external validity is important, one need to carry out random sampling from properly defined population. In this view the study employed the simple random sampling technique. This method was convenient for this study since the sampling frame is small and the population is well defined with an accurate census available from NGOs such as Pamoja Trust. Comprehensive enumeration maps showing all the households in the settlement were used and each household was assigned a number on the map. All the resultant numbers of each household were then written down each on a piece of paper and the resultant folded pieces were be placed in a container and shuffled. The researcher then blindly picked an item one at a time until the required sample size was obtained. The researcher was then in a position to pin point the exact location on the initial spatial map of all selected households within the settlement and administered one questionnaire to a subject over the age of eighteen in each selected household.

An enumeration process carried out by Pamoja Trust in 2009 revealed that the settlement had a population of 5153 persons. Mugenda and Mugenda (1999) recommend that if there is no estimate available of the proportion of the target population assumed to have the characteristic of interest, 10 per cent should be used. The study used a sample size of 515 persons from the study area.

3.5 Data Collection

According to Ngechu (2004) there are many methods of data collection. The choice of a tool and instrument depends mainly on the attributes of the subjects, research topic, problem question, objectives, design, expected data and results. This is because each tool and instrument collects specific data. Also, Best and Kahn (2004) posit that data may be collected by a wide variety of methods. Primary data is gathered and generated for the project at hand. Primary data is information gathered directly from respondents and for this study used questionnaires. Secondary data is the data is gathered for other purposes and used in the recent project usually the secondary data are found inside the company, libraries, research centers, internet and etc. Secondary data involved the collection and analysis of published material and information from other sources such as annual reports, published data.

The study used questionnaires administered to the sample population. The questionnaire had both open and close-ended questions. The close-ended questions provided more structured responses to facilitate tangible recommendations. The closed ended questions were used to test the rating of various attributes and this helped in reducing the number of related responses in order to obtain more varied responses. The open-ended questions provided additional information that may not have been captured in the close-ended questions. The questionnaire was carefully designed and tested with a few members of the population for further improvements. This was done in order to enhance its validity and accuracy of data to be collected for the study. The study also employed focus group discussion as one of methods in data collection. An interview schedule was therefore designed to guide the survey.

Secondary data was also collected for this study. This data was useful in generating additional information for the study from already documented data or available reports. Cooper and Schindler (2003) further explain that secondary data is a useful quantitative technique for evaluating historical or contemporary confidential or public records, reports, government documents and opinions. Mugenda and Mugenda (2003) add that, numerical records can also be considered a sub category of documents and that such record include figures, reports and budgets. This basically implies the incorporation of valuable statistical data in the study.

3.6Validity and Reliability

Reliability indicates the stability and consistency with which the data collection instrument measures the concept and validity tests the data collection tools and methods and ensures they are measuring the right concept and not something else.

3.6.1 Reliability

Instrument reliability refers to the level of internal consistency, or the stability of the measuring device (Thorndike and Hagen, 1961). Reliability is said to be stable if it gives consistent results with repeated measurements of the same object with the same instrument. Cronbach's alpha was used to test the internal reliability of each of the composite constructs. Internal consistency measure how consistently individual respond to the items within a scale.

A sample questionnaire was distributed to 30 respondents for pilot study. Vague questions were rephrased to convey the same meaning to all the participants. Some comments made by the respondents were incorporated into the final questionnaire. Cronbach's Alpha was then calculated using SPSS. The reliability yielded a coefficient of 0.85. Since the threshold is 0.80 (Mugenda, 2008), this result was sufficient to consider the instrument reliable for data collection. The researcher also relied on the supervisor's approval of the questionnaire to ensure instrument reliability was achieved.

3.6.2 Validity

Validity is the accuracy and meaningfulness of inference, which are based on research results. According to Borg and Gall (1989) validity is the degree by which the sample of test items represents the content the test is designed to measure. The information on the research instrument was cross checked, inspected and scrutinized to ensure accuracy, relevance completeness, consistency and uniformity of the collected data. Pilot testing was done in the same constituency in areas where data for the actual study was not collected and adequate adjustments implemented to enhance validity.

3.7 Data Analysis Techniques

Mugenda and Mugenda (2012) define data analysis as the process of cleaning and summarizing data so that it becomes information that can easily be interpreted and conclusions made to support decision making. Before processing the responses, the completed questionnaires were edited for completeness and consistency. Quantitative data collected was analyzed by the use of descriptive statistics using SPSS and presented through percentages, means, frequencies, and cross tabulation. The information was displayed by use of bar charts, graphs and pie charts and in prose-form. This was done by tallying up responses, computing percentages of variations in response as well as describing and interpreting the data in line with the study objectives and assumptions through use of SPSS. Content analysis was used to test data that is qualitative in nature or aspect of the data collected from the open ended questions. According to Baulcomb, (2003), content analysis uses a set of categorization for making valid and replicable inferences from data to their context. The data was broken down into the different aspects of implications of water development projects on the livelihoods of slum dwellers such as economic effects, health implications, food security and environmental sustainability in Kosovo village, Nairobi. This offered a quantitative and qualitative description of the objectives of the study.

3.8 Ethical Considerations

Before the study begun, permission was sought by getting a letter of recognition from the University and the authorities in the area were also be informed of the study in order to ensure the study follow principles. The five principles guiding ethics in research were observed, these are scientific merit, equitable selection of subjects, seeking informed consent, confidentiality and avoidance of coercion. Prior to collecting information from the respondents, the researcher explained to the respondents the objectives of the study, and how the findings would help them and the country at large. The respondents were asked to sign an informed consent form.

3.9 Operational definitions of Variables

Operational definition of variables is operationally defining a concept to render it measurable. It is done by looking at the behavior of the dimensions, indicators, properties denoted by concepts translated into observable and measurable elements to develop an index of the concepts. Measures can be objective or subjective.

Table: 3.1 Operational Definition of Variables

	Objective	Variables	Indicator	Measurement	Scale	Data collection method	Data analysis
1	To investigate the implications of water projects on the livelihoods of slum dwellers	**Dependent Variable** Livelihoods of slum dwellers	▪ Economic Empowerment ▪ Better health ▪ Improved environmental health	-Increased income -Reduced incidences of water related diseases -Improved hygiene -Improved human waste disposal	Ratio Ratio Ordinal Ordinal	Survey Survey Survey Survey	Measures of Central tendencies and percentages
2	To establish the influence of project water pricing on the economic status of Kosovo slum dwellers in Mathare constituency, Nairobi County.	**Independent Variable** Water pricing	▪ Poverty alleviation ▪ Productive employment ▪ Household savings ▪ Increased accessibility	-Reduced poverty levels -Increased employment opportunities -Increased household savings	Ratio Ratio Ratio	Survey Survey Survey	Measures of Central tendencies and percentages

3	To determine the implications of safe water provision on the health of Kosovo slum dwellers in Mathare constituency, Nairobi County.	**Independent Variable** Access to safe water	▪ Prevalence and incidences of water related diseases	-Reduced water related diseases	Ratio	Survey	Measures of Central tendencies and percentages
4	To examine the implications of improved sanitation provision on Kosovo slum environmental conditions in Mathare constituency, Nairobi County.	**Independent Variable** Improved sanitation provision	▪ Pollution control ▪ Proper waste disposal	-Reduced foul smell/ -Improved air quality-Improved human waste disposal methods	Ordinal Ordinal	Survey Survey	Measures of Central tendencies and percentages

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the findings of the data collected from Kosovo village in Mathare constituency, Nairobi County, Kenya on implications of water and sanitation projects on the livelihoods of slum dwellers.

