INFLUENCE OF COMMUNITY INTRVENTION STRATEGIES ON PERCEPTION OF SUSTAINABILITY OF PROJECTS: A CASE OF WATER SANITATION AND HYGIENE PROJECTS IN PERI-URBAN ESTATES AND RURAL SURROUNDINGS OF KISUMU CITY -KENYA

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2015

DECLARATION

This Research Thesis is my original work and has not been presented for any award in any University

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DEDICATION

This research thesis is dedicated to my wife, Dorah Indakwa, who has been an inspiration throughout the grueling period of putting together this piece of work

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ABBREVIATION AND ACRONYMS

ADB	African Development Bank
CBO	Community Based Organisation
CLTS	Community Led Total Sanitation
CMCs	Central Management Committees
DDA	Demand Driven Approach
DV	Dependent Variable
ECA	European Court of Auditors
EPHS	Elmore Primary Health Service
FGD	Focus Group Discussion
GHD	Global Handwashing Day
IFAD	International Fund on Agriculture Development
IMC	In Market Companies
IPHC	Integrated Primary Health Care
IV	Independent Variable
JMP	Joint Monitoring Programme
KDP	Kecamata development Group
KNBS	Kenya National Bureau of Standards
KWTF	Kenya Women Trust Fund
LVSWSB	Lake Victoria South Water Services Board
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation
MLE	Maximum Likelihood Estimation
MV	Moderating Variable
MWI	Ministry of Water and Irrigation
NGOs	Non Governmental Organisations
OD	Open Defecation
ODF	Open Defecation Free
O&M	Operation and Maintenance
RCS	Rochdale Community Sports
RoFTRA	Rochdale Federation of Tenants and Residents Associations
RWSN	Rural Water and Sanitation Network
SWS	Safe Water System

SRPP	Sector Reform Pilot Projects
TOTs	Training of Trainers
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Childrens Fund
UNU	United Nations University
USEPA	United States Environmental Protection Agency
USAID	United States Agency for International development
WASEH	Water Sanitation and Education for Health
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation

ABSTRACT

Global coverage of improved water and sanitation vary significantly within and across countries, with low income countries at 49% compared to 98% in high income countries. The burden of poor access falls primarily on poor populations and account for 3.4 million global deaths, heavy financial losses and loss of over 590 millions hours of productive time nursing water, sanitation and hygiene related illnesses and school going time for children. While investment in the water sector, especially in developing countries, is still inadequate, a significant proportion of the projects are ill-conceived and poorly implemented leading to premature failures and abandonment. This study sought to establish the influence of community intervention strategies- participation, empowerment, capacity building, conflict management and ownership on the perceived sustainability of water sanitation and hygiene (WASH) projects. It adopted a mixed method research anchored on a concurrent triangulation design. It targeted government and donor funded WASH projects within 148,494 households in eight sub-locations in the peri-urban and surrounding rural settlements in Kisumu city, Kenya. A sample size of 384 households was picked guided by Krejcie and Morgan table and proportionately distributed across the study area using a multi-stage sampling technique. Individual households were identified using a systematic sampling procedure and the respective heads subjected to a face to face questionnaire administration. Fifteen projects (30% of WASH projects population) were sampled and for every project, between 7-10 ordinary members of the projects and beneficiaries were randomly selected and included in focus group discussions. Data was collected over a period of three months. Instrument validity was ensured with input from two research experts from the University of Nairobi while reliability was determined using a split-half testing technique. Chi-square test for independence statistic and Binary logistic regression model in SPSS software version 17 was used to analyse quantitative data while qualitative data was analysed using content analysis method. The study established a significant independent influence of community participation ($p < 0.001$), capacity building ($p < 0.001$), empowerment ($p < 0.001$) and conflict management ($p < 0.001$) on sustainability of projects at 5% level of significance. When adjusted for confounding effects, the influence of community participation (P=0.002), capacity building (P=0.001), community empowerment (P<0.001), conflict management (P=0.003), community ownership (P<0.001) and the interaction between capacity building and community ownership(P<0.02) on sustainability of WASH projects were found to be significant. Strong and moderate levels of community participation {odds ratio (OR) strong (S) 7.7; moderate (M) 1.3}, capacity building {OR (S) 14.3; M 1.95}, empowerment {OR (S) 76.9; M 12.7}, and conflict management {OR (S) 27.5; M 6.5} were more likely to increase sustainability probabilities when compared to weak levels before adjusting for confounding factors. It was concluded that community participation, capacity building, community empowerment and conflict management had a significant independent and simultaneous influence on sustainability of WASH projects. As their strength levels increased, sustainability probabilities of WASH projects increased significantly. In addition, community ownership had a significant moderating effect on the interaction between capacity building and sustainability of WASH projects. The study recommends that WASH projects should ensure informed and active participation of communities in project identification and implementation. Communities should be strongly empowered and their capacities, especially of the management committee, sufficiently built in project management particularly in project establishment, technical, financial and conflict management. Further, WASH projects should be initiated and implemented in a manner that facilitates sufficient community sense of ownership. Future research should explore WASH projects sustainability against dependency on sorely internally generated funds and sustained external funding.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

It is today universally accepted that water is essential for life, crucial to sustainable development and a human right. However, efforts that address water needs of the global population, especially, in developing countries is inadequate. WHO/UNICEF (2013) estimate that 758 million people have no access to safe drinking water, 2.5 billion lack access to improved sanitation while 1.1 billion practice open defecation. Global coverage of improved water and sanitation vary significantly across regions and countries. On average, 89% of the global population have access to safe drinking water, 1% above the Millennium Development Goal (MDG) drinking water target. The coverage is highest in developed countries at 99%, it is at 87% in developing countries and 71% in least developed countries. In Latin America and the Caribbean 93% of the population have access to safe drinking water compared to 92% in Eastern Asia and North Africa, 87% in Western Asia and 68% in Sub Saharan Africa (WHO/UNICEF, 2013).

Globally access to improved sanitation stands at 64%, which is 11% below the MDG sanitation target and representing over 1 billion people. Developed countries have the highest coverage at 95%, developing countries at 59% and 40% in least developed countries. Regionally, the coverage stands at 89% in North Africa, 84% in Western Asia, 75% in Latin America and the Caribbean, 67% in Eastern Asia and 33% in Sub-Saharan Africa (WHO/UNICEF, 2013). Within countries improved water and sanitation coverage vary significantly in urban and rural areas. Most countries in Europe including France, Germany, UK, Belgium and Bulgaria; the United States of America and Japan have 100% coverage in both urban and rural areas (WHO/UNICEF, 2013).

Brazil has 100% improved water coverage in urban areas compared to 84% in rural areas and 87% improved sanitation coverage in urban areas compared to 48% in rural areas. In India improved water coverage stand at 96% in urban areas and 89% in rural areas while improved sanitation coverage is at 60% in urban areas compared to 24% in rural areas. This same scenario is evident in Egypt, which has improved water coverage at 100% in urban areas and 90% in rural areas whereas improved sanitation in urban areas is at 97% compared to 93% in rural areas. In Kenya 83% of the urban population have access to improved water compared to 54% in rural areas while only 31% have access to improved sanitation in urban

areas and 29% in rural areas (WHO/UNICEF, 2013). Another 25% of the population use shared latrines (unsanitary) while 15% (5.6 million people) have no access to latrines and practice open defecation (WHO/UNICEF, 2010).

Either within regions or countries, the challenge of access to improved water and sanitation falls largely on poor population who predominantly reside in informal settlements in cities and towns and in rural dwellings (World Bank, 2012). For instance, while improved average water coverage stood at 60% in urban areas in Kenya in 2010, only 20% of the population in informal settlements had access to the water (USAID, 2011), which was sold 5-10 times more per litre than in the wealthier settlements (UNDP, 2006). Further disparities exist between cities. In 2007, for instance, piped water covered 65% of poor households in Nairobi, 22% in Mombasa and only 7% in Kisumu, yet the households formed 21% of the population of Nairobi, 38% of Mombasa and 43% of Kisumu (MWI, 2007). Only 10% of the residents of Kisumu were connected to a sewerage system, which were frequently bursting or experiencing blockages (UN Habitat, 2008). About 51% used private pits, 34% shared toilets while 5% practice open defecation when compared to 37% that used private pits and flush toilets, 59% sharing toilet and 0% practicing open defecation in Nairobi and 72% using private pit and flush toilets, 27% sharing and 1% practicing open defecation in Mombasa (MWI, 2007). The pits were in close proximity to shallow wells, major sources of domestic water, which triggered cross contamination during wet seasons (LVSWSB, 2008; UN Habitat, 2005; Orwa, 2001).

Poor access to improved water and sanitation has profound consequences. WHO (2008) estimate that more than 3.4 million people die each year from diseases associated with these conditions, 99% of the cases occurring in developing countries. Inadequate basic sanitation facilities result in about 4 billion cases of diarrhea, 1.5 million deaths (UNICEF/WHO, 2009) and over one half of all chronic malnutrition cases (Waddington *et al.,* 2009) every year and an additional 400 million cases of chronical intestinal parasite infection in children (UNU, 2008). Poor hygiene accounts for an additional 750,000 annual deaths among children in developing countries (UNICEF/WHO, 2006). Besides impact on health, poor access to improved water lead to huge wastage of productive manhours. About 200 million hours are spent globally collecting water daily for domestic use, with women and children, especially girls, bearing the greatest responsibility (UN, 2010) and consuming 152 million hours (WHO/UNICEF, 2010; UNICEF/WHO, 2009; WHO, 2004). Often they collect the water from contaminated sources far away from home spending between 4 to 6 hours

daily (WHO, 2008). In addition, about 443 million school days are lost each year due to water-related illnesses (UNDP, 2006).

Increasing access to improved water and sanitation has enormous benefits. UN Water (2009) revealed that improving these conditions can reduce global disease burden by 10%. Further, 55% of child deaths (about 2.2 million) in poor rural areas could be prevented through basic Water, sanitation and hygiene (WASH) interventions while an additional 2 million lives could be saved through advanced WASH interventions (UNICEF, 2011; Hill *et al* 2001). Improving sanitation facilities and hygienic practices such as hand washing with soap could also reduce cases of diarrhoea by between 33% and 40% (UNICEF/WHO, 2009; Curtis and Cairncross, 2003). Hand washing with soap could further prevent over 2 million annual deaths of children below five years, one third of neonatal deaths, one quarter of pneumonia deaths and over 200,000 deaths from measles, flu and communicable diseases (GHD, 2009). Face washing with clean water could also prevent one third of trachoma cases and 1.9 million cases of blindness (Khandekar *et al.,* 2006). Besides benefits on health, halving the global population with poor access to improved water and sanitation, from 1990 levels, could increase school attendance by 272 million days (UNICEF/WHO, 2009) while every dollar invested in improving water and sanitation could provide economic returns to a community at a range of US $ 3-34 (WHO, 2008; WHO, 2004).

Different strategies and approaches are used globally in executing water sanitation and hygiene (WASH) projects. In developed countries, there is 100% connection of water and sanitation facilities to all residents in both urban and rural dwellings. The facilities are supplied largely by public institutions, a couple of private investments and individual owner initiatives. Whether public owned or otherwise, the facilities are well maintained and functional at all times. Maintenances cost are settled from user fees charged as mandatory monthly bills, except for private owner facilities. In the United States of America, 74% of the population receive safe drinking water and sanitation services from public water and sewerage facilities, 15% have own wells while 11% are connected to private investment facilities (USEPA, 2002).

In the developing world however, access to improved water and sanitation is largely inadequate despite heavy investments in intervention measures. Intervention approaches were initially supply driven undertaken largely by governments and donor agencies and a few pockets of individual initiatives. The public facilities were designed and constructed with minimal consultation with local communities among which they were established. The communities were also never prepared nor their capacity built to take up management and

maintenance of the facilities. In recent years however, new approaches have been adopted that lay emphasis in local community participatory strategies. Of significant is the human rights-based approach to programming used in projects funded by international institutions across the world including UNICEF (Berman, 2008; Rozger, 2001), Action Aid (Bwisa and Nyonje, 2012) and Water Aid (Gosling, 2010). The approach emphasise on community participation in project identification, use and maintenance of the services. It promotes establishment of community user-group committees responsible for management and in building partnerships with existing local organizations within communities where the projects are implemented.

Other approaches focus on community ownership, promotion of community leadership (http:// sgp.undp.org) and cost sharing of project resources (in the form of finances, provision of local materials or labour) as central pillars in all projects (USAID, 2010; USAID, 2008). Yet others employ demand driven project development approaches (World Bank, 2008; Care, 2010), promotion of privatizations, public-private partnership, use of appropriate technologies founded on community culture and environment and micro-credit driven approaches (Tremolet *et al*., 2010). These approaches introduce strategies of community participation, self management, ownership and empowerment in project design and management but in no clearly defined extent or combination leading to pockets of successful and largely failed cases. Most WASH investments had high failure rates, often breaking down or malfunctioning soon after the promoters exit. In many cases, the infrastructure were installed with no provision for sustainability in terms of financing and capacity for operation and maintenance by the operators (ECA, 2012; World Bank, 2011; RWSN, 2010 and Asingo, 2005).

An evaluation of public water sources in the city of Port-de-Paix, Haiti established that there were not functioning public water systems in the city by 2007 (CHR&GJ, 2007). A similar study on rural water supply in Punjab Province in Pakistan reported that 20% of projects initiated by community based organizations (CBOs) were not in use (ADB, 2009). In India, a quarter of the water infrastructure were malfunctioning and required urgent repair (Ray, 2004) while over one-third of rural water infrastructure in South Asia were non-functional (World Bank, 2004). World Bank (2011) revealed that over 70% of hand pumps constructed in Sub-Saharan Africa in the past 20 years were broken down, presenting a loss of between US $ 1.2 -1.5 billion. A European Court of Auditors (ECA, 2012) survey on sustainability of 23 EU funded WASH projects in Tanzania, Ghana, Nigeria, Burkina Faso, Angola and Benin revealed high failure rates. Only four of the projects generated enough

revenue to cover operation cost, three relied on government financing and other sources and the remaining 16 had no support infrastructure beyond installation. Additionally, all boreholes funded by the EU were either non functional or in poor working conditions while some had their water pumping stations built without sufficient electricity to run the pumps. A similar survey by the Rural Water Survey Network done in 2007 revealed that 36% of all installed water hand-pumps in 21 countries in Sub-Saharan Africa were broken down, wasting investment worth between $1.2 and $1.5 billion in 20 years (RWSN, 2010). In East Africa, Water Aid (Taylor, 2009) survey revealed that over 46% of public improved water systems in rural Tanzania were broken down, 25% having broken down just 2 years after installation wasting about half of all investment in rural water supply.

In Kenya, a survey of over 700 wells sunk in Busia and Teso districts in 1980s, revealed that 43% were broken down by 2001 (Miguel and Gugerty, 2004). In Kitui district, only 28% of the wells initiated between 1983 and 1991 were operational by 1994, the rest having broken down or remained unused due failed installation or maintenance of hand pumps (ODA/CAFOD, 1994). Sustainability failures were further reported in a Safe water system (SWS) project implemented by Care International in Kenya in 60 schools in Suba, Homa bay and Rachuonyo districts in 2005. An evaluation conducted in 2008, 2.5 years after SWS interventions on the project's 55 schools revealed that programme activities were poorly sustained in all the project schools (Saboori *et al.*, 2011). Only 27% of the schools reported providing drinking water continuously and 6% reported providing soap for handwashing regularly although only 2% provided soap with containers at the time of the evaluation. The report further revealed that most schools had broken water facilities but less than 10% replaced them. A midterm evaluation of the Kegonga-Ntimaru IPA project in Kuria district, Kenya revealed that years after a water and sanitation interventions in the district, only 8% of households had access to improved water for domestic purposes. Over 61.5% relied on unprotected springs, rivers and streams while 17.4% used open public wells. Further, 23.4% of children above 5 years of age and 21.5% below 5 years were yet to practice hand washing after visiting toilets (Nyonje and Aboka, 2012).