This chapter represents the summary of analyzed data. The results are presented based on the objective of the study which sought to establish the implications of water and sanitation projects on the livelihoods of slum dwellers in Kosovo village in Mathare constituency, Nairobi County, Kenya. The results have been organized under the following categories; demographic, influence of project water pricing on the economic status of slum residents, implications of safe water provision on the health of slum dwellers and finally implication provision of improved sanitation on slum environmental conditions.

The analysis was done through descriptive statistics and findings of the study were presented in form of frequency tables and percentages. The discussion of the outcomes is based on the outputs from Statistical Package for Social Sciences (SPSS).

4.2 Response rate

Out of 515 respondents targeted 504 persons were interviewed. This was 97.86% of the sample population. The data was interpreted according to the research questions. The return rate was statistically representative, therefore enhancing generalization of the research results. There was also, a focus group discussion done aimed at clarifying the data collected.

4.3 Socio-demographic data

This section describes the demographic characteristics of respondents who participated in this study. The researcher investigated the following demographic characteristics: age, household size, gender, occupation, and level education.

4.3.1 Age of the respondents

The age of the respondents may determine their ability to understand how water and sanitation

projects may have affected their livelihood in the settlement depending on their experience, knowledge and exposure to information.

Table 4.1: Age groups within the respondents

Age group of respondents	Frequency	Percent	Cumulative Percent
18-25	63	12.4	12.4
26-30	182	36.2	48.6
31-35	90	17.8	66.4
36-40	87	17.2	83.6
41-45	50	10	93.6
46 and above	32	6.3	100
Total	504	100	

Table 4.1 above reveals that majority of the respondents were of between age 26-30 (36.2%) followed by age 31-35 (17.8%) which almost tied with age 36-40 (17.2%). This implies majority of people living in the settlement are in youthful stage. This age group is also important for creating ready work force.

4.3.2 Household number of the respondents

Table 4.2: Respondents' household number

Household number	Frequency	Percent	Cumulative Percent
1-2	31	6.2	6.2
3-4	270	53.6	59.8
5-6	185	36.7	96.5
Above 6	18	3.5	100
Total	504	100	

A proportion of 6% of households surveyed had between 1 and 2 persons. The households with persons ranging 3 - 4 had the greatest proportion with 270 (53.6 %) of the respondents falling in this category. The study revealed that 185 respondents accounting for 37% had household number ranging between 5 and 6 people, while only 18 respondents accounting for 6% had more than 6 people in their households.

4.3.3 Gender distribution of respondents

Table 4.3: Gender among respondents

	Frequency	Percent	Cumulative Percent
Male	226	44.9	44.9
Female	278	55.1	100.0
Total	504	100.0	

The gender representation of the respondents was slightly skewed with women being more than the men by 10%. This was perhaps since the interview was conducted during the day and men who are mainly regarded as bread winners in many families were out of the settlement for job.

4.3.4 Level of education of the respondents

Table 4.4: Level of education of respondents

Level of education	Frequency	Percent	Cumulative Percent
None	17	3.4	3.4
Primary	223	44.3	47.7
Secondary	116	23.0	70.7
Tertiary	148	29.3	100
Total	504	100.0	

The table shows only a small percentage of respondents sampled of less than 4% did not have any formal education. The rest of the respondents had at least achieved primary education. This meant that most of the respondents were able to understand how the water and sanitation projects would have influenced their livelihood.

4.3.5 Marital status of the respondents

Table 4.5: Marital status of the respondents

Marital status	Frequency	Percent	Cumulative Percent
Yes	376	74.7	74.7
No	128	25.3	100
Total	504	100	

Of the respondents interviewed, 376 (74.7%) were married and 128 (25.3%) were not married. This signifies that most of the respondents in the settlement had family responsibilities.

4.3.6 Occupation of the respondents

Table 4.6: Occupation of the respondents

Type of employment	Frequency	Percent	Cumulative Percent
Salaried	76	15.1	15.1
Casual	243	48.3	63.4
Self-Employed	185	36.6	100
Total	504	100	

A proportion of 15% of households' surveyed accounting to 76 were depending on salaried employment as their main source of livelihood. The greatest number of respondents depended on either casual (48.3%) or self employment (36.6%). This implies that most of respondents were low income earners depending on temporary jobs and small scale businesses.

4.3.7 Main source of water for the household

Table 4.7: Household's source of water

Household's source of water	Frequency	Percent	Cumulative Percent
Piped water	286	56.7	56.7
Water kiosk	188	37.3	94
Water vendors	30	6	100
Total	504	100	

Majority of respondents (94%) were now accessing safe water since water from the kiosks and piped water come from water treatment plants. This is shown in table 4.7 above.

4.3.8 Distance to the main source of water after establishment of water projects

Table 4.8: Current distance from house to main source of water

		Frequency	Percent	Cumulative Percent
Distance in Meters	<50	475	94.3	94.3
	51-100	29	5.7	100
	Total	504	100.0	

After water projects were brought into the settlement 94% of the households are able to access water in less than 50meters from their houses, whereas the rest (6%) access their main source of domestic water within 51-100 meters. Compared to the distance travelled to access water before the projects there was significant reduction of distance travelled. Unlike before the projects currently every household is able to access water within a distance of less than 100 meters.

4.3.9 Distance to the main source of water before establishment of water projects

Table 4.9: Distance from house to main source of water before water projects

		Frequency	Percent	Cumulative Percent
Distance in Meters	<50	92	18.3	18.3
	51-100	117	23.3	41.6
	101-150	204	40.4	82
	151>	91	18	100
	Total	504	100.0	

Before the water projects were established in the settlement longer distances were traveled by the residents in order to access domestic water as compared to the current situation. This was probably due inadequate provision within their houses hence forcing them to travel longer distances. Only 18% of the respondents used to access water within 50 meters distance, 23%

accessed water between 51-100 meters whereas majority (40%) of respondents' accessed water between 101-150 meters.

4.4 Economic effects of water and sanitation projects on the livelihood of slum dwellers

One of the objectives the study sought to address was to determine whether water project pricing can have any influence on the economic status of slum residents. A set of questions were asked regarding economic benefits brought about by water and sanitation projects in the settlement.

4.4.1 Reliability of the main source of water

In order to determine whether respondents' main water supply was reliable, the respondents were asked to state whether there was a constant supply of water from their main source of water or not.

Table 4.10: Reliability of the main source of water

Constant supply of water	Frequency	Percent	Cumulative Percent
Yes	413	82%	82%
No	91	18%	100%
Total	504	100%	

Results showed that over 82% of the respondents felt that water supply in the settlement is constant and reliable. This is attributed to the introduction of water kiosks and piped water from Nairobi water Sewerage Company which supplies water throughout like other formal settlements.

4.4.2 Amount of water spent by a household per day

The respondents were asked the average amount of water each household spent in a day. Majority (60%) of the households were spending between 40-60liters, given that the average

household number ranged between 3-4 persons the water spent per person per day was still below the recommended universal standards by WHO (i.e. 50 liters-100liters).

Table 4.11: Amount of water spent per household each day

		Frequency	Percent	Cumulative Percent
Water spent (No. 20litre containers)	<1	84	16.7%	16.7%
	2-3	302	60%	76.7%
	4-5	101	20%	96.7%
	6>	17	3.3%	100%
	Total	504	100%	

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4.4.3 Payment for water

The study wanted to know whether residents were paying to get domestic water or not. The largest proportion of respondents accounting to 88% was paying for water which is normal for urban population. The remaining 12% were likely to be beneficiaries of illegal tapings.

Table 4.12: Payment for water

Payment for water	Frequency	Percent	Cumulative Percent
Yes	444	88%	88%
No	60	12%	100%
Total	504	100%	

4.4.4 Cost of water

The study revealed that three tariffs for buying water where available in the settlement; the tariffs mainly depend on the source of the water.

Table 4.13: Cost of water

Cost of water in Kshs. per 20 litre container	Frequency	Percent	Cumulative Percent
5	26	5.9%	5.9%
3	225	50.7%	56.6%
0.4	193	43.4%	100%
Total	444	100%	

The study found out that 6% of the respondents were buying water at 5 shillings these were mostly people getting water from water vendors. 51% of the respondents accounting to 225 persons bought water at 3 shillings where these included water from Kiosks and from individual neighbors who are connected to Nairobi water and sewerage company systems. The last group of respondents access water at only 40 cents per 20 litre container. This group of people enjoys cheaper water tariffs since they are connected to Nairobi water and sewerage company water system.

4.4.5 Cost of water before water and sanitation projects

The study identified two tariff charges that existed before water projects were introduced. 72% of the respondents were buying 20 liters of water at 5 shillings mainly from illegal connections controlled by organized gangs (Mungiki) in the settlement. The remaining 28% were depending on water vendors who charged 10 shillings per 20 litres. The water tariffs were particularly high before the projects due to inadequate provision of water leading to pressure on the available water hence higher tariffs. Mungiki had a big role also in controlling water prices in the settlement too.

Table 4.14: Cost of water before introduction of water and sanitation projects

Cost of water in Kshs. per 20 litre container	Frequency	Percent	Cumulative Percent
10	142	28.2%	28.2%
5	362	71.8%	100%
Total	504	100%	

4.4.6 Time taken to fetch water per day after implementation of water projects

There is knowledge gap on the amount of time taken by households to fetch water in urban slums. The study sought to determine the amount of time taken before and after the water projects were put in place.

Table 4.15: Time taken to fetch water per day after implementation of water projects

Time taken in minutes to fetch water per day	Frequency	Percent	Cumulative Percent
<2	253	50.2%	50.2%
3-4	164	32.6%	82.8%
5-6	87	17.2%	100%
Total	504	100%	

The study found out that after the water and sanitation projects were established about a half (50.2%) of the respondents was accessing household water in less than 2 minutes. 33% of the respondents were taking 3-4 minutes. Numerous water points enabled all the respondents to access water in less than 7minutes meaning no much time was lost to access water.

4.4.7 Time taken to fetch water per day before implementation of water projects

The study found out that before water projects were established in the settlement 30% of the respondents were able to fetch domestic water in less than 5 minutes while 32% of the respondents accessed water in 6-10 minutes. Significant number of respondents accessed water in more than 10 minutes (40%) showing a lot of time was spent in accessing water probably since there were long queues for them to access water.

Table 4.16: Time taken to fetch water per day before implementation of water projects

Time taken in minutes to fetch water per day	Frequency	Percent	Cumulative Percent
<5	151	30 %	50.2%
6-10	161	32%	62%
11-15	155	30.8%	92.8%
16-20	37	7.2%	100%
Total	504	100%	

4.4.8 Water transport situation in the settlement before and after the water projects

The study established that no single household was paying for water transport under normal circumstances for it to access domestic water after the establishment of the water projects. This means that no extra cost is incurred by the households to access domestic water apart from the buying cost.

On contrast, before the water projects were put in place 40% of the respondents accounting to 202 persons were paying to have domestic water transported from water point sources to their houses. At the same time 60% of the respondents were not paying for water transport before water projects mainly since they were close to the water points or people who could not afford water transport costs thereby carrying on their own.

Table 4.17: Payment of water transport from the water source to house before execution of water projects

Payment for water transport	Frequency	Percent	Cumulative Percent
Yes	202	40%	40%
No	302	60%	100%
Total	504	100%	

The respondents paying for water transport were also asked to tell how much they incurred to transport water to their homes and the cost was calculated per day. The study revealed that majority of respondents paying water transport spent between 11-20 shillings followed by 21-30 shillings. This shows that at times the cost of transporting water was more than the actual buying price of water.

Table 4.18: Household water transport cost per day before implementation of water projects

Water transport cost per day	Frequency	Percent	Cumulative Percent
1-10	36	18 %	18%
11-20	97	48%	66%
21-30	49	24%	90%
31-40	20	10%	100%
Total	202	100%	

4.4.9 Water projects and their relation to economic benefits to Kosovo residents

Almost all the respondents (99%) acknowledged economic relieve associating it to introduction of water and sanitation projects in the settlement. Fox and Liebenthal (2006) argues that water, sanitation and hygiene are essential for achieving the MDGs- and hence for alleviating global poverty. The remaining 1% did not seem to realize any economic benefits from these projects saying that there economic status had not been changed in any way that can be attributed to provision of water and sanitation projects in the settlement. The main reasons that the residents felt water projects had contributed were reduced water buying price and extra-time for economic activities.

Table 4.19: Perception of the respondents on economic benefits of water & sanitation projects

Economic benefits of water & sanitation projects	Frequency	Percent	Cumulative Percent
Yes	499	99%	99%
No	5	1%	100%
Total	504	100%	

The respondents had various reasons as to why they felt water and sanitation projects were of economic importance.