1.1.1 Community participation in Projects

Bamberger (1986) defines community participation as an active process whereby beneficiaries influence the direction and execution of development projects rather than a mere receipt of a share of project benefits. Mathbor and Rodgers (2002) view community participation as the involvement of a significant number of persons in situations or actions

that enhance their well being. They provided four conditions that determine meaningful participation; who participates; what they participate in, why they participate and the implications of their participation. Arnstein (1969) extended this argument by providing eight different levels of participation. He noted that the higher the level of participation, the higher a community gained control over the activities they engage in.

Before 1950s, rural development initiatives in most developing countries were purely top down, designed and implemented by government and development agencies with minimal community involvement (Mathbor and Rodgers, 2002). However, this approach soon faced challenges of diminishing development resources, increasing cost of running projects and increasing demand by beneficiaries for efficiency and effectiveness in running projects, gradually creating a need for engaging beneficiaries in unlocking some of the challenges (Bamberger, 1986). The concept of community participation in rural development projects gradually began to take shape in the 1950s. It was seen a means to increase project efficiency and effectiveness, share project cost, build beneficiary capacity and increase empowerment (Chowdhury, 1996). In 1980s and 1990s almost all development projects implemented by governments, donors, international organizations or non governmental organizations in rural communities claimed to use participatory approaches (Stirrat, 1996). Agarwal (2001), Cooke and Kothari (2001) provided the link between community participation and sustainability of the projects. They argued that participation provided local input in projects, created a platform for discussing community concerns and improved decision making leading to long tern success of the project. Tosun and Timothy (2003) observed further that community participation improved community acceptance and support for development projects. The extent of community acceptance and support informed the level of community ownership of the project that overally informed sustainability unless constrained by lack of capital, skills, knowledge and resources (Scheyvens, 2003).

1.1.2 Community Empowerment

Schuftan (1996) and Adams (1990) defines community empowerment as a continuous process whereby individuals or communities gain the self esteem, confidence, understanding and the power necessary to articulate their concerns, ensure that action is taken to address them and gain control over their lives. Empowerment could occur at either individual or community levels, or at both levels (Smith *et al.*, 2001; Robinson and Elliott, 2000). However, it manifest only when the individual(s) or the community gain power. Power is not bestowed by others, but those who have it must cooperate with those who need

it to create the necessary conditions to make empowerment possible (Rappaport, 1987). In 1970s it became apparent that community participation in rural development provided an effective platform for transforming the capacity of individuals and communities to identify own needs and strengthen their abilities to improve their conditions (Freire, 1972).

Freire noted further that the participatory approaches created awareness among the poor population on power relations, networks of solidarity and built community confidence in their own knowledge and abilities resulting in community empowerment. This awareness intensified in the 1990s when it became increasingly clear that when communities and individuals succeeded in organizing and mobilising themselves they were able to achieve the social and political changes necessary to realize power and take control of their lives (Wallerstein and Bernstein, 1994). Such a community was able to identify their problems, develop solutions and facilitate the required change (Blackburn, 2000). With this realization, most rural development projects in the 1990s and subsequent years incorporated development approaches that promoted community empowerment as a strategy for improving project performance and sustainability. However, while little information exist on the extent to which empowerment contributes to sustainability of project, Burns *et al.* (1994) argue that empowerment generate successes only to the extent to which community abilities are developed. Empowerment to the level of citizen control is the most effective as a community at this level is able to actively participate in communal decision-making and take responsibility for their actions.

1.1.3 Community Capacity Building

Peltenburg *et al*. (1996) defined capacity building as a conscious effort to strengthen and improve the abilities of individuals and groups to perform tasks in a more efficient, effective and sustainable manner. Over the years, it has been acknowledged that effective community participation and empowerment is achieved when the capacity of the local communities was strengthened in managing local development initiatives, especially, in operation and maintenance (Tonts and Haslam-McKenzie, 2005; Platteau, 2004; Sajiwandani, 1998). Goodman *et al*. (1998) argue that a strengthened local capacity is a necessary condition for development, implementation and maintenance of local development projects. Building community capacity is therefore the foundation for sustainable, long term project implementation and growth and involves helping community components such as individuals, organizations and networks enhance their capacity to engage, either singly or

collectively in development activities (ACP EU, 2012; Chaskin *et al*, 2001). This realization increased focus in 1990s on building communities capacities as a vehicle to ensuring project success and improving the well being of the communities (Tonts and Haslam-McKenzie, 2005). Over the years capacity building was applied to produce changes at various developmental levels ranging from individual through to the entire nation (Sajiwandani, 1998).

Delivery of community capacity building can take the form of provision of skills through training, strengthening relationships between organizations, engaging individual community members to join existing organizations or form new ones and changing organization policies or practices (McLaughlin, *et al*., 1997). Governments and development agencies today support capacity building by providing training and mentoring for community projects, funding locally design community development ventures solely to boost project successes and sustainability. Capacity building efforts further targets building internal capacity of rural communities on leadership and project management to prepare them future challenges when project funding ceases (Macadam *et al.*, 2004). There is further focus in providing guidance for rural community development efforts and maintaining policies that offer infrastructural investment rather than direct financial support for operation and maintenance (Macadam *et al.*, 2004).

1.1.4 Conflict Management within Projects

Verma (1998) defines conflict as a serious disagreement between two or more people, which may either have positive result if properly managed or negative effects if poorly managed to the satisfaction of stakeholders. Conflicts are thus inherent in all projects or ventures that involve more than one individual. They arise out of differences in sharing resources or from diverse interest and priorities held by the people (Warner, 2000). Ohlendorf (2001) identifies difference in beliefs, peoples orientation, demands, prospects, views, imagination and ego as the main causes of conflict. Conflicts over resources arise not much out of scarcity of resources rather from incompatibility in use of the resources arising from inequitable use (Thomasson, 2005). Project success and sustainability therefore lies not in the absence of conflict but in the skills and mechanism incorporated to manage conflicts among project members and beneficiary community as they arise (Goodman *et al*., 1998). Holahan & Mooney (2004) observed that a project team's ability to manage conflicts had a direct impact on the team's ability to make effective decisions and achieve its goals. While constructive conflict had a positive impact on decision outcomes, destructive conflict had an

adverse impact on decision outcomes which in turn directly related to team performance. Teams with high levels of unmanaged destructive conflicts made poorer quality decisions and exhibited less commitment to these decisions hindering their ability to stay within schedule and achieve project goals and sustainability.

1.1.5 Community Ownership of Project

Community ownership is a concept that has taken prominence in rural development initiatives with the enhancement of participatory approaches over the years. Ownership is a concept that defines characters whose voices are heard, who have influence over decisions and who are affected by the process and outcome (Lachapelle, 2008). When the community takes centre stage in all three areas, community ownership of the development process is assured. As participatory approaches in rural development advanced, the concept of community ownership in rural community development became increasingly significant.

Rifkin (1990) noted that projects where communities had shown strong ownership tended to be more successful and were sustained over longer period. Communities were more likely to be committed to a project if they had a sense of ownership in regard to the problems and solutions being addressed. Community ownership in-turn contribute significantly in realizing projects sustainability through community investment and commitment (Maganga *et al*., 2002). Ownership may be ensured through incorporation of participatory and empowering approaches (Brennan, 1994), promotion of locally appropriate technology within existing community structures or establishing democratic and gender sensitive community management committees. It may also result from strengthening community capacities through training on maintenance and repairs or by engaging communities in meeting investment and operation costs in projects (Diageo, 2008).

1.2 Statement of the Problem

Access to improved water and sanitation especially in developing countries has remained poor. In Kenya only 64% of the population had access to improved water and 30% improved sanitation at the close of the MDGs that set targets of 88% and 75% respectively for all countries by 2015 (WHO/UNICEF, 2013). Further, improved water and sanitation across the country is varied with glaring disparities in the cities. In 2007, for instance, piped water coverage of poor households in Nairobi was at 65%, 22% in Mombasa and only 7% in Kisumu, yet the households formed 43% of the population of Kisumu compared to 21% of Nairobi and 38% of Mombasa (MWI, 2007). In addition, only 10% of the residents of

Kisumu were connected to a sewerage system, that experienced frequently breakages and blockages (UN Habitat, 2008). About 51% used private pits, 34% shared toilets while 5% practice open defecation when compared to 37% that used private pits and flush toilets, 59% sharing toilet and 0% practicing open defecation in Nairobi and 72% using private pit and flush toilets, 27% sharing and 1% practicing open defecation in Mombasa (MWI, 2007). The pits were in close proximity to shallow wells, major sources of domestic water, which triggered cross contamination during wet seasons (LVSWSB, 2008; UN Habitat, 2005; Orwa, 2001). Of concern however, is that the government of Kenya, international institutions and non governmental organizations have since 1990s initiated several water and sanitation projects in Kisumu and neighbouring in an effort to remedy the situation with minimal success. While the projects are a priority to the residents, majority are unsustainable, either broken down, malfunctioning or abandoned due to operation and maintenance failures, inappropriate technology or insufficient community interest (Freeman, *et al*., 2012; Saboori, *et al*. 2011; O'Reilly, *et al.*, 2007). Consequently, the communities have continued to rely on unimproved drinking water sources and appalling sanitation and hygiene conditions that significantly contribute to high prevalence of water related diseases (UN Habitat, 2005) in the region, high mortality and morbidity, especially, among children under the age of five (KNBS, 2008) and great losses in productive time for women and school going time for children (UNDP, 2006).

Goodman and Steckler (1987) observed that most development projects collapsed or were abandoned because the development agencies created projects that missed out on community priorities or used complex technologies beyond community operation and maintenance capacities. Researchers have since demonstrated that community intervention strategies such as participation (Ngondi *et al.*, 2010), capacity building (Care international, 2010), empowerment (Government of Zambia, 2011), conflict management (Barron *et al*., 2007), shared decision making (Hickey and Mohan, 2005) and ownership (ACP-EU, 2012) independently and significantly influence sustainability of projects. These strategies enable the communities to become independent and take control of the projects, the crucial abilities necessary for sustaining projects (Nikkah and Redzuan, 2009). Guided by these arguments, this study the thesis that sustainability of WASH projects in the communities depends on community acceptance of the projects, their level of involvement, capacity to participate and take control and the level of harmony in community interactions in the project. As a result, this study conceptualized that community participation, capacity building, empowerment, ownership and conflict management as community intervention strategies are key

determinants, either independently or simultaneously, to sustainability of WASH projects. Whereas literature provide evidence of the independent relationship between the intervention strategies and sustainability of projects (Arnold et al., 2009; Barron *et al*., 2007; Cole, 2006; Buykx *et al*., 2012; USAID, 2008), there is limited information on the extent to which the strategies independently and collectively influence sustainability of projects and whether community ownership provides a moderating effect on this relationship. The study upheld that this was crucial information for a proper design and effective implementation of any WASH project that it sought to unearth.

1.3 Purpose of the Study

This study sought to establish the influence of community intervention strategies on perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city-Kenya.

1.4 Objectives of the Study

The study was guided by the following objectives:

i. To examine the extent to which community participation strategy influence perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city**.**
ii. To assess the extent to which community capacity building strategy influence perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city
iii. To examine the extent to which community empowerment strategy influences perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city**.**
iv. To establish the extent to which community conflict management strategy influences perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city**.**
v. To determine the extent to which community ownership influences the relationship between the combined community intervention strategies and perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city**.**

1.5 Research Questions

The study sought to answer the following research questions:

i. To what extent does community participation strategy influence perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city?

ii. To what extent is perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city influenced by community capacity building strategy?

iii. To what degree does community empowerment strategy influence perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city?

iv. To what level is perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city influenced by conflict management strategy?

v. By what extent is community ownership moderating the relationship between combined community intervention strategies and perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city?

1.6 Research Hypotheses

The study tested the following alternative hypotheses.

i. There is a significant relationship between community participation strategy and perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city.

ii. Community capacity building strategy has a significant influence on perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city.

iii. There is a significant relationship between community empowerment strategy and perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city.

iv. Conflict management intervention strategy significantly influence perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city.

v. Community ownership has a significant influence on the relationship between combined community intervention strategies and perception of sustainability of water sanitation and hygiene projects in peri-urban estates and rural surroundings of Kisumu city.

1.7 Significance of the Study

This study seeks to provide an understanding on the strategies of community participation, empowerment and ownership, capacity building and conflict management, and determine the extent to which they individually and collectively influence perceived sustainability of water, sanitation and hygiene projects. It is hoped that the findings of the study would generate invaluable information on the contribution of these strategies on the sustainability of projects. It is further hoped that this information would form a basis for improving future design and implementation of projects. The information would be crucial to local communities, project planners, implementers and development partners keen in initiating and implementing sustainable projects within communities. It is believed that communities would benefit from the generated knowledge on the level of community participation, empowerment and ownership that is necessary to ensure sustainability of projects. This information, based on data, should be able to form a solid basis for promoting community involvement and ownership in development projects. In addition, the study hopefully generated knowledge that would provide useful insights to future researchers and development agencies on the performance of community managed projects and how best to improve their sustainability. It is the researchers belief that if the envisaged benefits are realized in future, then the effort, resources and time put in this study would be of a worthy cause.

1.8 Basic Assumptions of the Study

The study assumes that members of the communities at household level within the regions where WASH projects are implemented have information about the progress of the projects and are able to provide useful and truthful information to guide the study. To encourage honesty, the study ensured that respondents were provided with a friendly environment where participation was voluntary and opportunity to withdraw from the study was given at any time with no ramifications. Confidentiality was ensured and respondents were assured of the protection of their identity. The study further assumed that the

communities within which WASH projects were implemented were aware of the presence of the projects in their midst and appreciated the intended purposes of the projects. As a result they were either participating in the activities of the projects as members or merely beneficiaries of the project services.

It was acknowledged that the study would rely on self reported information by respondents, obtained either through interviews or questionnaires. Such information are prone to biases occasioned by exaggeration, attribution, telescoping or selective memory. Since it was not be possible to independently verify the correctness of these information, the study assumed that the information as was presented by respondents was reliable. It was further assumed that the methodology used in this study was the best suited to investigate the influence of the variables under study, unravel the study problem and answer the research questions. The sample size used was assumed to be representative as it was drawn from the entire population of WASH projects in the study area that were presented with an equal chance of inclusion. Consequently, it was possibly to generalized the study findings to apply to all the WASH projects in the study area and in the entire country.

The study questionnaires were administered to heads of households who were systematically sampled from every 4^{th} homestead to the east and west and 3^{rd} homestead to the south and north. Since a homestead could have one or more households, it was assumed that a head of any of the households in the homestead or the alternative head, and in their absence an adult of age 18 years and above from any of the households in the homestead who was not a visitor to the household and has lived in the household for more than 6 months as adequate representative of that homestead and was included in the study.

1.9 Limitation of the study

The study had limited precedence that could be used to compare findings. From available literature, little information is available on empirical studies that examined the extent and simultaneous effect of study independent variables on sustainability of WASH projects. No study was also found that examined the moderation effect of Community ownership on the relationship of the study independent variables on sustainability of WASH projects. This study was however able to make comparison with findings of previous studies that examined relationship of the individual study independent variables with sustainability of projects. The study also made reference to earlier studies that considered the moderation effect of sense of community, a closer variable to community ownership, on the relationship between the variables in this study. Similarly, there were limited documented information on

WASH projects in the study area in terms of project management and performance. Minimal documented information was also available on the projects' management structures, community capacity building and conflict management measures. Nonetheless, the researcher relied largely on verbal responses and opinion conveyed in focus group discussions and questionnaires on the various aspects of the study.

The study was limited in time and it was not therefore possible to cover a wider study area and many WASH projects. This limitation was remedied by use of appropriate sampling techniques that ensured representativeness of the sample. Further, the study assumed that all the WASH projects under investigation were managed independently and served an independent target population. However, it was later established that some projects shared management officials and target population. This created a situation where an individual experience or opinion on particular project could influence is view of another project. The study remedied the limitation by ensuring that no one individual participated either as participant in a focus group discussion or a questionnaire respondent in two or more projects.

1. 10 Delimitation of the Study

This study was confined to the peri-urban estates of Kisumu city (Winam division) and its rural surroundings- Kadibo, Maseno and Kombewa divisions. The region has poor population living under poor water and sanitation conditions when compared to the peri-urban and rural surrounding of other major cities in Kenya (MWI, 2007). For instance, while piped water connection to poor households stood at 65% in Nairobi and 22% in Mombasa, Kisumu city had a mere 7% connectivity yet the households formed 43% of the city's population compared to 21% in Nairobi and 38% in Mombasa (MWI, 2007). Similarly, only 10% of Kisumu residents were connected to a sewerage system, which also experienced frequent blockages and burst by 2007 (UN Habitat, 2008), 51% used private pits, 34% shared toilets and 5% practiced open defecation in 2007. 37% of Nairobi residence in the same year used private pit and flush toilets, 59% shared pits while 0% practiced open defecation when compared to 72% that used private pit and flush toilets in Mombasa, 27% sharing and 1% practicing open defecation (MWI, 2007). Kisumu rural surroundings of Kadibo, Maseno and Kombewa divisions on the other hand are inhabited by poor populations with an average poverty incidence of 45% compared to 22% in Nairobi neighbourhood and 39% in Mombasa (KNBS, n.d). The rural surroundings have limited piped water supply (8% of all households) and rely largely on unimproved shallow wells and surface water (80% of all households) for domestic purposes. 79.5 % of households in these regions rely on pit

latrines for waste disposal while 16.7% of households practice open defecation (KNBS, 2010).

Similarly, Kisumu and the rural surroundings have in the past 20 years hosted a large number of WASH projects initiated by the government, international agencies and non governmental organizations (NGOs). The projects have sought to address the appalling water supply and sanitation situation in the region. However, the continued poor state of water and sanitation conditions presents a major interest for this study, a factor that formed a strong basis for anchoring the study in the region. The study respondents were restricted to household heads (male or female) and alternative heads, and in their absence adult household occupants (who were not visitors) as questionnaire respondents and project officials, project ordinary members and beneficiaries who participated in focus group discussions. Heads or adult household occupants were considered knowledgeable in household water, sanitation and hygiene activities and better understood how the household interacted with the WASH projects in their areas and could provide reliable data. Similarly, project officials, projects' ordinary members and beneficiaries were considered knowledgeable in the projects' performance and understood the project's interaction with the local communities.

The study adopted a mixed method approach anchored on concurrent triangulation design. The design enabled the study to collect and analyse both qualitative and quantitative data concurrently and used information from the two world views to better understand the problem. This offered a better opportunity for in-depth analysis of the study variables within the short study period than could have taken either a longitudinal design or independent qualitative and quantitative designs done sequentially. The study was delimited on questionnaires and interview guides as a method of data collection. Questionnaires was used to gather quantitative data while focus group discussions (FGDs) was used to gather qualitative data. The FGDs were most suited for gathering in-depth opinion from respondents on issues investigated whereas questionnaires were most suited for quantitative data gathering.

Finally, the study variables were restricted to community participation, capacity building, empowerment, conflict management and community ownership, and how they influence sustainability of WASH projects. It was understood too that other factors similarly influenced sustainability of projects. However, the study was focused on determining the role of these variables independently and simultaneously on sustainability of projects, an area that has not been considered in previous studies.

1.11 Definition of Significant Terms used in the Study

For purposes of this study, the following terms bears the stated meanings:

Community intervention strategies: refers to community participation, capacity building, empowerment, conflict management and community ownership strategies.

Community Participation: refers to the process by which communities are enabled to become actively and genuinely involved in defining the issues affecting them, making decisions over them, taking control over decisions made. Formulating policies and implementing actions that ensure delivery of services to achieve desired change.

Community Capacity Building: refers to the process of enhancing community abilities on construction, operation and maintenance of WASH projects through provision of adequate information and training.

Community Empowerment: refers to the process that built confidence in individuals and communities on their understanding of WASH projects and abilities to express concerns, find solutions and ensure that action is taken to address them.

Community Conflict Management: refers to the process of reducing the negative aspects of conflicts within community projects by institutionalizing and making operational mechanisms that pre-empt and address conflicts as they arise.

Community Ownership: refers to the level at which communities and individual beneficiaries of the project identifies with it and willingly and voluntarily participate in its activities to achieve a common goal.

Household: The smallest unit of a family headed by either a father, mother or elder wife

Sustainability: refers to the perceived ability to exist today and into the distant future.

Sustainable water sanitation and hygiene project- Refers to a donor or government funded or promoted WASH project that is perceived by respondents as well managed, generating adequate internal resources for operation and maintenance and enjoys the support of the community.

1.12 Organisation of the Study

This study is organized into five chapters. Chapter one introduces the study by outlining its background, statement of the problem, its purpose, research objectives, research questions and hypothesis. It describes the significance of the study, basic assumptions, limitation and delimitation of the study and finally defines significant terms as used in the

study. Chapter two presents a review of literature on the concept of sustainability of water sanitation and hygiene projects and how the independent variables namely community participation, capacity building, empowerment, conflict management and community ownership influence sustainability of WASH projects. It reviews the theoretical and conceptual framework and provides a summary of literature review. Chapter three presents the research paradigm, research design, target population, and sample size and sampling procedure. It reviews the research instruments and describes how the instruments were pilot tested and the validity and reliability established. It further outlines the data collection procedure used, data analysis techniques and concludes with the study ethical considerations.

Chapter four reviews data analysis, presentation, interpretation and discussion. It discusses the questionnaire return rate and test for multicollinearity and analysis of Likert type data. It presents a profile of the respondents in terms of their distribution by type of project, relationship to project and motivation to initial engagement in the projects. It further reviews respondents perception of the projects in terms of priority and period of project's exclusive reliance of internally generated funds for operation and maintenance. It presents a mean analysis of sustainability of WASH projects, mean analysis of community participation strategy and analysis of the relationship between community participation and sustainability of WASH projects. It also presents mean analysis of community capacity building strategy and analysis of the relationship between community capacity building and sustainability of WASH projects. Similarly, it presents mean analysis of community empowerment strategy and the analysis of the relationship between community empowerment and sustainability of WASH projects, mean analysis of community conflict management strategy and the analysis of the relationship between community conflict management and sustainability of WASH projects. It ends with a presentation of the mean analysis of community ownership, analysis of the relationship of community ownership and sustainability of WASH projects and the moderation effect of community ownership on the relationship between community intervention strategies and sustainability of projects.

Chapter five presents a summary of study findings, conclusion, the study contribution to the body of knowledge and recommendations. At the tail end is the reference section followed by annexes that include letter of transmittal, survey questionnaire, focus group discussion guide, qualitative data coding framework, a work plan, budget, research permit from NCIST and map of study area.

CHAPTER TWO:

LITERATURE REVIEW

2.1 Introduction

This section discusses the concept of sustainability and how it applies generally to community projects and specifically to water sanitation and hygiene projects. It further discusses five community intervention strategies; community participation, empowerment, capacity building, conflict management and ownership and reviews how the strategies influence sustainability of projects. The section begins by reviewing theoretical literature on sustainability of projects and the influence of the community intervention strategies on sustainability of the projects. It then proceeds to discuss empirical literature linking these relationships. The section further isolates and expound on three theories- ladder of participation, ladder of citizen empowerment and diffusion of innovation that link sustainability of projects to the intervention strategies and close by presenting a conceptual framework that best capture how the intervention strategies influence sustainability of WASH projects.

2.2 Concept of Sustainability of Water, Sanitation and Hygiene projects

Literature reveals little consensus on the operational definitions and concept of sustainability (Bartholomew *et al*. 2006; Jackson *et a*l., 1994; USAID, 1988). Sustainability is viewed as a multidimensional concept that presents in three perspectives. It could either refer to maintaining flow of benefits that were realized in the initial programme, continuing programme activities within an existing organizational structure or building the capacity of the beneficiary community to manage the programme. IFAD (2007) holds the first perspective and defines sustainability as ensuring that the benefits realized and institutions supported through projects are maintained and continue after the end of the project. USAID (1988) holds a similar view that a project is sustainable only when it is able to deliver an appropriate level of benefits for an extended period of time after major financial, managerial and technical assistance from an external donor is terminated.

Bartholomew *et al*. (2006) views sustainability from a different prism. They define sustainability as the final stage where a programme is incorporated into organizational routines so that it is still maintained even after the original programme funding ends or programme adopters or champions exit. Shediac-Rizkallah and Bone (1998) expands this view by maintaining that a programme is sustainable only when there are institutional factors

that perpetuate it within the community. The community should have capacity attributes that can influence sustainability processes, lending credence to the third perspective of sustainability. However, Glaser (1981) while recognizing the importance of sustainability observes that not all innovations should last for a long period of time since people, circumstances, situations or problems change and when they do re-adjustments, re-organization or rebirth becomes necessary.

From 1950s policies and practices adopted by development agencies focused on a top-down approach to development. Governments, international partners or non-governmental organizations designed and implemented development projects with minimal involvement of beneficiary communities (Nikkhah and Redzuan, 2009**).** As a result the projects missed out on local community priorities and often used complex technologies that were beyond communities operation and maintenance capacity. Consequently, most of the projects collapsed after installation or were abandoned immediately after external funding ceased, draining billions worth of investment (Goodman and Steckler, 1987/88). However, late 1980s saw a shift of focus to a bottom- up approach that emphasized participation of target communities in all stages of a project development process. It brought into play concepts like community participation, empowerment, capacity building, conflict management, shared decision making and ownership as determinants of sustainable projects (Hickey and Mohan 2005). The approach encourages target communities to gain control over decisions affecting their project and in the process gain independence and empowerment crucial for sustaining the projects beyond the development assistance phase (Nikkhah and Redzuan, 2009).

International h_20 collaboration (2013) observes that the long term sustainability of WASH interventions is not merely a measure of intervention coverage in terms of physical water supply or sanitation infrastructure that are established and functioning or the number of people who are served, but it is more a concern for the service delivered over time. It is a focus on long term reliability of the systems management, long term support, sound financial plans and continued capacity development. As such, sustainability becomes a major challenge to development agencies and communities. Often communities are unable to adequately manage the interventions due to lack of technical and long term financial support leading to poor maintenance, breakdowns and abandonment of the systems. Such failures lead to heavy losses in investment and impedes community ambition for rapid development.

An external evaluation on sustainability of pilot WASH projects implemented by International h_20 collaboration in Dominian Republic, Ghana and the Philippines between 2009 and 2012 revealed that after four years of intervention project's financing strategies in

all the three countries were poor and could not ensure adequate revenue streams to meet long term capital maintenance and replacement costs (International h_20 collaboration, 2013). Equally significant was the lack of management mechanism to address the apparent financial pitfalls. There was also inadequate capacity and willingness of the local institutions to provide long term follow-up support for rural interventions, especially where local capacity was weak or there was lack of political will. This posed a threat to the sustainability of the projects. The pilot projects covered 15670 interventions made in 496 urban and rural communities and ranged from household hygiene promotion, water point and rural water supply systems to utility-managed urban systems. The evaluation surveyed 11 separate interventions implemented within 144 communities, and covered over 2330 households across the three pilot countries. It gathered data through households survey questionnaires, observations, Key informant interviews, direct check of physical infrastructure and from document review. The evaluation findings presented a strong argument that sustainability of WASH interventions dependent largely on elaborate financial strategy that guaranteed steady revenue stream, robust management mechanism and capacity and willingness for follow-up support to local communities by project partners.

However, a study by Tango international (2009) on sustainability of IFAD funded projects in Asia and the Pacific region revealed that sustainability of a project was influenced more by implementation strategies that were adopted. This included participatory approaches, management flexibility and capacity strengthening of stakeholders to plan and manage future actions. The study further highlighted that projects that involved participants during project design, implementation, monitoring and evaluation (M&E) and those that supported ongoing local initiatives registered considerable success towards sustainability. This was also evident for projects that were successful in social mobilization, promoting participation and contributing to building grass-roots institutions. It further reported that projects that were implemented within communities with strong traditional institutions or those that strengthened the capacity of individuals, households and communities were more sustainable. This was also the case with projects with clear exit strategies that were planned and agreed upon by all partners during the design phase and used as benchmark throughout the project implementation period.

2.3 Community Participation and Sustainability of WASH projects

Community participation is a process by which people are enabled to become actively and genuinely involved in defining the issues of concern to them, in making decisions about factors that affect their lives, formulating and implementing policies, in planning, developing and delivering services and taking action to achieve change (WHO, 2002; Davidson, 1998). Blackburn (2000) advances the same argument and holds that community participation aims to enable communities to identify problems, develop solutions and facilitates change process through projects. Through this process, authority and responsibility shifts from project initiators to communities or beneficiaries ensuring that their interest is considered during project design and implementation (Rahnema, 1992). A similarly argument is held by Tango International (2009) that reported that sustainability of any particular project will depend on its overall impact on participating households and communities. This observation arose from an evaluation of IFAD supported projects in Asia and the pacific conducted by the organisation. They are supported by Finkenflu-gel (2006) and Boyce and Lysack (2000) who argue that involvement of community members in all aspects of program design and implementation is vital for developing a sense of ownership of the programme, which can positively influence its sustainability.

Agarwal (2000) and Cornwall (2000) hold that participatory community management of water projects enhanced their sustainability. By establishing project committees in which community representation is prominent, projects enhance local participation in decision making that improve project performance (Bardhan, 2001; Meinzen and Zwarteveen, 2001). Platteau (2004) expanded participation concept to mean the process by which project beneficiaries or communities act as facilitators and active contributors to the projects in which they participate, ensuring that local interest are addressed leading to sustained action and self-reliance. A World Health Organisation report (WHO, 2002) on programmes done in Europe held that effective community participation ensured increased democracy, improved mobilization of resources and energy, created better decisions and more effective services, which in turn ensured community empowerment, ownership and sustainability of programmes.

Itzhaky and Schwartz (1998) in review on empowering the disabled in Israel reported that active participation in decision-making by the local communities appeared to be strongly related to empowerment. The same observation was reported by Boyce and Lysack (2000) in their review of the involvement of disabled people and their communities in the rehabilitation process. They observed that when community members were actively involved in planning

and decision making in community based rehabilitation process, ownership and sustainability of the process was impressive.

Bracht and Kingsbury (1990) and Flynn (1995) were able to show a positive relationship between community participation and sustainability. They asserted that the avenue by which community participation influences program sustainability was through the intermediate process of promoting a sense of ownership of the program. This view is also held by Wallerstein (1992) and Robertson and Minkler (1994) who argue that community participation enhance overall community competence and capacity. Pretty *et al.* (1995) on the other hand viewed participation along a spectrum with passive participation at one end and self-mobilisation at the other. They noted that passive participation occurs when people are directed on what to do while self-mobilisation is realized when the local people themselves take total command, and concluded that participation by manipulation or passive participation exhibited limited community empowerment compared to interactive participation or participation by self-mobilisation that was highly empowering.

Rakodi (1991) and Friedmann (1992) have advanced a paradigm that sees empowerment as the true end of participation. They were supported by Abott (1996) who showed that empowerment is achieved through participation. A report on projects implemented by IFAD concluded that sustainable project interventions was achieved in project where there was successful social mobilization, promotion and facilitation of community participation and facilitation for the establishment of grass-roots institutions within the target region (IFAD, 2006). This view was strengthened by an evaluation of water projects in Kitui district in Kenya which revealed that only 28% of the wells initiated from 1983 were completed by 1991. While the failure in completion was due to inability of the communities to raise enough funds for installation of hand pumps, the underlying problem was noted to be failure of the projects to sustain sufficient community motivation to complete the projects. This was largely due to inadequacies in community participation strategies used by the sponsor (ODA/CAFOD, 1994).