Table 4.20: Reasons for economic benefits attributed to water & sanitation projects in Kosovo

Economic benefits of water & sanitation projects	Frequency	Percent	Cumulative Percent
Reduced water buying price	366	73.3%	73.3%
Water transport cost relieve	17	3.3%	76.6%
Extra-time for economic activities	83	16.7%	93.3%
Cost of toilets lowered	33	6.7%	100%
Total	499	100%	

73% of the respondents acknowledging economic benefits from water projects pointed out reduced water tariffs as the main reason why they felt the projects had helped them economically. The residents were now able to save money to start small scale businesses hence improving their source of income. 3% mentioned water transport relieve as reason to why they felt the water and sanitation were of economic importance, 17 % felt that time saved due to easy access to water and sanitation facilities compared to the period the projects were established was used to perform other activities of economic value. Another section of respondents (6.7%) considered reduced toilet tariffs as the key aspect through which the residents were able realize economic benefits from the said projects.

4.5 Health implications of water and sanitation projects in Kosovo village

The quality of water and sanitation provision in any given settlement can determine the residents' health condition. The researcher was interested in establishing the influence of safe water access and improved sanitation on prevalence and incidences of water related diseases to Kosovo residents. This was simply done by comparing number and frequency of water related diseases suffered by the residents before and after establishment of water and sanitation projects in the settlement.

4.5.1 Incidences of water and sanitation related diseases before and after water and sanitation projects

The following tables contrast incidences of water and sanitation related diseases before and after establishment of water and sanitation projects.

Table 4.21: Incidences of water related diseases before the water projects among the respondents.

Incidences of water related diseases	Frequency	Percent	Cumulative Percent
Yes	336	66.7%	66.7%
No	168	33.3%	100%
Total	504	100%	

Table 4.22: Incidences of water related diseases after water the projects among the respondents.

Incidences of water related diseases	Frequency	Percent	Cumulative Percent
Yes	132	26.1%	26.1%
No	372	73.9%	100%
Total	504	100%	

Comparison between tables 4.21 and 4.22 above shows that, access to safe water and better sanitation had a tremendous reduction on incidences of water and sanitation related diseases suffered by the settlement residents. Whereas 66.7% of the respondents had suffered water related diseases before establishment of water and sanitation projects only 26.1% of the respondents suffered water related diseases after the water and sanitation projects were established in the settlement. This change can be attributed to improved sanitation, and improved access to safe drinking water among the residents.

4.5.2 Prevalence of unsafe water and poor sanitation related diseases

Access to unsafe water and poor sanitation can contribute to range of diseases. The respondents were asked to state most prevalent disease related access to unsafe water and poor sanitation suffered by family members before and after the water and sanitation projects were established. The most common diseases related to unsafe water and poor sanitation suffered by respondents before the water and sanitation projects are presented in table 4.23 below.

Table 4.23: Prevalent diseases suffered in the settlement before water & sanitation were established

Common diseases suffered by the respondents	Frequency	Percent	Cumulative Percent
Typhoid	130	38.7%	38.7%
Diarrhea	50	15%	53.7%
Amoeba	21	6.1%	59.8%
Malaria	36	10.8%	70.6%
Intestinal worms & Skin diseases	87	25.8%	96.4%
Cholera	12	3.6%	100%
Total	336	100%	

The responses as illustrated by table 23 above shows most prevalent six diseases related to unsafe water and poor sanitation suffered by family members before establishment of water and sanitation projects in the settlement. Typhoid and Intestinal worms/skin diseases were the most prevalent diseases representing 39% and 26% respectively of diseases related to unsafe water and poor sanitation experienced in the settlement. The two diseases rated high before the projects perhaps due to high contamination of domestic water and human waste. Diarrhea and Malaria represented 15% and 11% respectively of such diseases. Amoeba and Cholera were the least diseases attributed to unsafe water and poor sanitation in the settlement with 6% and 4% respectively.

Table 4.24: Prevalent diseases suffered in the settlement after water & sanitation projects were established

Common diseases suffered by the respondents	Frequency	Percent	Cumulative Percent
Typhoid	36	27.2%	27.2%
Diarrhea	24	18.3%	45.5%
Amoeba	11	8%	53.5%
Malaria	18	14%	67.5%
Intestinal worms & Skin diseases	43	32.5%	100%
Total	132	100%	

After implementation of water and sanitation projects in the settlement five diseases related to unsafe water and poor sanitation were mentioned. The five include all the suffered diseases before the projects with exclusion of cholera. Intestinal worms & Skin diseases were the most common diseases with 33% of the mentioned diseases, closely followed by typhoid with 27%. Cases of diarrhea were at 18% of the common mentioned diseases, while Malaria and Amoeba remained the least mentioned diseases with 14% and 8% respectively. The study also noted significant reduction in frequencies for all said diseases in comparison to the situation before water and sanitation projects were implemented. This drop in disease prevalence among the residents is therefore directly attributed to the availability of safe drinking water and improved sanitation.

4.5.3 Water and sanitation projects' contribution to improved health condition of the households

In order to determine the influence of safe water access and better sanitation to health condition to the households living in the settlement, the respondents were asked to give their opinion on

whether the water and sanitation projects had contributed to improved health conditions to their families or not.

Table 4.25: Opinion on whether water and sanitation projects have influence on health condition of the people in the settlement

Water and sanitation projects influence on health condition	Frequency	Percent	Cumulative Percent
Yes	487	96.7%	96.7%
No	17	3.3%	100%
Total	504	100%	

As illustrated in *table 4.25,* 96.7% of the respondents were able to associate improved health conditions of their families to the availability of safe water and improved sanitation in their settlement. On the other hand, 3.3% of the respondents did not correlate health conditions of their families to the established water and sanitation projects.

The reasons given by the respondents as to why they relate the water and sanitation projects to improved health condition of their families were grouped into three categories and are presented in table 4:26 below. The 3.3% of the respondents who did not correlate health condition of their families to the established water and sanitation projects explained that the health condition of their families did not change with the introduction of water and sanitation projects primarily because their health condition were not water and sanitation related.

Table 4.26: Reasons why water & sanitation projects in Kosovo settlement contributed to improved health condition of the residents

Reasons for improved health condition of the residents	Frequency	Percent	Cumulative Percent
Access to safe drinking water	260	53.4%	53.4%
Improved human waste disposal	191	39.2%	92.6%
Adequate safe water facilitating environment clean-up	36	7.4%	100%
Total	487	100%	

Majority of respondents (53.4%) felt access to safe drinking water had contributed to better health conditions to their families. This was mainly because access to safe drinking water had reduced the risk of contaminating water borne diseases. Improved human waste disposal (39.2%) was the second main reason why the residents felt their health condition had improved as a result of water and sanitation projects in the settlement, possibly because there was proper human waste handling from the settlement to the sewers that when not properly managed causes contamination that brings about water related diseases. The last reason (7.4%) that made the respondents relate improved health condition of their households to water and sanitation projects was the availability of adequate safe water facilitating environment clean-up.

4.6 Environmental implications of water and sanitation projects on the livelihood of Kosovo residents

The study sought to establish whether introduction of water and sanitation projects had any positive implications towards the environmental conditions. Different aspects of environmental sanitation were examined.

4.6.1 Toilet ownership

The respondents were asked whether each household had its own toilet before and after introduction of water and sanitation projects in the settlement. The study found out that before the water and sanitation projects were put in place only 23% of the respondents accounting to 117 households had private toilets. The rest (77%) relied on communal toilets that were faced with a challenge in cleanliness thereby leaving the residents prone to water borne and sanitation related diseases.

Table 4.27: Households with private toilets before establishment of water and sanitation projects

Households with private toilets	Frequency	Percent	Cumulative Percent
Yes	117	23.3%	23.3%
No	387	76.7%	100%
Total	504	100%	

Upon implementation of water and sanitation projects the study established that the percentage of households with private toilets had increased from 23% to 37%. This is presented in tables 4:27 and 4:28 below. This increase came about because when the water became available, the residents were now comfortable managing their own waste and therefore, they chose to own toilets rather than rely on the communal toilets.

Table 4.28: Households with private toilets after establishment of water and sanitation projects

Households with private toilets	Frequency	Percent	Cumulative Percent
Yes	185	36.7%	36.7%
No	319	63.3%	100%
Total	504	100%	

4.6.2 Common types of toilets in the settlement

The study established that before water and sanitation projects were established in the settlement there were only two types of toilets commonly accessed by the households. As presented in tables 4:29 and 4:30 below, flash toilets remain the most common toilets both before and after the implementation of the water projects because they are cheaper to setup than pit latrines that require space for digging and eco toilets that require a structure and space where they are placed. Similarly, flash toilets require less effort to clear human waste from the toilet to the sewer lines compared to the eco toilets that require effort to move the waste from the toilet to the sewer lines.

Table 4.29: Common types of toilets before establishment of water and sanitation projects

Common types of toilets	Frequency	Percent	Cumulative Percent
Latrine	123	24.4%	24.4%
Flash toilet	381	75.6%	100%
Total	504	100%	

Table 4.30: Common types of toilets after establishment of water and sanitation projects

Common types toilets	Frequency	Percent	Cumulative Percent
Latrine	107	21.3%	21.3%
Flash toilet	312	61.8%	83.1%
Eco-toilet	85	16.9%	100%
Total	504	100%	

4.6.3 Convenience of toilet access in the settlement before and after establishment of water and sanitation projects in the settlement

In order to determine whether there was convenience in access to human waste disposal facilities in the settlement brought about by the water and sanitation projects, the residents were asked to give their opinion on how convenient the toilet access situation was before and after water and sanitation projects were brought into the settlement. The findings of the study are presented in tables 4:31 and 4:32 below.

Before water and sanitation projects were brought into the settlement 49% of the respondents considered access to human waste disposal facilities inconvenient, 45% fairly convenient and only 6.3% of the respondents felt the human waste disposal facilities were very convenient to them.

Table 4.31: Convenience of toilets before establishment of water and sanitation projects

Toilet convenience	Frequency	Percent	Cumulative Percent
Very convenient	32	6.3%	6.3%
Fairly convenient	227	45%	51.3%
Inconvenient	245	48.7%	100%
Total	504	100%	

Upon implementation of water and sanitation projects in the settlement only 15% had the opinion that access to human waste disposal facilities was inconvenient, 66% said the access to human waste disposal facilities were fairly convenient while 19% of the respondents felt human waste disposal facilities were very convenient to their households. The residents had a problem of human waste disposal especially during morning rush hour when about five households have to queue in order to use one toilet finding it not convenient at all.

Table 4.32: Convenience of toilets after establishment of water and sanitation projects

Toilet convenience	Frequency	Percent	Cumulative Percent
Very convenient	98	19.4%	19.4%
Fairly convenient	330	65.5%	84.9%
Inconvenient	76	15.1%	100%
Total	504	100%	

4.6.4 Handling of human waste from toilet before establishment of water and sanitation projects

Regardless of whether household owned a toilet or not the respondents were asked how human waste disposal from the toilets was done before and after water and sanitation projects were operational in the settlement. This was felt necessary to determine the end disposition of human waste which could be harmful if not properly handled. The study found out that before establishment of water projects, all human waste from flash toilets culminated directly into Mathare River or into open spaces within the settlement. As presented in table 4:29 this is equivalent to 75.6% of the total human waste in the settlement. According to table 4:29 the remaining 24.4% of human waste was deposited in pit latrines which also is not a very safe human waste disposal method especially in densely populated areas due to high contamination of ground water through infiltration.

4.6.5 Handling of human waste from toilet after establishment of water and sanitation projects

Table 4.33: Human waste handling after establishment of water and sanitation projects

Toilet convenience	Frequency	Percent	Cumulative Percent
Eco-toilet	85	16.9%	16.9%
Pit Latrine	107	21.2%	38.1%
Temporary sewer line	89	17.7%	55.8%
NWSC-sewer line	122	24.2%	80%
Drain into the river/Open spaces	101	20%	100%
Total	504	100%	

Upon introduction of water and sanitation projects in the settlement, the study established that the percentage of households channeling human waste directly into the river reduced from 75.6% to only 20%. The study also observed that after the water projects were in operation, temporary sewer lines and Nairobi water and sewerage main sewer line were connected to majority of the households and public toilets in the settlement. In this regard, 18% of the respondent's human waste was discharged into temporary sewer lines while 24% was discharged into Nairobi water and sewerage main sewer line. The study attributed such sewerage connections to adequate water supply that now enables the residents to flash and drain human waste into the sewerage systems. Similarly, human waste discharged into pit latrines and eco-toilets accounted for 21% & 17% respectively.

4.6.6 Benefits of water and sanitation projects towards environmental condition

The respondents were asked to give their opinion on whether the water and sanitation projects had any positive contribution towards their environmental condition. This was to establish whether the residents were able to link improved environmental condition to the laid projects in their settlement. As revealed by table 4:34 below the majority of the respondents acknowledged that water and sanitation projects established in the settlement had contributed to improved environmental condition in the settlement and this accounted for 92.6% of the respondents. The remaining 7.4% argued that water and sanitation projects did not help in improving environmental condition.

Table 4.34: Benefits or no benefits of water and sanitation projects towards environmental condition

Benefits or no benefits of water and sanitation projects to environment	Frequency	Percent	Cumulative Percent
Yes	467	92.6%	92.6%
No	37	7.4%	100%
Total	504	100%	

For whichever reason given above, the respondents were asked to explain their reasons. Reasons as to why the respondents felt the water and sanitation projects in the settlement had contributed to environmental improvement are grouped into four reasons as presented in the table 4:35 below.

Table 4.35: Reasons linking water and sanitation projects in the settlement to environmental improvement

Reasons for environmental benefits of water & sanitation projects	Frequency	Percent	Cumulative Percent
Clean toilets due to adequate water	80	17%	17%
Affordable toilets have increased toilet accessibility hence reducing fly toilets	146	31.3%	48.3%
Sewerage systems enabling proper human waste disposal	173	37.1 %	85.4%
Many drainage channels are now unblocked due to adequate water availability	68	14.6%	100%
Total	467	100%	

Sewerage systems enabling proper human waste disposal was the most mentioned reason accounting to 37% of the respondents seconded by (31%) affordable toilets thereby increasing toilet accessibility as a result reducing fly toilets thereby reducing foul smell in the settlement. Some respondents (17%) mentioned adequate water in the settlement enabling clean toilets to be the greatest reason why they considered water and sanitation projects to have contributed to improved environmental condition.15% of the respondents felt adequate water facilitating to

drainage channel clean up to be the main reason the water and sanitation projects helped to improve the environmental condition.