A study by Ofuoku (2011) on the effect of community participation on sustainability of rural water projects in Delta Central Agricultural Zone of Delta State, Nigeria, demonstrated that there was a significant positive relationship between participation and sustainability of the water projects. He observed that the higher the level of citizens participation in the projects the higher the sustainability of the projects. He, however, did not establish the extent to which these levels of participation influenced sustainability.

A mid term impact evaluation by United Nations Childrens Fund (UNICEF) of their water and sanitation partnership programme provided a solid association between community participation, capacity building and ownership in community projects and their success and sustainability (UNICEF, 2011). The programme, dubbed the One Million Initiative, was a partnership between UNICEF and the governments of Mozambique and Netherlands. The seven year programme commenced in 2006 and targeted 18 districts within provinces of Manica, Sofala and Tete in Mozambique. It sought to provide one million people in the districts with safe drinking water, through the construction of new water supply sources and rehabilitation of existing ones, provide adequate sanitation facilities to one million people and promote adoption of appropriate hygiene practices by 1.2 million people. It further targeted to provide appropriate drinking water, sanitation and hygiene facilities in 400 primary schools and strengthen districts and provincial technical and management capacities in planning, coordination and implementation of the programmes (UNICEF, 2011).

The programme approach was focused on meeting basic needs of rural populations, decentralised management and participation of users. Participation was demand responsive where user communities and schools sought inclusion and took responsibility for operation and maintenance of improved facilities and promoted behavioural change. The programme engaged local NGOs to carry out promotional activities across the districts and generated demand responses for improved services, built capacity to sustain services, construct latrines and maintain government capacities at provincial and district level as a strategy to ensuring long-term sustainability of the interventions. The mid -term evaluation of the UNICEF/ government of Mozambique water and sanitation partnership programme was done in Mozambique between 2008 and 2010. The evaluation sought to determine the impact of programme interventions on the welfare of the final beneficiaries and revealed that while proportion of households using improved water sources for drinking increased from 16% in 2008 to 28% in 2010, 31% of the households in villages where improved water source was introduced still continued using unimproved water sources, citing long distances to the water points and long queues as main obstacles.

It further revealed that the community approach to total sanitation increased latrine ownership by 13.6%. Cases of handwashing using soap or ash after defecation increased by more than 40% among adults in 2010 compared to 20% in 2008. Cases of water treatment increased by 20% in households in regions that received project intervention in 2010 compared 2% in 2008 while prevalence of water related diseases declined from 31 to 14%, sanitation intervention accounting for between 3-6% of the decline. Functioning water points

in the programme area increased from 54% in 2008 to 82% in 2010 while improved water points managed by community committees increased from 64% in 2008 to 77% by 2010. The evaluation concluded that the successes was a result of an instituted community participation, capacity building and ownership that were key pillars of the programme.

Buykx *et al.* (2012) conducted a longitudinal evaluation study of Elmore Primary Health Service (EPHS) located in rural Victoria, Australia. Between 1994 and 2003, Elmore community was operating a poorly managed health care service that eventually broke down in 2004. The service was poorly introduced to local residents and received poor acceptance and ownership. The consultation process lacked transparency, there was decline in health service provision over time and the residents lost autonomy over health infrastructure that they had invested in, gradually eroding its sustainability. However, in 2004, Elmore community developed EPHS as an alternative and cure to the health provision challenges. The service formed an Elmore community working group tasked with engaging community and promoting the service. It identified strong and visionary community leaders who served as champions and with an additional role of building strategic alliances with state department on human services to facilitate community consultative meetings (Buykx *et al.,* 2012).

Findings of the longitudinal evaluation of EPHS carried out between 2008-2012 revealed that four years into implementation EPHS had proactively managed change to remain sustainable by developing a comprehensive community engagement system. Elmore community working group was able to engage and capture community interest in the service from inception through the early development stages. The community gradually developed acceptance and ownership of the health services provided eventually taking control over them. The champions were instrumental in engaging the community to develop an integrated primary health care system that enjoyed significant community participation and ownership. They developed strategic alliances that facilitated effective consultative meetings that led to the establishment of a suitable and acceptable health service delivery model that was sustained through a public-private funding model agreed upon by the community. It concluded that, just as community participation was crucial in the evolution and acceptance of project continuous community engagement was required to sustain the service (Buykx *et al.,* 2012).

Ngondi *et al.* (2010) conducted a study to determine the effects of community interventions with pit latrines in five districts of Amhara, Ethiopia. The pit latrine promotion interventions involved an intensive initial community mobilisation on latrine construction and use, training community leaders and health extension workers, educating the community to

build their own latrines and constructing demonstration latrines for learning and adoption. Community members provided all materials for construction and labour and participated voluntarily in latrine promotion programmes. Before and after programme implementation baseline surveys were conducted and an evaluation study done after 3 years of intervention. The study adopted a multi-stage cluster random sampling and sampled 1096 households, which were assessed for the presence of household latrines and compared to baseline figures. The study revealed that the proportion of households with pit latrines increased by an overall 32.3% (95% confidence interval). Using logistic regression analysis, the study established that an increase in household size, higher socio-economic status and participation in health education were independent determinants of latrine ownership. It concluded that increased household latrine coverage was largely a result of the intensive community mobilisation undertaken in the programme

Ogari (2012) examined the influence of community participation in sustainable implementation of health projects in Borabu Division, Nyamira county. He targeted community members affiliated to community based organizations, leaders in charge of development and local administrators (chiefs) in Borabu Division. Using a systematic sampling procedure he sampled 60 community members and 7 leaders from 6 community groups. He employed a descriptive survey design, collected data using a self-administered questionnaire and analysed using qualitative and quantitative data analysis methods. The study revealed that a timely, well planned and implemented public involvement programs contributed to the successful design, implementation, operation, and management of projects. Whenever members of a community were well informed and adequately involved in project revitalization processes chances of project success was high. This was also true for projects where community members were involved in decision making. It improved their understanding and ownership of the projects and boosted their support for the implementation process. He further observed that participation improved the potential of poor rural communities in making sound decisions over their welfare. This participation was more effective whenever accompanied by effective and efficient training or capacity building programmes that are linked to on-going development projects in the area.

Okungu (2012) made similar observations in a study to establish the influence of community participation on sustainability of donor-funded rural water projects in Karemo Division, Siaya County, Kenya. His study employed a descriptive survey design, sampled 201 members from 420 community members and 28 water committees and collected data using survey questionnaires and focus group discussion guide that had initially been pilot

tested for validity. He interviewed six (6) NGOs, conducted 3 focus group discussions and analysed data using descriptive statistics.

He observed that community contribution towards project capital costs, and operation and maintenance positively influenced sustainability of the projects. Most projects appeared sustainable during donor funding phases but became less sustainable upon the exit of donors owing to the top-down development decisions associated with donor influences but which gradually compromise sustainability of the projects. Of the projects he investigated, majority were donor initiated. While only 12.1% of respondents indicated participating in selecting project technology and in planning processes, 66.8% of respondents still showed a drive for the projects. He attributed the high energy to the community driven implementation strategy adopted that led to remarkable projects completion records. The strategy enabled 70.8% of community members to contribute resources at the project construction stage boosting ownership. However, upon completion of the projects and donor pull out, there was a reduced community involvement in project operations and non commitment to proper management practices. This compromised community ownership and sustainability of the projects.

He observed that only 38.2% of the respondents were paying for water usage and less funds were available for operation and maintenance. As a result, only 35.7% of project facilities were in good condition, 42.9% were dilapidated and 21.4% had already stalled. Overally, only 49.0% of the respondents were satisfied with the leadership styles after the exist of donors majority calling for an improvement in management.

2.4 Community Capacity Building and sustainability of WASH projects

In recent years it has been widely recognized by governments, development experts and funding agencies that community capacity is a necessary condition for development, implementation and maintenance of effective projects within communities (Goodman *et al*., 1998). It is the combined influence of a community's commitment, resources and skills that can be deployed to build on community strengths and to address problems and opportunities (Aspen Institute, 2000). Building community capacity is thus a foundation for sustainable, long term project implementation and growth and involves helping community components-individuals, organizations, networks enhance their capacity to engage, either singly or collectively in development activities (Chaskin *et al*, 2001). This capacity reflects in different dimensions such as participation and leadership, skills, resources, social and inter-organizational networks and understanding community history, power and values (Chaskin *et al*, 2001; Goodman *et al*, 1998).

Waisbord (2006) in a review of Change Project interventions designed to develop capacity in health promotion in Peru between 2002 and 2005 noted that successful capacity development in health promotion required not only training of individuals but strengthening of institutional networks in a society. He cautioned that projects should never be dependent on individuals alone but focuses on long-term sustainability of capacity development that promote ownership and sustainability.

An external evaluation of USAID sponsored water, sanitation and hygiene (WASH) programme in Ethiopia provided a good association between capacity building and sustainability of projects (USAID, 2008). The programme was implemented between 2004 and 2009 through eight international partners and non government organizations (NGOs) in 30 woredas (districts). It sought to improve access to sustainable and adequate water and sanitation services, increase community awareness and promote safe hygiene practices among the rural population in the districts. The evaluation assessed the performance and effect of the programme on target beneficiaries, implementation challenges, weaknesses and strengths. It covered five projects in five accessible woredas with activities ranging from spring development, hand dug well and private pit latrine construction, institutional latrines promotion to hygiene education. Qualitative data were collected through review of programme documents, key informant interviews with project and partners' staff, focus group discussions with beneficiaries, and observation of programme activities in the field.

Data were analyzed using an evaluation criteria that organized it into output level achievements, effectiveness, impact, and sustainability (USAID, 2008). Findings revealed that by 2008, 411 new and existing water supply schemes had been constructed and rehabilitated providing safe water to over 220,000 people, while over 130000 people gained access to individual household sanitation facilities. Satisfaction with the improved water facilities was high among members of the community. In 80% of the projects visited, WASH Committees that were trained under the programme were functioning, well organized and had taken over responsibility for management, operation and maintenance of facilities. The committees introduced financial systems where they collected user fees or fees from monthly water sales for operation and maintenance. The committees made linkages with Woreda water and health officers for follow-up and technical support. However, the weak capacity of woreda offices alongside absence of clear lines of accountability, lack of the committees' legal status and ownership rights of user groups, remained the greatest threat to the long-term sustainability of benefits. The capacity gap impacted on coordination, planning and

implementation across the districts and threatened long-term support to operation & maintenance (O&M) and monitoring and evaluation of the programme (USAID, 2008).

In a research to establish how Pacific NGOs and donors view the relationship between capacity building, financial and organisational sustainability, Low and Devenport (2002) observed that accessing funds to implement projects was in itself not a guarantee for success and sustainability unless there was a corresponding management capacity. They noted that training focusing on leadership and management and availability of finances were critical factors in the sustainability of an organization and its projects. However, sustainability could also fail if poor capacity building strategies were deployed that fail to enhance organization management and leadership expertise.

Similar findings were reported by Tang *et al.* (2005) in a study of a World Bank supported technical assistance project that was implemented in eight cities in China between 1997-2000. The project aimed to build capacity of policy-makers, public health managers and practitioners on application of community-based health promotion strategies. The entire project was implemented over a three year period by a single institution using a comprehensive health promotion strategy. Tang and colleagues observed that the strategy enabled the development of a learning process that gradually improved community management of health projects ensuring their sustainability over a long time. These projects were sustained much longer than similar projects earlier implemented by individuals through ad hoc consultancies. They noted that in the latter instances, information was limited and insufficient in developing community capacity to manage and maintain projects leading to the observed poor project successes.

In Kenya, similar findings were reported by Bwisa and Nyonje (2012) in a mid- term evaluation of the Tangulbei local right programmes implemented by Action Aid international in Kenya in West Pokot district. The evaluation, that was conducted five years into programme implementation, sought to assess the efficiency and impact of the programme in the lives of target population and the viability of sustainability strategies that were put in place. The study used Fisher's formula to determine a sample size of 384 respondents and a two-stage cluster sampling approach to select six study clusters (location) and equally allocate the 384 respondents in the clusters. Both qualitative and quantitative data were collected. Qualitative data were collected by interviewing individuals and focus group discussions. A total of 54 in-depth interviews were conducted in the six clusters and focused on nine target groups. Several key informants interviews and a number of Focus Group Discussions that involved between 8 and 12 discussants in a group were also carried out.

Quantitative data were collected using structured questionnaire. Whereas quantitative data were analyzed using descriptive statistics, content analysis was used to analyse qualitative data. The data was first organized into themes and trends, and patterns subsequently established. The study revealed that the programme was able to achieve sustainability of the local implementing institutions that included schools, women networks and girl forums by continuously developing their capacity in operation and organizational development through trainings. The study identified capacity building through Training of Trainers (TOTs) as most effective in enhancing sustainability in financial management and equipment maintenance (Bwisa and Nyonje, 2012). This study however, did not examine the extent to which capacity building influenced sustainability of the projects or whether such an interaction was moderated by other variables, which this study investigated.

A report by Care International in Kenya (2010) on its activities in five districts in Nyanza province, Kenya carried out between 2004-2009 underscored how community capacity building alongside other strategies facilitated project sustainability. The water, sanitation and hygiene promotion project (WASEH 11) sought to address sustainable improvement in the health security of vulnerable target population in the districts. It adopted a demand driven approach (DDA), partnering with interested community based organizations through an implementation partnership agreement that detailed the role of each group in the project. The partnering institutions appointed 2 representatives who joined the Central Management Committees (CMCs) that oversaw the activities of the groups at the locational level. The project was implemented by building the capacity of the local institutions and schools in sanitation infrastructure, water infrastructure development, safe water system intervention and hygiene promotion. Project staff trained community groups and central management committees in project management and participatory monitoring and evaluation and were charged with the responsibility of conducting quarterly reviews. Individuals were also identified and trained as latrine and tank artisans and hygiene promoters. The report revealed that the elaborative capacity building resulted in sustainable management of project activities. By 2008, All CMCa were functional, 49% of targeted households adopting safe water system and all the groups effectively managing water and sanitation activities.

The report further noted that sustainability of boreholes was more profound whenever capacity of beneficiary communities was built on reticulation. This enabled them to effectively generate funds for operation and maintenance from the sale of water. However, this study did not establish the contribution of community capacity building in relation to the

other strategies on sustainability of water and sanitation projects or whether this interaction was moderated by the other strategies, which this study investigated.

2.5 Community Empowerment and Sustainability of WASH projects

The concept of empowerment has different meanings within the context of community-based development work and exhibit either at individual, group or community level or both (Smith *et al*. 2001; Robinson and Elliott, 2000; Zimmerman 2000) Whereas individual empowerment is concerned with individuals gaining mastery over their lives, community empowerment focuses on the social contexts where empowerment takes place (Wallerstein and Bernstein, 1994). Schuftan (1996) and Adams (1990) argue that community empowerment is a continuous process within which individuals or communities gain the self esteem, confidence, understanding and the power necessary to articulate concerns, ensure that action is taken to address them and gain control over their lives. Labonte (1998) argues further that community empowerment is achieved through a process of capacity building and building competencies, skills and critical awareness. Empowerment also occur psychological when people build their self-esteem or confidence from collective action and participation in interventions.

Tosun & Timothy (2003) on the other hand considers knowledge as the essential element in empowerment. The view is supported by Sofield (2003) who argues that communities need access to a wide range of information to understand what they are required to make decisions about and meaningfully participate in project activities. Rappaport (1987) asserts that empowerment can only occur when individuals and communities take power. It is not bestowed by others, but those who have power must cooperate with those who want it to create the necessary conditions to make empowerment possible. Community empowerment is thus a factor of individual empowerment. It take root when individuals gain control over the four dimensions of empowerment; social, political, economical and psychological dimensions through access to information, knowledge and skills; decision making, and individual self-efficacy and participation (Zimmerman and Rappaport 1988; Rappaport, 1987).