Table 4.36: Reasons why water and sanitation projects in the settlement did not contribute environmental improvement

Why not benefits of water and sanitation projects to the Kosovo environment	Frequency	Percent	Cumulative Percent
Pollution in the settlement is still experienced from within and without	24	64%	64%
Access to adequate water has increased dirty grey water in the settlement	13	36%	100%
Total	37	100%	

Respondents who felt water and sanitation projects were not of help in improving environmental conditions gave reasons that were categorized into to two as shown on the table above. 64% of the respondents with such opinion argued that their environmental condition did not change since the nearby Mathare River remained as polluted as before the water and sanitation projects were set up in the settlement. They particularly pointed out that the river was not only being polluted from within Kosovo settlement but also other settlements upstream. These were mostly people living adjacent to the River. 36% of the respondents with the view that water and sanitation projects in the settlement did not contribute towards environmental improvement argued that increased access to adequate water lead to more grey water in the settlement. Since the settlement does not have adequate infrastructure to enable proper disposal of domestic waste water, this has resulted to waste water spillage in the limited open spaces and drainage channels worsening the hygiene conditions in the settlement.

From the data analysis in Chapter four above, the study has come up with several findings as guided by the objectives of the study, that illustrate the relationship between the variables and the dependencies.

It is observed that the water and sanitation project had a positive impact on the residents of Kosovo settlement. The project managed to uplift the health conditions of the residents through the provision of a clean environment where residents live without the threat of waterborne diseases that are brought about by lack of proper management of human waste. The availability of safe and affordable drinking water has enabled these residents to shift focus from concentration on the provision of basic needs such as clean water and food to more productive and progressive economic activities. Money spent on medicines and doctor consultations due to diseases is now being used on other essential services such as education. The sustainability of this project will enable the Kosovo settlement residents to continue advancing economically, afford them healthy and happy families that live in a better environment.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction of the chapter

This chapter discusses the summary of the findings; conclusions reached and then give the recommendations as per the responses from the respondents. This is in relation to implications of water and sanitation projects on the livelihood of slum dwellers in Kosovo village in Mathare informal settlement, Nairobi County. The chapter also looks at the conclusions and recommendations as deduced from the study findings. Finally, the chapter points out the areas the researcher thought would require further research in related fields.

5.2 Summary of findings

The main findings of this study are discussed under three broad objectives of the study.

5.2.1 Influence of water pricing on economic status of slum dwellers

Most of the respondents (99%) acknowledged economic relieve associating it to introduction of water and sanitation projects in the settlement. The economic improvement of the residents attributed to lower water pricing of water and sanitation projects was realized both directly and indirectly. 73% of the respondents acknowledging economic benefits from water projects pointed out reduced water tariffs as the main reason why they felt the projects had helped them economically. They particularly argued out that reduced water prices had enabled them to save money so as to perform other obligations of economic nature.

3% of the respondents mentioned water transport relieve as reason to why they felt the water and sanitation were of economic importance to their households since before the projects were established they could incur extra cost of transporting the water besides buying it at higher price comparatively.

On another point, 17 % of the respondents felt that time saved due to easy access to affordable water and sanitation services as a major economic score compared to the period the projects were not established since such saved time is now used to perform other activities of economic value.

Another section of respondents (6.7%) considered reduced toilet tariffs as the key aspect through which the residents were able realize economic benefits from affordable water tariffs of the said projects.

5.2.2 Implications of safe water provision on the health of slum dwellers

The study found out that safe water provision had significant positive implications towards Kosovo slum dwellers. Since inception of the water and sanitation projects believed to provide safe water, incidences of water related diseases have reduced from 67% to 26%.

The study found out that 97% of the respondents were able to associate improved health condition of their families to the provision of safe water and improved sanitation in their settlement. 53% of the respondents argued that access to safe drinking water thereby reducing risk of contaminating water borne diseases as main reason as to why the respondents felt water and sanitation projects had influenced their health condition positively. They claimed that water provision before establishment of the water and sanitation projects in the settlement have been highly contaminated with human waste due to water breakages and illegal tapping leading to unhygienic conditions.

The study found out that adequate safe water had contributed to improved human waste disposal methods. 39% of the respondents acknowledging positive implications of safe water provision to the health of their households mentioned improved human waste disposal to have been contributed to reduced incidences of water related diseases since less water contamination with human waste was greatly reduced. The improved human waste facilities and services were as a result of adequate safe water provision in the settlement.

The study also found out that adequate safe water provision had enabled clean environment inside and outside the houses thereby reducing risk of suffering from unhygienic environment. 7.4% of the respondents related improved health condition of their households to water and sanitation projects due to adequate safe water facilitating environment clean-up.

5.2.3 Implications of improved sanitation provision on slum environmental condition

The study found out that improved sanitation provision in slum areas can contribute towards improved environmental condition through several ways. 93% of the respondents attested that establishment of water and sanitation projects had contributed to improved environmental condition in the settlement. Various reasons were given by the respondents to support their answers.

37% of this respondents argued that the newly constructed sewerage systems had helped to solve the problem of improper human waste disposal leading to environmental pollution. 31% of the

respondents believed that affordable toilets thereby increasing toilet accessibility to have lead to reduced environmental pollution. They explained that affordable human waste disposal facilities had greatly reduced fly toilet cases thereby reducing foul smell in the settlement. Some respondents (17%) mentioned adequate water in the settlement enabling clean toilets to be the greatest reason why they considered water and sanitation projects to have contributed to improved environmental condition.15% of the respondents felt adequate water facilitating to drainage channel clean up to be the main reason the water and sanitation projects helped to improve the environmental condition.

5.3 Discussion of findings

The study found out that upon introduction of water and sanitation projects in the settlement 99% of the respondents were able to associate economic improvement of their livelihood to the services provided by the projects. This findings complement study by Fox and Liebenthal (2006) which concluded that safe water, sanitation and hygiene are essential for achieving the MDGs- and hence for alleviating global poverty.

Besides creating jobs for many local people in the settlement most of the respondents acknowledging economic benefits from water projects pointed out reduced water tariffs as the main reason why they felt the projects had helped them. Reduced water tariffs enabled more savings thereby creating wealth mostly to start small businesses. 17 % of the respondents felt that time saved due to easy access to water and sanitation facilities compared to the period the projects were established was used to perform other activities of economic value. Before the projects water supply was not constant and reliable. During water shortages the residents used to fetch water or buy water at hiked prices from water vendors or outside the settlement. These sources of domestic water were characterized by long queues leading to time wastage. Though the distances travelled to access water were not long, fetching water is an opportunity cost in number of man-hours, which would have been used in gainful employment. Similarly, before the water and sanitation facilities were human waste disposal facilities in the settlement were few and inconvenient. The residents had a problem especially during morning rush hour when about five households have to queue in order to use one toilet. This not only dehumanizes them but also results to delays to work. Upon introduction of the water and sanitation projects the toilet tariffs reduced leading to more savings.

Since water and sanitation projects brought about reduction in incidences of water related diseases, the residents are able to spend that money to cater for other ways of economic importance such as to improve their nutrition. This is along Hesselbarth (2005) observation that improved water quality will reduce the health risks and also the costs of preventing and treating ill family members. Furthermore, the reduction of working days lost to water-related diseases will also have a positive impact on the household's income situation.

Most of the respondents (96.7%) were able to associate improved health condition of their families with the provision of water and sanitation provision in their settlement. The findings agree with that of (Hesselbarth, 2005) which concluded that providing sustainable access to safe water supply and basic sanitation together with hygiene education can bring about a major reduction of water-related health risks and child morbidity and mortality.

The respondents stated that before establishment of the water projects in the settlement, residents mainly depended on private service providers, illegal water connections and water from nearby Mathare River. This endangered public health and environment quality in the process, because water from these sources is not quality assured. Typhoid cases in the settlement can be attributed to the heavy presence of private service providers whose services is not regulated.

The unreliable situation of water supply in the settlement before establishment of water projects implied residents had to store water in order to ensure supply during the dry days. The process of water storage involves risk of contamination if not properly handled. Some of water borne diseases suffered by their household members can be attributed to improper water storage leading to contamination.

Since about 94% of the residents are now getting water from NWSC after establishment of the water projects, then it is believe that the water is of assured quality. This is because NWSC has an obligation to its residents to treat any water that it supplies. The study therefore associated reduction in incidences and prevalence of water related diseases to safe water provision in the settlement.

The study therefore concludes that, the level and accessibility of safe portable water supply services is therefore directly related to the incidence of water related diseases so that where the level and accessibility is high then the incidence of disease is lower.

Majority of the respondents (93%) observed that improved sanitation had positively impacted on their health conditions. The study found out that before the sanitation projects were set up in the settlement particularly the public toilets, significant number of the households had fly toilets as the main way of human waste disposal. This implied danger in terms of contact between human waste and human beings resulting in high incidence of intestinal worms and skin infections in the settlement.

Safe adequate water supply can enable people to clean their environment to ensure high standards of hygiene. After establishment of water projects the residents were able to unblock clogged drains and wash away sewerage disposal. This helped to destroy fertile breeding grounds for bacteria that posed danger to public health. Whereas typhoid is related to unsafe drinking water skin infections are related mostly to unhygienic living conditions.

Human waste disposal has improved upon implementation of sanitation projects in the settlement. Due to this state of affairs then only 43 incidences compared to 87 of intestinal worms and skin infections before water and sanitation projects were reported. Intestinal worms and skin infections are directly related to poor sewerage disposal services in terms of increased risk of exposure of humans to human excreta.

5.4 Conclusion of the study

The purpose of this study was to investigate the implications of water and sanitation projects on the livelihood of slum dwellers in Kenya, where focus was on Kosovo village residents in Mathare constituency Nairobi County. The literature review showed a positive influence of safe water access together with improved sanitation to improved health conditions, economic improvement and improved environmental conditions.

Water and sanitation projects in slums have contributed positively towards improved livelihoods of the residents at the local level through safe water access, reduced water pricing and improved sanitation provision. The quality and sustainability of the projects established is however wanting, some of the aspects of the projects being temporary. E.g. Plastic sewer lines connected to toilets are vulnerable to breakages.

Some people may not be aware of how water and sanitation projects can contribute towards their improved livelihoods due to inadequate knowledge of the project's objectives and purpose.

5.5 Recommendations of the study

Based on findings from this study, the following recommendations are made;

i) Water and sanitation projects should be up-scaled in slums. From the study it has been established that water and sanitation projects in slums have significant implications on the livelihood of the residents. The government and other development agencies should therefore strive to enhance the capacity of the existing projects as well as reach out new areas to improve livelihood of more people.

ii) On another score, other infrastructural facilities that complement provision of water and sanitation projects such as proper route networks and drainage channels should be constructed alongside such projects. Adequate provision of safe water resulted to high volumes of storm water leading to stagnant water in the settlement.

iii) All the personnel involved in the implementation of water and sanitation projects should be constantly trained on proper project management practices. They should be motivated through ample monetary gain for the work they do. Similarly, there should be constant, awareness creation for the community members about the benefits and proper practices of water and sanitation projects.

iv) Community participation especially in the implementation of the projects should be increased to ensure sustainability of water and sanitation projects thus enhancing continued livelihood improvement.

5.6 Suggestion for further research

This study has encountered other areas which would require further research. These are;

1. The effects of community participation on the sustainability of water and sanitation projects in slum areas
2. Challenges facing the successful implementation of water and sanitation projects in slum areas
3. It would be of interest to future researchers to establish the implications of water and sanitation projects on the livelihood of slum dwellers in other slums of the country and of the world
4. As time change so does the perception of the people, so a couple of years down the line, another survey can be done in the same settlement to note if any changes occurred.

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APPENDICES

Appendix 1: Letter of Transmittal

Titus Mulinge

Email: ticoh01@yahoo.co.uk

Date……..

Dear Sir/Madam,

I am an MA student at the University of Nairobi and in my final year of study. As part of the requirement for the award of the degree of Master of Arts in Project Planning and Management, I'm undertaking a research on **Implications of Water Supply and Sanitation Projects on the Livelihoods of Slum Dwellers In Kenya: A Case of Kosovo Village in Mathare Constituency, Nairobi County**

In this regard, I'm kindly requesting for your support in terms of time, and by responding to the attached questionnaire. Your accuracy and honest response will be critical in ensuring objective research.

It will not be necessary to write your name on this questionnaire and for your comfort, all information received will be treated in strict confidence. In addition, the findings of the study will surely be used for academic research purposes and to enhance knowledge in the field of Project Planning and Management.

Thank you for your valuable time on this.

Yours faithfully

Mulinge Titus Munyao.

L50/66659/2010

Appendix 2: Questionnaire for Kosovo Dwellers

Request for Participation

This questionnaire is prepared to facilitate in the collection of relevant data for an academic research whose aim is to study the **implications of water supply and sanitation projects on the livelihoods of slum dwellers in Kosovo village in Mathare informal settlement, Nairobi county.** The information gathered will only be used for the study and shall not be used to victimize any one and the respondents will remain anonymous and their names shall not be revealed to anyone. We would like you to participate in this survey. You were randomly chosen from among many people and everything that you tell us will be kept confidential. The information that you provide us will be combined with information from about 515 other people, and will not be identifiable as coming from you. Your participation is voluntary. You do not have to participate. If you do, you can choose not to answer a particular question, or even stop the interview at any point. You or your family will not get into any trouble if you decide not to participate. This instrument is to be administered to households who have lived in this settlement for a period of not less than five years.