Economic empowerment come from economic gains; psychological empowerment from self-esteem and pride brought to individuals and communities; Social empowerment resulting from increased community cohesion when members of a community are brought together through a development initiative and political empowerment resulting from a shift in balance between the powerful and the powerless, between the dominant and the dependent (Scheyvens, 2003). Empowerment ensures that the community has the skills and the

expertise in managing the project in readiness for project takeover at closure. A proper project take over is essential to ensure sustainability, and the exit strategy should be considered and prepared from the very outset of the project (ACP-EU, 2012). When communities are well empowered they acquire the ability at individuals or groups level to determine or control factors that affect their lives. Such communities will be active agents of change, have the ability to find solutions to their problems, make decisions, implement actions and evaluate their solutions (Di Castri, 2003). Di Castri further argues that community empowerment is the resultant of an active community participation in projects and interventions that affect their live. Such interventions should address the four dimensions of empowerment to achieve sustainability. Narayan and Shah (2000) argue that community empowerment is itself not a means to an end but is achieved through community participation, capacity building and access to appropriate information.

Studies have provided a link between empowerment and sustainability of projects. Rowan and Streather (2011) were able to prove that minimal facilitation by project sponsors contributed to community empowerment. From three Social Impact Assessment done for Pertamina Geothermal Energy, a World Bank-financed geothermal energy development project in Indonesia, they proved that locals preferred minimal facilitation in their own development rather than handouts. In a case where the project developer provided initial water project inputs and the local community were left to assume responsibility of installing and maintaining drinking water distribution system, sustainability of the system was ensured in the entire village when compared to when the developer took over installation and operation of the system. Cole (2006) conducted a case study in eastern Indonesia to investigate the effect of information on empowerment that lead to sustainable tourism. The study was done in the villages of Wogo and Bena in Tenggara Timor that are popular for tourism between 1989 and 2003. It covered three phases and adopted a longitudinal action research design.

The first phase started in 1989 through 1994 during which the researcher undertook close village observation while acting as tour guide for tourist. The second phase involved a Rapid Rural Appraisal in Wogo village in 1996. It lasted 10 days during which 30 questionnaire-based interviews was administered. The last phase was in 1998 and covered eight months of ethnographic fieldwork in the two villages. During fieldwork, participant observation and Focus Groups Discussions were held with groups of women, men and young people in the two village of Bena and Wogo. Interviews were held with key government officials, including head of the Regency Department of Tourism, head of the Regency

Department of Education and Culture and Regency Head. Other interviews were held with tourists before and after village visits. Similarly, participant observation, interviews and focus group discussions were held with tour guides who accompanied most of the tourists on village visits. The study revealed that community participation rarely moved beyond passive participation due to lack of knowledge, confidence, capital, skills and self-belief. Communities effectively participated in decision making in development only when they understood the development processes and the variety of development options. He concluded that access to relevant information was essential as an early stage of empowerment.

Government of Zambia and UNICEF commissioned an independent evaluation in 2011 to review progress of a community led total sanitation (CLTS) project that was implemented countrywide to increase rural sanitation coverage in Zambia (Government of Zambia, 2011). CLTS was introduced countrywide following a successful pilot project in Choma district, Zambia that increased sanitation coverage by 65%, and 75% of villages verified as open defecation free (ODF) in just two months. The CLTS approached was grounded on the strong involvement of dynamic local leadership. A three throng approach of traditional leaders, elected officials and technocrats were mobilised and used to aggressively mobilise communities to completely eliminate open defecation (OD). They enabled the communities to establish and utilize latrines, practice household handwashing and use other forms of environmental sanitation such as refuse pits.

The evaluation assessed the relevance, efficiency, effectiveness, impact and sustainability of CLTS at the community, district and the national levels. It sampled 6 districts for field visits and used district host to identify sample villages. Qualitative data was collected in a period of 2.5 weeks by two evaluators. Semi-structured interviews were used to source information from facilitators, councilors, traditional leaders, NGO staff, technocrats whereas focus group discussions was used at village level to source information from village leaders, village members, women and children. Additional information was obtained through observation and transect walks with community members. The findings revealed that CLTS was more successful and general hygiene improvement was noticeable in regions where communities were better empowered and took responsibility for day to day use and maintenance of sanitation facilities (Government of Zambia, 2011). This was enabled through training and facilitation, especially where a small group of highly skilled champion facilitators with proven experience was used to training the community. Follow ups were also essential in maintaining sustainability of interventions

In an effort to understand how community empowerment that lead to sustainable community development can be achieved through community projects, Partington and Totten (2012) undertook a case study of Rochdale community and examined the contribution of community sports development on community engagement and empowerment. Rochdale Community Sports (RCS) project was establishment in 2001 by Rochdale Federation of Tenants and Residents Associations (RoFTRA), UK with the sole purpose of developing Rochdale community through sports. Previously, RoFTRA campaigned and lobbied on behalf of its members, individual tenants and residents associations on social housing estates, largely on housing issues. However, the introduction of RCS brought an organizational shift from housing issues to a broader aspect of social regeneration. It combined the delivery of sports activities with the development of skills and capacity. The project worked in partnership with tenants and residents associations to engage children and young people in sports and recreation services.

The case study adopted an action research approach and examined how RCS delivery enabled or disabled the empowerment of tenants' and residents' associations and their communities (Partington and Totten, 2012). Using ethnography principles, the researchers gathered data from community sports sessions, tenants' and residents' meetings, strategic planning meetings and other informal RCS activities. One of the researchers was employed in the project and used the opportunity to interact more with participants, seek deeper understanding of points of interest and gather in-depth and insightful data. The researchers collected qualitative data through group discussions, participant observation and in-depth interviews. The data was triangulated for a deeper understanding of the phenomena of interest.

The study revealed that RCS project was successful in empowering Rochdale community through aggressive community engagement in project activities, effectively building capacity of tenants and residents associations and developing a social capital within the community and without. It utilized tenants and residents associations forums in engaging communities. Tenants were constantly consulted and involved in decision making and this enabled easy project acceptance and ownership by the community. The emerging power relations within the project and the community became strong enough to influence the relationship between the project and mainstream agencies such as local authority and Cultural Trust that had traditionally managed sporting activities in the community, and the relationship between the project and tenants and residents associations. The project sufficiently empowered individuals and the community who were then able to develop own

sports based activities and services and attain self-reliance. The effective engagement of young people positively influenced their behavior and relationships and weeded out deviant behaviour. Tenants, residents and staff members created a social capital through recreational activities. The network became part of a much larger social movement through membership of RCS, providing a huge potential for generating power within the community. This resulted in sustainability of RCS activities even after the project closed down after withdrawal of funding.

2.6 Community Conflict Management Strategies and Sustainability of WASH projects

Human beings have different needs and interests over resources. While these differences are good for equitable and successful management of the resources, they can easily lead to conflicts. Thamasson (2005) argues that conflicts arise not much out of scarcity of resources but rather from incompatibility in use of the resources arising from inequitable use. As such, there should be adequate structures and skills within projects for solving problems and resolving conflicts among community members or participants in projects (Goodman *et al*., 1998)

World Bank (1998) and Warner (2000) have linked conflicts within projects or project environment to a snarl-up in project implementation that often lead to un-sustainability or termination. They concur that conflicts are inherent where resources are shared and often diverse interest and priorities are held. Whether caused by improper management, which sometimes disregards conventional ways of management and the participation of indigenous people or diminished access to resources, denial of use or property rights over the resources, competing priorities, varying levels of commitment and differing perspectives on what needs to be done, conflict mitigation becomes a critical element in sustainable management of the resources.

Warner (2000), in an effort to establish the role of conflicts and conflicts management on community-based natural resource projects, documented experience arising from a case study of a conflict management programme that was implemented by six community-based natural resource projects in Fiji and two in Papua New Guinea (PNG). The programme aimed to reduce conflicts and disputes between project stakeholders and contribute to wider peace-building and conflict efforts within the project countries. It was introduced when a range of conflicts and disputes had negatively affected the effectiveness and sustainability of the community based projects. They suffered negative publicity, increased operation costs, threatened withdrawal of sponsors and assisting NGOs and un-cooperating beneficiaries.

There was low staff morale, increased staff resignations in the face of heightening political tensions. Upon introduction of the programme in 1998, a basket of conflict management strategies were promoted with emphasis on skills training in conflict analysis and consensus building and use multi-stakeholder meetings. From the experiences, Warner was able to show that a consensual approach to conflict management was critical and precursor to a build up of social capital necessary to reduce disputes and conflicts that would otherwise be a major obstacle to projects sustainability.

Holahan and Mooney (2004) in a two year research to examine the nature of conflict on team decision making and project team performance observed that a team's ability to make effective decisions and achieve its goals depended centrally in its ability to manage conflicts. They identified two forms of conflicts- constructive and destructive, noting that constructive conflict enabled teams to generate higher quality decisions and a deeper understanding and commitment to the decisions reached as opposed to a destructive conflict that degraded decision making and thwarted the attainment of project goals. They observed that conflicts had a powerful, indirect effect on project performance. While constructive/cognitive conflict had a positive impact on decision outcomes, destructive conflict had an adverse impact on decision outcomes. Decision outcomes was in turn directly related to team performance. Teams with high levels of destructive conflict made poorer quality decisions and exhibited less commitment to these decisions hindering their ability to stay within schedule and achieve project goals and sustainability (Holahan and Mooney, 2004).

They noted further that constructive conflict thrived under conditions of high trust, high behavioral integration and low contentious communication and when these conditions were reversed, a hostile climate was created that facilitated mutation of constructive conflict into destructive conflict. This made team members less receptive to the ideas of other team members, became less able to objectively assess new information provided by other team members thus compromising decision quality and commitment, wasting time and creating inefficiencies in the task performance. They concluded that the ability to minimize the incidence of destructive conflict was the key to improving project teams' decision making and project performance and survival (Holahan and Mooney, 2004).

In an effort to examine the role of participatory development projects in either generating or mitigating conflict in rural Indonesia, Barron *et al*., (2007) conducted a study of the Kecamatan (Sub-district) Development Project (KDP). KDP was implemented by the Government of Indonesia's in 40% of all villages across the country. It sought to deliver

development resources by introducing transparent, accountable and participatory development planning to the rural communities. The project funded village projects from block grants administered by established sub- district committees that were manned by representatives of constituent villages. The committees evaluated and funded proposals from village groups on competitive basis creating "winners" and "losers in the process and new spaces for public deliberation, avenues for the participation of marginalized groups and opportunities for the cultivation of civic skills. It also introduced facilitators at village level who provided information on the process, helped villagers identify and prioritize their needs, and monitored programme implementation. The evaluation study assessed how the project interacted and influenced local conflict dynamics and the capacity of the community to respond to them. It covered three sub-districts which had received KDP and one control in each of the two districts in East Java and Nusa Tenggara Timur provinces, selected on the basis of having high or low capacity to manage conflict. A team of 15 researchers conducted nine months of qualitative fieldwork in 41 villages and held over 800 interviews and 100 focus group discussions. They also carried out several quantitative surveys in the research villages. The project and control locations were matched using propensity score techniques and qualitative verification (Barron *et al*., 2007).

The study revealed that KDP related conflicts almost never become violent at a time when there were 36 violent disputes related to other government development programs and services in the study area. They attributed this to inbuilt mechanisms in KDP projects (fora, facilitators and procedures) that were used to address tensions as they arose. KDP projects had also defined communities needs and matched them with local priorities reducing likelihood of conflicts. About 92% of survey respondents in East Java and 96% in Nusa Tenggara Timur reported that use of fora for addressing KDP-related problems as the most effective compared 50% of respondents in both sites who favoured the use of facilitators. They further observed that increased knowledge of the rules, processes and aims of KDP programme tended to limit the number of program malfunction conflicts—the most destructive form of development-triggered conflict. They concluded that development projects with inadequate dispute resolution mechanisms more often stimulated local conflict either directly from the development resources they introduce to the target communities or indirectly by intensifying pre-existing tensions. Those that had clear and accessible conflict management mechanisms were much less likely to lead to violent outcomes as they were able to successfully address project-related conflicts as they arise due to establish procedures for dealing with tensions (Barron *et al*., 2007).

2.7 Community Ownership and Sustainability of WASH projects

Ownership is term generally associated with control of physical or intellectual property embodied in legal rights. W hen applied in a development context, a sense of ownership is a concept through which to assess whose voice is heard, who has influence over decisions, and who is affected by the process and outcome (Lachapelle, 2008). When the community takes centre stage in all three areas, ownership is assured. The potential for ownership can also be understood in part by gauging the capacity for and quality of trust in a community development effort. A high degree of trust in a development process or outcome determines the potential for ownership (Bracht and Kingsbury, 1990).

Rifkin (1990) report that communities are more likely to be committed to a project if they have a sense of ownership in regard to the problems and solutions being addressed. Projects that do not address community concerns nor allow their participation lack community ownership. Where ownership is lacking, instances of projects machinery left to deteriorate after project implementation are common because the community is not committed or does not have the financial and technical capacity to maintain them. In this way a well planned and implemented project can be unsuccessful in reaching its overall project objectives because the community was not involved from the beginning (ACP-EU, 2012). Brennan (1994) asserts that ownership in a project is realized through participatory and empowering approaches. Rather than remain passive participant, communities are able to actively participate in the entire process of acquisition and operation of a development facilities. This implies that communities will have to elect management committees that will be accountable for managing the facilities.

Maganga *et al*. (2002) in a paper review of the historical development of domestic water supplies in Tanzania, the consequences of major policy shifts and reasons for failure of water supply systems observed that community ownership contributed significantly in realizing sustainability of projects through community investment and commitment to the projects. Ownership was enhanced in water projects that established community water committees that were critical in boosting sustainability. This view is supported by TANGO International (2008) that reported that integrating stakeholders into district societies as a proxy for project management units benefits project sustainability in that projects would be seen largely as a local initiative, rather than an external initiative put in place by an international agency. This arrangement also significantly increase awareness of project

interventions among key partner institutions and boost familiarity of project management with the local language and culture considerable boosting ownership.

An independent evaluation of sustainability and levels of community involvement and ownership of Diageo supported water of life projects that were implemented through in-market companies (IMCs) in eight countries across Africa- Kenya, Uganda, Cameroon, Nigeria, Burkina Faso, Ethiopia and Tanzania revealed that the projects were able to significantly improve community ownership and sustainability (Diageo, 2008). This was realized by incorporating locally appropriate technology within an existing water system, establishing democratic and gender sensitive water committees and strengthening their capacities through training on maintenance and repairs and by involving communities in financial or in-kind contribution. The projects ranged from bore hole construction and rehabilitation, rainwater harvesting, water filter to hand pumps installation (Diageo, 2008).

UNICEF (2007) was able to show that lack of community ownership resulted in poor sustainability of projects in an evaluation of the PlayPump technology as an alternative appropriate technology for water, sanitation and hygiene programmes in developing countries. The evaluation carried out in playpump implementing countries of South Africa, Mozambique and Zambia between August and September 2007. The study sourced primary data on playpump technology through focus group discussion and key informant interview guides administered to stakeholders. Secondary information was obtained through literature and internet search. The evaluators held interviews with programme manager of PlayPumps International, the manufacturer (Outdoor Fabrication and Steelworks) and the maintenance and advertising company (Roundabout Outdoor) in Johannesburg, South Africa. They further interviewed communities and institutions that had adopted PlayPump water systems in South Africa, Mozambique and Zambia and physically assessed installed PlayPump water systems in the countries. They also had interviews with key stakeholders in the three goverments, NGOs, and USAID that involved with the implementation of PlayPump technology in the countries. The evaluation concluded that while the technology was new and robust it was unsustainable and required serious and urgent revision. It lacked community ownership as the community lacked negotiating power with project installation and O&M teams. They also had no control over advertisement and messages displayed on tanks, lacked authority to determine the appropriate technology to use and were never adequately consultation or empowered (UNICEF, 2007).