Would you like any more information before making your decision to participate or not?

SECTION 1: GENERAL DATA OF THE RESPONDENTS

Q. NO	QUESTION	RESPONSES	X	CODE
1.0	How old are you?	……Years		
1.1.	How many people live in your household?	....		
1.2.	What is your gender?	1=male		
		2=female		
1.3.	What is your level of education? *(Mark one appropriate box only)*	1= None	□	
		2= Primary	□	
		3=Secondary	□	
		4= Tertiary	□	
		5=Others, *Specify*.....	□	
1.4.	What is the main source of	1=Salaried employment	□	

	livelihood for this household?	2=Casual employment	□	
		3=small scale business	□	
		4=large scale business	□	
		5=peasant farmer	□	
		6=large scale farmer	□	
		7=beggar	□	
		8=others, *Specify*.....	□	
1.5.	Do you have a spouse?	1= Yes	□	
		2= No	□	
1.6	What is the main source of water for your household?	1=piped water		
		2=water kiosk		
		3=water vendors		
		4=bore hole		
		5=Rain water		
		6=River		
		6= other, specify		
1.7	What is the distance in meters from your house to the main source of your water?	1= 0-50		
		2=51-100		
		3=101-200		
		4=201-300		
		5=301-400		
		6=401-500		
		7=Above 500		

1.8	Before the establishment of the water projects in the settlement how far from house did you access main source of water? *(In meters)*	1= 0-50		
		2=51-100		
		3=101-200		
		4=201-300		
		5=301-400		
		6=401-500		
		7=Above 500		

SECTION 2: ECONOMIC EFFECTS OF WATER AND SANITATION PROJECTS ON THE LIVELIHOOD OF SLUM DWELLERS

Q. NO	QUESTION	RESPONSES	X	
2.1	Is there a constant supply of water in your area?	1=yes		
		2=no	□	
2.2	What is the average amount of water does your household spent in a day? (in 20liter containers)	1 and below		
		2-3		
		4-5		
		6 and above		
2.3	Do you pay for water in your village?	1=yes	□	
		2=no	□	
2.4	If yes above how much in shillings per 20 litre jerican?	....		
2.5	How much were you paying for 20 litre jerican before the water projects in the settlement were established?			
2.6	How long do you take in fetching water per day? (in			

	minutes)			
2.7	How long were you taking to fetch water per day before the water projects? (in minutes)			
2.8	Do you pay to transport water to your household?	1=yes		
		2=no		
2.9	If yes above how much do you spent per day?	....		
2.10	Before the water projects in your settlement were established did you pay to transport water to your household?	1=yes		
		2=no		
2.11	If yes above how much did you spent per week?	....		
2.12	Has water projects in your settlements helped you economically in any way?	1= yes		
		2=no		
2.13	Give the main reason for your answer above?	....		

SECTION 3: HEALTH IMPLICATIONS OF WATER AND SANITATION PROJECTS ON THE LIVELIHOOD OF SLUM DWELLERS				
Q2. NO	**QUESTION**	**RESPONSES**	☒	
3.1	During your stay in this settlement has any of your family members suffered water related disease? (Before establishment of water and sanitation projects)	1=Yes		
		2=No		
3.2	During your stay in this settlement has any of your	1=Yes		

	family members suffered water related disease? (After establishment of water and sanitation projects)	2=No		
3.3	Mention the most frequent disease in your family before establishment of water and sanitation projects?			
3.4	Mention the most frequent disease in your family after establishment of water and sanitation projects?			
3.5	In your own opinion did the water projects in your settlement improve health condition of your family?	1=Yes		
		2=No		
3.6	Explain the main reason for your answer above?			
	SECTION 4: ENVIRONMENTAL IMPLICATIONS OF WATER PROJECTS ON THE LIVELIHOOD OF SLUM DWELLERS			
4.1	Does this house have its own toilet?	1=yes		
		1=no		
4.2	Did this house have its own toilet before establishment of water and sanitation projects?	1=yes		
		1=no		
4.3	Type of toilet before establishment of water and	1=Latrine		
		2=Flash toilet		

	sanitation projects?	3=Eco-toilet
		4=Other state
4.4	Type of toilet after establishment of water and sanitation projects?	1=Latrine
		2=Flash toilet
		3=Eco-toilet
		4=Other state
4.5	How convenient was the human waste disposal before water and sanitation projects?	1=Very convenient
		2=fairly convenient
		3=poor/not convenient at all
4.6	How convenient is the human waste disposal after water and sanitation projects?	1=Very convenient
		2=fairly convenient
		3=poor/not convenient at all
4.7	Before water and sanitation projects where did your main source of toilet discharge its effluent to?	
4.8	After water and sanitation projects where does your main source of toilet discharge its effluent to?	
4.9	Do you think water projects in your settlement had any positive contribution towards environmental conditions?	1=Yes
		2=No
4.10	Explain the main reason for your answer above?	

Thank you for your cooperation

Appendix 3: Focus Group Discussion Guide

1. Are you aware of any water and sanitation projects in your settlement? (Give details of all the projects)
2. For how long has the projects above been in existence?
3. In what ways were you involved in implementation of the projects above?
4. Did the projects help you to improve your livelihood in the following aspects?
    a. Economic
    b. Health
    c. Environment
5. Describe how the projects helped your settlement economically
6. Describe how the projects helped your settlement in health aspect
7. Describe how the projects helped your settlement environmentally

Appendix 4: Action Plan

ACTIVITY	TIMEFRAME	RESPONSIBILITY	ASSUMPTIONS
Proposal writing	By 01 November, 2012.	Researcher	
Review and approval of proposal	By 8th November, 2012.	Supervisor/course Coordinators	Proposal to be developed on time by the researcher and approved on time.
Sampling	By 10th November, 2012.	Researcher and supervisor	Proposal approved on time
Pre-testing question nnaire	By 11th January, 2013.	Researcher assisted by supervisor	Pre-testing done on time
Collection of data	By 14th January, 2013.	Researcher	Absence of major constraints in the field
Data analysis and interpretation	By 18th March, 2013.	Researcher	Data analysis done on time
Writing and typing of thesis	By 1st April, 2013.	Researcher	Report writing completed on time.
Submission of final draft	30th May, 2013.	Researcher	Thesis submitted on time.

Appendix 5: Research Budget

Item/Activity	**TOTAL COST (KSHs)**
Transport (Reconnaissance and Actual Field work)	36,000.00
Subsistence allowances for the assistant researchers	34,000.00
Equipment (Stationary, diskettes, photocopying papers etc)	21,500.00
Typing of Researcher thesis, printing and binding	15,000.00
Typing of Research questionnaires & interview schedules	13,000.00
Miscellaneous	7,000.00
Grand Total	**126,500.00**