Arnold et al., (2009) made similar observation in a cross-sectional cohort study of a 3-year combined household water treatment and hand-washing with soap campaign in rural

eastern Guatemala. The campaign, which was spearheaded by Caritas and Catholic Relief Services across 90 villages between 2003 and 2006, promoted water treatment by boiling, solar disinfection and chlorination using diluted bleach. All the villages received the same intervention packages initiated at the same time. During implementation, Caritas and Catholic relief services technicians visited households, identified and trained community health promoters who were tasked with monthly visits to households, and promotion of water treatment and handwashing with soap. The promoters educated mothers on proper nutrition and offered donations in the form of rice, beans and oil at the end of every session. The cohort study was done six months after the project interventions and covered 15 intervention villages and 15 control with a total of 600 households and 929 children under the age of 5 years. It sought to establish the health effectiveness of behaviour-based water and hygiene interventions.

The researchers pre-tested and validated survey instrument over a 2-week period in nearby, non-study villages before commencing household interviews between April and June of 2007. They collected self-reported handwashing behaviour by interviewing mothers, measured water-treatment practices using self reported behavior and collected information about hygiene and water storage with discrete spot check observations during the interviews. They further collected and analysed household water samples collected in a random sample of 48 households from four intervention and four control study. The study applied restriction and propensity score matching to increase comparability between intervention and control groups based on pre- intervention characteristics to select intervention and control villages. Daily longitudinal prevalence between the intervention and control groups for self reported health outcomes was analysed and targeted maximum likelihood estimation (MLE) used to improve efficiency of the estimator and control for potential residual confounding for self-reported health and anthropometric outcomes.

Findings revealed that the 3 years promotional intervention there was only modest gains in confirmed water treatment behaviour (risk difference at 0.05, 95% confidence interval 0.02–0.09) and no significant difference between the intervention and control villages in self-reported handwashing behaviour, spot-check hygiene conditions, or the prevalence of child diarrhoea, clinical acute lower respiratory infections or child growth. The study concluded that the lack of child health impacts was due to unsustained behaviour adoption, a demonstration of the difficulty of implementing behaviour-based household water treatment and handwashing interventions that register impact. It is however, evident that the interventions had minimal community participation and ownership. The were foreign and

community interest and involvement was merely elicited from token gifts given to mothers (Arnold et al., 2009).

Practical experiences gained from 15 projects sponsored by the first ACP-EU Energy Facility, and documented in Fiche no. 8 report provided a much more clear link between community involvement, ownership and sustainability (ACP-EU, 2012). The report revealed that when a project is not understood, adopted or appreciated by the beneficiaries, its sustainability is uncertain. When a community is adequately involved in a project, it acquires a certain degree of control over the project and when financial returns or other tangible benefits are obtained a more sense of satisfaction is realised. The satisfaction encourages community implementers to overcome project critics and dissatisfaction from other quarters, and even prevent thefts and vandalism of the project's equipments. This satisfaction cements ownership and ensures sustainability of the project in the long term. The report acknowledged awareness raising as an important aspect of community involvement that enhanced project ownership and sustainability in the long run. Awareness raising not only informed the target communities and local authorities about project's activities creating a demand or interest in a project but also created transparency. By understanding project's benefits and how to handle it, community role in the project, level of participation and expectation, the community easily embraces new projects and is more willing to support the projects and/or buy its products boosting sustainability.

A similar evaluation of Action Aid international in Kenya funded Tangulbei local Rights programme in East Pokot revealed that sustainability of the programme's interventions by local communities in terms of ownership was quite low (Bwisa and Nyonje, 2012). Majority of community members viewed the programme as belonging to the donors and openly expressed it in their sentiments. There were instances where the community avoided supervision of construction work in schools leading to poor workmanship citing lack of involvement in the contractual agreement that was made only between the contractor and the donor. This was a clear manifestation of poor ownership that posed a threat to sustainability of the programme interventions.

2.8 Theoretical Framework

This study is guided by the theory of diffusion of innovation, ladder of community participation and the ladder of citizen empowerment that informed its conceptualisation. Rogers (2003) in his theory of diffusion of innovations emphasised the significance of community acceptance and participation in an innovation to enable sustainability. The theory holds that a community development process involves a continuous change process that begins with an introduction of innovation that must be accepted, adapted, implemented and maintained by the community before it is finally institutionalized to enable sustainability. This process is facilitated by a change agent that link the resource system (innovator) and the user system (resource user) in this case the community. In a project context, diffusion of innovations theory demands that a project idea should be understood and accepted by the community to enable adoption. Once adopted, the community must effectively participate and own the entire process to ensure its maintenance and sustainability. To catapult adoption and ownership, a change agent is essential who can either be an individual community gate keeper or community committees.

This study is founded on the understanding that water sanitation and hygiene projects are innovations when first introduced into a community. The theory of diffusion of innovation expect such a project to be introduced in a way that a community understands and appreciate, accept, adopt and implement with the ease of its normal routine operations. The effectiveness of community participation in the innovation would however depend on their level of participation.

The recognition of community participation in development initiatives as a strategy to enhancing sustainability was first advanced by Arnstein (1969) in his theory christened the ladder of participation. The theory classifies opportunities for community participation in development projects as a continuum of eight levels. At the lower end of the continuum is weak participation that he referred to as tokenism (manipulation). At this level, community members are merely invited to participate in projects that are designed and managed by outsiders, where they have no voice or control over project processes. Participation then rise through seven different levels of therapy, information, consultation, placation, partnership, delegated authority to citizen control. Citizen control is the peak of the continuum that has strong participation. This is the level where projects that initially were established of funded by outsiders build capacity of the local community to take over project leadership and decision making. It is most genuine level of participation, which when reached the community would sufficiently identify with and own the development initiative. Arnstein

asserted that participation at this level would guarantee sustainability of development initiatives. Using a ladder model, he stressed that levels of participation increased up the ladder and each level was supported by others levels. The theory holds that higher level of participation materializes only if supported or grounded on lower levels of participation.

8	Citizen control
7	Delegated power
6	Partnership
5	Placation
4	Consultation
3	Information
2	Therapy
1	Manipulation

Fig. 2.1 A ladder of participation (Arnstein, 1969)

The theory has been the basis of design of many projects that incorporate community participation as a key strategy in ensuring sustainability. Based on this theory, many projects have inbuilt designs with varying levels of community participation. The level of participation is informed by the sensitivity of the projects or their intended performance upon closure of funding phase.

The theory of participation is consolidated by Burns *et al.* (1994) in their theory of the ladder of citizen empowerment. They establish a link between participation and empowerment by propounding that participation that lead to empowerment was essential for sustainability of projects. Their theory views a citizen as a consumer who has to choose among alternatives and this choice is a means to accessing power. It introduces additional qualitative dimensions to the levels of participation. By the citizen taking responsibility of their actions, actively participating in communal decision-making, they attain a level of empowerment that guarantees sustainability.

CITIZEN CONTROL
12. Independent control
11. Entrusted control
CITIZEN PARTICIPATION
10. Delegated control
9. Partnership
8. Limited decentralised decision-making
7. Effective advisory boards
6. Genuine consultation
5. High quality information
CITIZEN NON-PARTICIPATION
4. Customer care
3. Poor information
2. Cynical consultation
1. Civic hype

Fig. 2.2 Ladder of citizen empowerment (Burns et al, 1994)

It is therefore evident, informed by the three theories, that the extent to which a community understand, accept and adopt project depends on strategies used to introduce the project idea. To effectively implement and maintain the project would depend on the level of community involvement in the development and implementation of the project, the extent of community empowerment, communities' capacity to manage and maintain the facilities and the extent to which the communities own the initiative. Based on this understanding, the study conceptualized that sustainability of WASH projects is dependent on community participation, community capacity building, community empowerment and community conflict management strategies moderated by community ownership.

2.9 Conceptual Framework

The conceptual framework presents the relationship between the independent variables and the dependent variable and how this relationship is influenced by the moderating variable. It further shows how the independent variables interact independently and simultaneously with the depended variable.

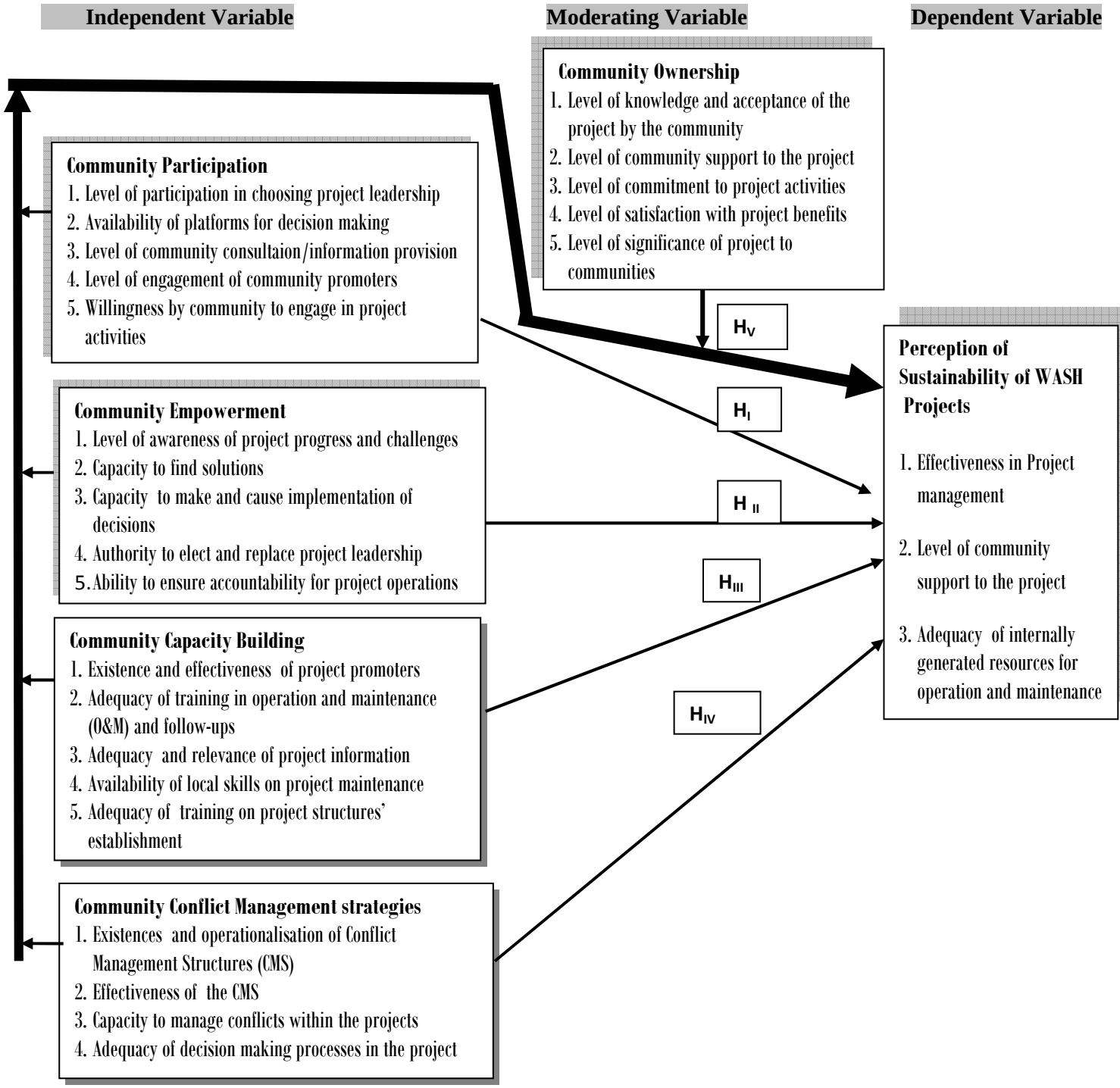

Fig 2.3. Conceptual Framework of the relationship between community intervention strategies and perception of sustainability of water sanitation and hygiene projects

The framework displays the conceptualized interactions of all variables in the study. The independent variables- community participation, empowerment, capacity building and conflict management strategies are displayed on the left hand side of the diagram and interact the dependent variable (sustainability) on the right hand side. The interactions are at two levels. The individual independent variable interaction with the dependent variable represented by hypothesis H_I, H_{II}, H_{III} and H_{IV} and the collective independent variables influence on dependent variable represented by hypothesis $H_{V.}$ This collective effect is however, moderated by community ownership variable that either enhance or reduce the influence of the four variables on dependent variable depending on the degree of ownership achieved. Sustainability is thus the end result of the individual and collective effect of the four implementation strategies moderated by the strength of community ownership. The framework further depicts that the degree to which individual independent or dependent variables are realized depend on the extent to which their corresponding indicators are achieved.

2.10 Summary of Literature Review

Literature review provided three perspectives of projects sustainability. However, based on the perspective of maintaining project benefits after initial project and building the capacity of the beneficiary community to manage the project, I operationalised sustainability in this study as referring to WASH projects that are well managed and maintained, and enjoy adequate community support.

Effort was made to isolate empirical and theoretical literature that associated sustainability of the projects to the independent variables under study that include community participation, empowerment, capacity building, conflict management and community ownership. Literature has demonstrated that active community participation is associated with project success and sustainability. The strength of this association depends on the level of community participation in project implementation where active and high level participation improves project success and sustainability. Literature further provides an association between community empowerment and sustainability of the projects. Empowerment can occur either at individual, community or both levels. Empowerment at community level is however, a factor of individual empowerment that is realized when communities gain understanding, confidence, self esteem and power to articulate concerns, take corrective actions and gain control over their actions, a pre-requisite for projects sustainability. It is achieved through adequate relevant information provision, active

community participation and capacity building. Literature further associate capacity building to sustainability of WASH projects. Effective capacity building especially in project management and operation and maintenance improve the capacity of the community to run and maintain the projects. When coupled with awareness raising, members of the community tend to accept and identify with the project boosting the momentum for successful project implementation.

Conflicts are presented as inevitable in projects. They arise either from the different needs or interest over the resources introduced by the projects, incompatibility in the use of the resources or by intensifying pre-existing tension. Inability to manage conflicts often has destructive consequences that degrade decision making. Poor quality decisions attract less commitment to the decisions by members, create inefficiencies in task performance and compromise ability of the project to achieve objectives and erodes their sustainability. However, projects with adequate conflict management mechanism that detect and resolve conflict at early stages have higher chances of success. A community's sense of ownership of a project tend to be influenced by their level of participation in project activities, competence in operation and maintenance and degree of empowerment. An active and empowered community develops a stronger sense of ownership over project interventions and has a better chance of sustaining the interventions.

The theoretical underpinning of the study is extricated by Arnstein ladder of participation, Burns ladder of citizen empowerment and Roger's theory of diffusion of innovations. The theories provided a good conceptualization of the relationships between the independent and dependent variables and enabled the development of a conceptual framework that grounded this study. However, whereas literature has studies that associate the individual independent variables under investigation to sustainability of projects in general, only a few linked the independent variables to sustainability of WASH projects (Buykx *et al*., 2012; USAID, 2008; Cole, 2006; UNICEF, 2007). Of the few none considered the extent of individual or collective contribution of the independent variables on sustainability of WASH projects. The existing studies also relied largely on qualitative information to establish the association of the variables. A few used quantitative methods and much fewer combined the two methods. This study adopts a mixed method design that concurrently triangulate qualitative and quantitative data. This approach is new in the area of study, offers a better understanding of the variables under study and will undoubtedly establish a stronger association among the variables. This breaks new ground in knowledge and contributes significantly to the future design and implementation of the projects.

Table 2.1 Summary of Empirical Literature Matrix

	Variable	Author (Year)	Title of Study	Findings	Knowledge Gap
1	Community participation strategy	Buykx *et al*., 2012	How do small rural primary health care services sustain themselves in a constantly changing health system environment	Elmore primary health service managed changed and maintained sustainability by developing a comprehensive community engagement system. a) Formed a working group that effectively engaged and captured community interest and participation in the service improving community acceptance and ownership b) The group (champions) engaged community in developing an IPHC system that enjoyed significant community participation and ownership. c) Developed strategic alliances that facilitated consultative meetings which established an acceptable health service delivery model that was sustained through a public-private funding model agreed upon by the community.	The evaluation employed both qualitative and quantitative methods of data collection but failed to show how quantitative data illustrated the observed influence of community engagement, strong leadership and committed champions and strategic linkages on sustainability of the health service.
		Ngondi *et al.*, 2010	Effect of a community intervention with pit Latrines in five districts of Amhara, Ethiopia	The study sought to determine the effects of community interventions with pit latrines in five districts of Amhara, Ethiopia. a) Proportion of households with pit latrines increased by 32.3% after three years of intervention. b) Established positive correlation between household size, higher socio-economic status and participation in health education and latrine ownership	Study compared baseline and evaluation data to establish impact, and used logistic regression to analyse association between household latrine ownership and increase in household size, higher socio-economic status and participation in health education. Both the study design and data analysis tools were appropriate for the study and the findings appear reliable.

		c) Household latrine coverage expanded with intensified community mobilization- effective awareness raising, training, use of extension workers, active community engagement and cost sharing.	
USAID, 2011	Water and sanitation	Assessed the performance and outcomes of a water and sanitation programme and the effects on target beneficiaries. Observation a) Proportion of households using improved water sources for drinking increased from 16% in 2008 to 28% in 2010 b) Community approach to total sanitation increased latrine ownership by 13.6%. c) Handwashing using soap or ash after defecation increased by more than 40% among adults in 2010 compared to 20% in 2008 d) Functional water points in the programme area increased from 54% in 2008 to 82% in 2010 e) Improved water points managed by community committees increased from 64% in 2008 to 77% by 2010.	Collected qualitative data from program documents, KII with project and partners' staff, FGD with beneficiaries, and direct observation of activities in selected sites in study area. Data was analysed using output level achievements, effectiveness, impact, and sustainability criteria. The study failed to detail how the criteria was applied making it difficult to determine its accuracy.
Ogari, 2012	Influence of community participation in the sustainable implementation of health projects: a case of Borabu Division, Nyamira	Examined the influence of community participation in sustainable implementation of health projects in Borabu Division, Nyamira county. Findings; a) A timely, well planned and implemented public involvement programs contribute to asuccessful design, implementation, operation, and management of projects.	The study adopted a descriptive survey design and collected and analyse both qualitative and quantitative data. However, the study failed to show how quantitative data augmented the findings of qualitative analysis.

			County	b) A informed community adequately involved in project revitalization process significantly boost chances of project implementation successes c) Participation is more effective whenever accompanied by effective and efficient capacity building (training) programmes linked to on-going development projects in an area	
2	Community capacity building strategy	USAID, 2008	External program evaluation water, sanitation and hygiene (WASH) program in Ethiopia.	Assessed performance and effect of a WASH programme on target beneficiaries, implementation challenges, weaknesses and strengths a) In 80% of the projects WASH committees earlier trained were functioning, well organized and had taken over responsibility for management, operation and maintenance of facilities b) Weak capacity of district offices (woreda) coordinating project was the greatest threat to the long-term sustainability of benefits. c) Capacity gap impacted on coordination, planning and implementation across the districts threatened long-term support to operation & maintenance (O&M) and monitoring and evaluation of the programme.	Evaluation covered five projects in five accessible woredas. Qualitative data were collected through review of programme documents, KII with project and partners' staff, FGD with beneficiaries, and observation of programme activities in the field. Data were analyzed using an evaluation criteria that organized it into output level achievements, effectiveness, impact, and sustainability. Study used a non representative sample identified by convenience
		Bwisa and Nyonje, 2012	Tangulbei local rights programme: A mid term	Assessed efficiency and impact of the local rights programme on the lives of target population and the viability of sustainability strategies put in	The study used appropriate sampling technique and data collecting instruments. Several interviews were held that provided adequate

	evaluation report	place. Findings: a) Achieved sustainability of the local implementing institutions that included schools, women networks and girl forums by continuously developing their capacity in operation and organizational development through trainings b) Capacity building through Training of Trainers (TOTs) was most effective in enhancing sustainability in financial management and equipment maintenance	data. By involving all clusters in the study and randomly sampling subjects, the study results were adequately representative.
Care International, 2010	Sustainable livelihood security for vulnerable household in seven districts of Nyanza province (dak achana) program	Reported how effective community capacity building facilitated water, sanitation and hygiene promotion project sustainability. It observed that: a) All Central Management Committees that had received training on project management were functional b) 49% of targeted households had adopted safe water system c) All partnering institutions that had received training were effectively managing water and sanitation activities d) Sustainability of boreholes increased whenever capacity of beneficiary communities was built on reticulation that equipped them with skills to effectively generate funds for operation and maintenance from sale of water e) An elaborative capacity building strategy resulted in sustainable management of project activities.	The study adopted a demand driven approach to community development and in partnering with local institutions. It focused in building capacity of local institutions in project management and other skills

3	Community empowerment strategy	Cole, 2006	Information and Empowerment: The Keys to Achieving Sustainable Tourism	Investigated the effect of information on empowerment that lead to sustainable tourism. The study revealed that: a) Community participation rarely moved beyond passive participation due to lack of knowledge, confidence, capital, skills and self-belief b) Communities were able to effectively participate in decision making only when they understood the development processes and the variety of development options c) Access to relevant information was essential as an early stage of empowerment	The case study adopted a longitudinal action research design. Employed participant observation, questionnaire-based interviews and FGD to source qualitative data. The study design was appropriate and data collection methods suitable for the study. Sampling procedure was not described making it difficult to determine the representativeness of the findings.
		Government of Zambia, 2011	Ministry of local government, housing, early education and environmental protection community led total sanitation in Zambia: An evaluation of experiences and approaches to date	An evaluation to assess the relevance, efficiency, effectiveness, impact and sustainability of CLTS at the community, district and national levels in Zambia. It revealed that: a) CLTS was more successful and general hygiene improvement more noticeable in regions where communities were better empowered and took responsibility for day to day use and maintenance of sanitation facilities. b) Empowerment was enabled through training and facilitation, especially where a small group of highly skilled champion facilitators with proven experience was used to train the community. c) Follow ups were essential in maintaining sustainability of interventions	Study sampled 6 districts for field visits. Sample villages were identified through district host. Qualitative data were collected by 2 researchers in 2.5 weeks using semi-structured interviews, FGD, observation and transect walks with community members. Sample villages were selected by convenience and their representativeness could have been compromised. The period of data collection was short and could have hampered adequate data collection considering that only 2 evaluators conducted the study using multiple data collection methods in a wide target area

Partington and Totten, 2012	Community sports projects and effective community empowerment: a case study in Rochdale	Conducted a case study that examined the contribution of community sports development on community engagement and empowerment. Findings: a) RCS project was successful in empowering Rochdale community through aggressive community engagement in project activities, effectively building capacity of tenants and residents associations and developing a social capital within and outside the community. b) Emerging power relations within the project and the community strengthened to the extent of influencing relationship between the project and mainstream agencies such as the local authority and Cultural Trust that traditionally managed sporting activities in the community c) Individuals and the community sufficiently empowered and were then able to develop own sports based activities and services and attained self-reliance d) The empowered community was able to sustain RCS activities beyond initial project period.	The research adopted a case study design and used ethnography and action research approaches where one of the researchers was an employee of the project under investigation. Qualitative data was collected through group discussions, participant observation and in-depth interviews and triangulated for in-depth understanding of phenomena. The research design, approaches used and methods of data collection were appropriate. The researchers however, failed to show the data analysis method used and how triangulation of data was achieved.

4	Community conflict management strategy	Holahan and Mooney, 2004	Conflict in project teams: Gaining the benefits, avoiding the cost	Conducted a 2 year research that sought to provide more guidance in conflict management. It revealed that: a) A team's ability to make effective decisions and achieve its goal was depended in its ability to manage conflicts. b) Destructive conflict had adverse impact on decision outcome which directly related to team performance c) A teams' ability to minimize destructive conflict was crucial in improving decision making and project's performance.	The researcher failed to provide the methodology used in data collection and analysis. The findings arrived at was not verifiable.
		Barron *et al*., 2007	Local Conflict and Development Projects in Indonesia: Part of the Problem or Part of a Solution	Examined the role of participatory development projects in generating and mitigating conflicts in Indonesia. Findings: a) Inbuilt conflict resolution mechanisms in KDP projects (Forums, facilitators and procedures) prevented conflicts from becoming violent at a time when there were 36 violent disputes related to other government development programs and services in the study area. b) 92% of survey respondents in East Java and 96% in Nusa Tenggara Timur confirmed that the fora were most effective mechanism for addressing KDP-related problems compared 50% of respondents in both sites who favoured the use of facilitators.	The study covered three project intervention sub-districts and one control. The sub-districts were purposely sampled on the basis of having high or low capacity to manage conflict. They matched project and control locations using propensity score techniques and qualitative verification. The study adopted a mixed method design. Data was gathered using quantitative surveys, interviews and FGD. Over 800 interview and 100 FGDs were held. It is noted that choice of research design and data collection and analysis was appropriate and elaborate.

5	Community ownership Strategy	UNICEF, 2007	An evaluation of the playpump water system as an appropriate technology for water, sanitation and hygiene programmes	Conducted an evaluation of playpump technology in WASH programmes in South Africa. Findings: a) Playpump technology was new and robust yet it was unsustainable and required elaborate and urgent review b) Local community lacked community ownership. The local community lacked power of negotiation with project teams on issues of installation and operation and maintenance, they had no control over advertisement or messages displayed on tanks or authority to determine the appropriate technology to use. They were never adequately consulted or empowered	Qualitative data was obtained through literature and internet search for secondary data, interviews and FGD with stakeholders. Study deployed appropriate data collection method for qualitative data. However, there was no information on data analysis methods used and how the findings were arrived at.
		Arnold et al., 2009	Evaluation of a pre-existing, 3-year household water treatment and handwashing intervention in rural Guatemala	Conducted a cross-sectional cohort study that sought to establish health effectiveness of behavior-based water and hygiene interventions in Guetamala. Findings: a) There were only modest gains in confirmed water treatment behaviour (risk difference at 0.05, 95% CI 0.02–0.09) after 3 years of promotional intervention b) no significant difference in control and intervention villages in self-reported hand-washing behaviour, spot-check hygiene conditions, or prevalence of child diarrhoea, clinical acute lower respiratory infections or child growth c) Unsustained behaviour adoption caused minimal child health impact, a demonstration of	The cohort covered 15 intervention and control villages. Collected data through interviews and spotchecks. Collected and analysed water samples using standard analytical methods. It applied restriction and propensity score matching to increase comparability between intervention and control groups based on pre-intervention characteristics to select intervention and control villages. The study design and methods for data collection and analysis was appropriate for the study. The results could be therefore be reliable.

		the difficulty of implementing tangible behaviour-based household water treatment and hand-washing interventions	
ACP-EU, 2012	Sustainability II: Ownership and community involvement.	Practical experiences from 15 ACP-EU energy facility projects revealed that : a) When a project is not understood, adopted or appreciated by beneficiaries, its sustainability is uncertain. b) When a community has control over a project and receive some tangible benefits, it achieves a greater sense of satisfaction, which help solidifies its support for the project.	The report did not show the method used to analyse the experiences gained ACP-EU sponsored projects investigated.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was used in conducting the study. It presents the research design and the philosophical thinking behind it, target population, sample size and sampling procedures. It explores data collection instruments and how they were pilot tested, the procedures used in determining instruments' validity and reliability, data collection procedures and analysis techniques. The chapter further explains ethical considerations during data collection and operationalisation of variables.

3.2 Research Paradigm

The study adapted a pragmatic knowledge claim which allow a researcher to seek knowledge and understanding of a situation under study, problems and consequences using multiple approaches (Creswell, 2008). A pragmatic approach is based on abduction reasoning that employ both induction and deduction reasoning to enable use of both qualitative and quantitative methods in the same research study (Creswell, 2008). Pragmatists believe that knowledge is not only developed through careful observation and measurement of the objective reality that exist (quantitative approach) but by also seeking an understanding of the world by developing subjective meanings from the researchers own experiences and those of his subjects on the situation under study (qualitative approach). They believe that since the world is not an absolute unity, its complete understanding demand the use of different ways of gathering and analyzing data. This calls for use of a number of methods, techniques and procedures in generating information that is used to nraveling situations. The philosophy is further advanced by Tashakkori and Teddlie (1998) and Datta (1994) who argue that pragmatism is best paradigm for justifying the use of mixed methods research. This is the philosophy that informed the researcher to seek an understanding of the association between the variables under study by undertaking objective measurement and developing meaning to the opinion and experiences of the community on the relationships of the variables as expressed in Focus group discussions.

3.2.1 Research Design

Research design refers to the overall strategy that is used to integrate the different components of a study in a coherent and logical way in order to effectively address of research problem. It ensures that the evidence obtained in a study enables it answer the research question it sought to investigate as unambiguously as possible (Yin, 1989) . In this study, the research sought to investigate the extent to which the independent variables influenced the depended variable without manipulating environment. Guided by a pragmatic philosophy, this called for a deeper understanding of the association between the variables by using both qualitative and quantitative data. This requirement informed the choice of descriptive survey as the research design for the study. The design enables information to be collected without manipulating the environment (Shield and Rangarjan, 2013) and may involve use of both qualitative and quantitative research methodologies to enable description of events in greater depth, measurement of central tendency and analysis of correlations between multiple variables using such quantitative tests as Pearson product moment, regression and multiple regression. This ability informed the choice of this design as the most appropriate for this study.

The use of mixed method approach in the descriptive survey design enabled both qualitative and quantitative research to proceed simultaneously and independently of each other and the results triangulated during data analysis for a deeper understanding of a research problem. Mingers (2001) advocated for concurrent triangulation approach as the most appropriate, where the objective is to use both qualitative and quantitative data to develop a deeper understanding of the phenomenon of interest.

Teddlie and Tashakkori (2009), Tashakkori and Creswel (2008) and Creswell and Clark (2007) presented strong arguements on the superiority of mixed method approaches over single methods and the potential for a deeper understanding of a research problem. They held that by combining qualitative and quantitative worldviews, mixed method approaches are critical in enriching and deepening ones understanding of a phenomenon. The approaches further offers greater opportunity for complimentary and divergent views (Teddlie and Tashakkori, 2009) and ability to create a convergence between qualitative and quantitative methods and subsequently neutralizes or cancels the limitations and biases inherent in any single method (Byrne and Humble, 2007).

In this study both quantitative and qualitative approaches were used simultaneously to collect and analyse data within the limited study period. The quantitative approach was used

to generate quantifiable and numerical data that was analysed to provide insight on the relationships between variables under study while qualitative approach was used to source in-depth non-numerical data that was used to compliment, qualify and validate the statistics obtained through the quantitative approach. In this manner, a better and deeper understanding of the relationships between the variables was established. The combined data was used to specifically establish the existence of a relationship(s) between the independent variables (implementation strategies) and the dependent variable (sustainability of WASH projects), the extent and strength of the relationships and the influence of various proportions of independent variables on the dependent variable, with the aim to establishing the combinations and proportions of independent variables that had significant effect on the dependent variable. These relationships were better understood and appreciated from this choice of design.

3.3 Target Population

The study targeted residences of the peri-urban estates of Kisumu town and its rural surrounding amongst whom government or donor funded water, sanitation and hygiene (WASH) projects were implemented. The study area covered Kadibo, Winam, Kombewa and Maseno divisions of presently Nyando, Kisumu town East and Kisumu town West districts. The target population was insolated to include households in the peri-urban estates of the town and the surrounding rural settlements. Data from the Kenya National Bureau of Statistics (2010) indicated that there were 148,494 households in the study area distributed as shown in Table 3.1.

Table 3.1: Distribution of Households by Administrative Units

District	Division	No. Of Household
Kisumu Town East	Winam	102508
	Kadibo	12994
Kisumu West	Maseno	17128
	Kombewa	15864
Total		**148494**

Adopted from KNBS census data (2010).

The study targeted all the household in the study area. For every household, one representative who was the household head, either male for male headed household or female

for female-headed households were targeted. In total, 148,494 persons were targeted. The study further targeted all WASH projects within the study area that promoted access to improved water and sanitation, and were initiated by either the government of Kenya or donor agencies like NGOs, civil society organizations, intergovernmental institutions, international organizations and other foreign agencies. Table 3.2 presents the distribution of water sanitation and hygiene projects in the study area. Fifty WASH projects existed in the study area. For each project between 7-10 persons were targeted for focus group discussions.

Table 3.2: Distribution of Water, Sanitation and Hygiene Projects by Administrative Units

Division	Sublocation	Boreholes/Springs Projects	Dams/Waterpans Projects	Total
Winam	Bar A	5	2	7
	Kanyawegi	2	5	7
	Korando B	4	2	6
	Manyatta B	2	-	2
Maseno	Marera	5	2	7
Kombewa	North Alungo	5	2	7
Kadibo	Kochieng	4	4	8
	Nyamware South	3	3	6
Total		**30**	**20**	**50**

Source: District Water, Public Health and County Administration offices (2013)

3.4 Sample Size and Sampling Procedure

This section describes how the sample size was determined and the procedure that was used to identify sample subjects**.**

3.4.1 Sample Size

Kerlinger (1973) defines a sample as a set of individuals selected from a population and which is intended to mirror the population characteristics. The size of the sample and scale of representativeness determines the degree to which it mirrors population characteristics. Krejcie and Morgan (1970) designed a model for determining sample sizes at different levels of confidence and margin of error. They recommend that at 95% confidence level and 5% margin of error, a sample of 384 subjects is representative for a population of

above 100,000 subjects. Based on this model, a sample size of 384 households was selected from the population of 148,494 households in the study area. In addition, 30% of WASH projects (15 projects) were selected from a population 50 projects in the study area, and for each project between 7-10 ordinary members and beneficiaries of the projects were sampled and included in focus group discussions. The 30% procedure is recommended by Mugenda and Mugenda (2008) who argue that 30% is sufficient in determining the cluster that a sample is spread.

3.4.2 Sampling Procedure

Two groups of sample sizes were determined. The first group included sample households within the study area while the second group comprised ordinary members and beneficiaries of the projects. A sample size of 384 households was selected and distributed proportionately in all sub-locations sampled in the study. In order to identify sample sub-locations for inclusion in the study, a multi–stage sampling technique was used. Oso and Onen (2009) observe that a multi-stage sampling procedure progressively selects smaller areas until the individual members of the sample have been selected through a random procedure. Using a multi-stage sampling procedure, 30% of locations in each of the four study area divisions were sampled in the first stage of the procedure. A table of random numbers was used to select the sample locations. In this procedure, locations in every division were assigned a single digit number starting from zero (0) to the n number of locations. From the table of random numbers, the researcher blindly started at any digit and moving either across, up or down selected 30% of the locations whose digits ranged between 0 and n. Every number was selected once and numbers already included were omitted. The same procedure was repeated for the other three divisions until all sampled locations were selected. In the second stage of the multi-stage sampling procedure, 30% of sub-locations from the sampled locations were selected using the same procedure. Table 3.3 illustrates the process of multi-stage sampling used in this study.

Numbers of households in the selected sub-locations were obtained from the KNBS census report and using the formula presented below, each sub-location was assigned a proportionate number of sample households

$$\text{Sample household at sub-location} = \frac{\text{Population households at sub-location} \times 384}{}$$

Total population of households in sampled study area

In order to isolate the specific households per sub-location for use in the study, a systematic random sampling was used. Every primary school, a health centre, a market centre and church was used as a central point. From the central point, every fifth homestead to the East and West and third homestead to the North and South was sampled and the procedure followed through until the target number of household was achieved. In every homestead, the head of every household was sampled. In peri-urban estates where homesteads are not well defined, residential buildings 50 meters to the east and west and 30 metres to the north and south from the central point was sampled and the distanced maintained between homesteads until the target number was achieved.

Table 3.3: Multi-Stage Sampling Method used to determine number of households sample size

Region	Divisions	Locations	1st Stage 30% randomly selected Locations	Sub-location	2nd stage 30% randomly selected Sublocations	Pop. Households	Sample Households
Peri- Urban	Winam	Town	Kisumu S.W	Ojola	Kanyawegi	1454	36
		Kondele		Osiri			
		Kolwa Central		Kanyawegi			
		Kolwa west	Kolwa West	Nyalenda B			
		Kolwa East		Nyalenda A			
		Kisumu S. W.		Manyatta B	Manyatta B	7808	190
		Kisumu central	Kisumu N.	BAR 'B'			
		Kisumu E.		Nyahera	BAR A	957	23
		Kisumu N		BAR 'A'			
		Kajulu E.	Kisumu C.	Korando A			
		Kajulu W.		Korando B	Korando B	1367	33
		Miwani					
Rural Settlements	Kadibo	Kawino N.	W. Kochieng.	Nyamware N			
		Kawino South		Nyamware S.	Nyamware S.	971	24
		W. Kochieng					
		E. Kochieng					
		Kombura	East Kochieng	Okana	Kochieng	1521	37
		Bwanda		Kochieng			
		Katho					
		Kanyagwal					
	Maseno	Kisumu N.W.	Kisumu N.W	E. Karateng	Marera	1282	31
		W. Kisumu		W. Karateng			
		Otwenya		Sunga			
		East Seme		Marera			
	Kombewa	N.C. Seme	S.W. Seme	S. Alungo	N. Alungo	386	10
		Kodero		N. Alungo			
		W. Seme		Ang'oga			
		S.Central Seme		W. Kadinga			
		S.W. Seme		E. Kadinga			
				Alwala			
		Total				**15746**	**384**

Adopted from KNBS census data (2010).

In the second category of sampling, all WASH projects in sample sub-locations were identified from district water, public health and county administration office records and categorized into boreholes, springs, water pans and dams projects. Stratified random sampling was used to sample 30% of the projects in all the sample sub-locations (Table 3.4).

Table 3.4: Population and Sample Distribution of Water, Sanitation and Hygiene Projects by Administrative Units

Division	Sublocation	Total number of water/Sanitation Projects	Sample Number water/Sanitation Projects
Winam	BAR A	7	2
	Kanyawegi	7	2
	Korando B	6	2
	Manyatta B	2	1
Maseno	Marera	7	2
Kombewa	North Alungo	7	2
Kadibo	Kochieng	8	2
	Nyamware South	6	2
Total		**50**	**15**

For every sampled project, simple random sampling was used to select between 7-10 individuals that participated in focus group discussions. The participants were either beneficiaries, officials or ordinary members of the WASH projects or the projects' implementing institutions. Krueger (1994) recommends that 7-10 subjects are a suitable number for focus group discussions. He notes that the number is large enough to generate rich discussion but not too large to limit participation of all subjects. In total, additional 132 individuals participated in the focus group discussions.

In the second category of sampling, all WASH projects in sample sub-locations were identified from district water, public health and county administration office records and categorized into boreholes, springs, water pans and dams projects. Stratified random sampling was used to sample 30% of the projects in all the sample sub-locations (Table 3.3).

3.5 Research Instruments

The study used questionnaires to collect quantitative data and focus group discussion for qualitative data. Secondary data were collected through desktop review and internet search. The questionnaires were used to source data from sample households heads who were either females or males. A total of 384 questionnaires were administered and each took between 40 and 50 minutes to complete. The questionnaires were administered by the researcher and his six assistants on a face to face basis and in instances where the targeted heads of household were absent, elder persons of 18 years and above in any of the households in the homestead was selected and if still absent the appointment was rescheduled to a different date.

The questionnaire was organized into an introductory and main body sections. The introductory section contained both open and closed ended items. The closed ended items presented options from which respondents made their choices and sought to capture fairly straight forward issues. Open ended items on the other hand allowed respondents to provide opinion without guidance. The introductory section captured general information about the study location, the respondents' details and their relationship to the WASH projects in the area. The main body section was organized into six thematic areas, each corresponding to the variables under study. Each themetic area contained 10 items that examined all the indicators that explicated the objective variable. The items were presented as closed -ended five point Likert type and allowed the respondents to express an opinion on every item as best represented by one of the five options presented. The first thematic area solicited information on community participation, the second sought for information on community capacity building while the third solicited information on community empowerment. The fourth thematic area sought for information on community conflict management, the fifth examined community ownership while the sixth thematic area presented items that extricated project sustainability.

Focus Group Discussions (FGD) was used to capture qualitative data. A total of 15 FGDs were held and drew participants from 15 sampled projects institutions that were implementing WASH projects in the study area. The discussions, that were guided by researcher and recorded by the research assistants, and involved between 7-10 participants who were either ordinary members of WASH implementing institutions or beneficiaries of the WASH projects. A tape recorder was used to record all the proceedings. Every discussion was guided by focus group discussion guide. The guide was structured into an introductory and the main body sections. The introductory section captured general information about the

location of the study, the respondents' details, their relationship to WASH projects in the area and objectives of the projects. Except for one closed ended item, the section contained open ended items that provided opportunity to the respondent to express free opinion on the items under consideration. The main body of the guide captured information on all the variables under study. It was organized into themes corresponding to the variables under study with each theme examining all the indicators of a specific variable. All items in this section were open ended and sought in-depth opinion of the respondents on the variable under investigation. It was structured to solicit respondents opinion on community project implementation intervention strategies that were in use and how they influenced sustainability of the WASH projects.

A desk top review Journals, books and project reports were used to source relevant secondary data on the various intervention techniques and their contribution to sustainability of WASH projects in the study area.

3.5.1 Pilot Testing of Instrument

The questionnaire and FGD guide were pre-tested in neighbouring sub-locations to the study area before commencement of actual data collection. Pre-testing lasted two weeks and involved a relatively lower number of subjects, 10% of the study sample size (38 households). This percentage was recommended by Lackey and Wingate (1998) as adequate for a pilot study. Using simple random sampling five neighbouring sub-locations with similar characteristics to the main study area were selected for the pilot study. They were Omiya Mwalo and South Ramba in East Asembo division, Kango in Ombeyi division, East Jimo in East Nyakach division and Lower Kadiang'a in West Nyakach division. The number of pilot study households per sub location was proportionately determined using the following formula.

$$\text{No. of Pilot households (hsehlds) in sublocation (Subloc)} = \frac{\text{No of hsehlds in Subloc} \times \text{Total no. of Pilot hsehlds (38)}}{\text{Total no. of hsehlds in sample sublocations}}$$

The resultant household distribution are presented in Table 3.5.

Table: 3.5 Distribution of households used in the pilot study

Division	Sublocation		Pilot Households
East Asembo			
	Omiya Mwalo	=	9 households
	South Ramba	=	9 households
Ombeyi	Kango	=	8 households
E. Nyakach	Jimo East	=	7 households
W. Nyakach	Lower Kadianga	=	5 households
Total			**38 households**

In the pilot study, questionnaires were administered to heads of the 38 households. The households were identified using the procedure described under section 3.4.2. In addition, two randomly selected sub-locations out of the five sub locations used in the pilot study were identified for focus group discussions. In each sub-location one WASH project was sampled and between seven-ten members of the project implementing institutions and beneficiaries were randomly selected and included in discussions. As both the questionnaires and the discussion guide were administered, the researcher checked for clarity of questions, accuracy of responses and the effect of questions on respondents to determine whether the respondents readily responded to them.

3.5.2 Validity of the Instruments

Measurement of validity ensures that the results obtained from the analysis of data accurately represents the phenomenon under study (Mugenda and Mugenda, 2003). Donald and Delno (2006) identified three types of validity; content, criterion and construct related validity, that are often of interest to a researcher. In this study, data collecting instruments was tested for measurement, design and statistical conclusion validity through the guidance of supervisors. Measurement of validity was assessed by examining the content and construct of the instrument. For content validity, the supervisors provided guidance in assessing the accuracy with which the instruments captured the variables under investigation. All items in the instruments were reviewed and the accuracy by which they addressed the research objectives and questions assessed. Construct validity was evaluated by examining whether a consistent significant proportion of high scores in items investigating independent variables

correlated positively or negatively with scores in items investigating the dependent variable. This was done by comparing several scores from different subjects. Design validity assessment focused on whether the items in the instruments were able to generate adequate and relevant data that would enable the researcher to make conclusive inferences and generalization. Assessment of statistical conclusion validity focused on whether the instruments and their items were appropriately designed to enable collection of data in appropriate scale that would allow use of appropriate statistical procedures that would lead to correct conclusions.

3.5.3 Reliability of the Instruments

Reliability refers to the degree to which a research instrument produces consistent data after repeated trials on the same group of persons or an individual (Mugenda and Mugenda, 2003; AERF, 1999). It is influenced by both the instrument- items in the test, the sample-heterogeneity of sample and the type of reliability (Webb *et al.*, 2006; Dawis, 1987). It can either be reported in terms of reliability coefficient (*r)* or as standard errors of measurements (*SEm*) (Haertel, 2006). Different methods are used to measure reliability coefficient for an instrument. The most common are test-retest and split-half. This study used a split half technique as a measure of reliability. The method was preferred because it requires only one test administration (Allen and Yen, 2002). In the procedure, all items in the data collecting instruments were numbered and administered to 38 respondents in the pilot study. The questionnaire items were then split in two halves in the manner that ensured the two halves were parallel and the correlation between the two scores determined.

Studies by Rudner *et al*.(2002), Van der Linden and Laecht (1998) and Cronbach (1951) revealed that split half technique could produce different values of reliability depending on the method of splitting that is adopted. They observed that the traditional methods that split test items on an odd-even number basis or grouped items on 1^{st} half and 2^{nd} half basis did not guarantee that the two parts were perfectly parallel and were often producing inconsistent measures. Cronbach went further to propose the Cronbach's alpha as an alternative with the capacity to average all possible split half correlations, thus offering solution over the traditional split approaches. However, this method has also its weaknesses as demonstrated by Eisinga et al., 2012 and Ritter, 2010. The best reliability when using split half method is thus achieved when the two halves are as near parallel as possible (Haertel, 2006; Allen and Yen, 2002; Feldt and Brennan, 1986) since such halves produces almost equal means, variance and covariances (Chakrabartty, 2011; Madonald, 1999).

This study adopted a split half iterative method based on the Classical Test Theory that was demonstrated by Chakrabartty (2011) as capable of producing two parallel halves of almost equal means and variances. In this method, the total score for every item in the test instrument was calculated and sorted out in ascending order. The scores were then allocated into two groups in the order that the highest score was place in group 1, second highest score in group2 , third highest score in group 2 and the fourth highest in group1 until all the scores were group. For each row, the difference in the scores in group 1 and 2 was calculated. Similarly, the sum of the total scores in group 1 and 2 and the difference determined to verify if it was as close to zero as possible. Rows that had large difference in score between group 1 and 2 were identified and the scores swapped between the groups. The procedure was repeated until the difference of the total scores in group 1 and 2 were as near as possible to zero. The results of this process is presented in Appendix V. As recommended by Cohen and Swerdlik (2010) and Ary, Jacobs and Razavieh (2002) a Pearson product moment correlation coefficient was determined for the two groups to estimate the reliability of each of the halves (half test). The half test was adjusted to full test reliability as recommended by Kaplan and Saccuzzo (2011) and Ary, Jacobs and Razavieh (2002) using the Spearman- Brown correlation formula presented below.

$$\text{Full test reliability } (r) = \frac{2 \times r_{half\ test}}{1 + r_{half\ test}}$$

Where, r is the correlation coefficient

The final test result is presented in Appendix VI. The test results provided a full test reliability coefficient (r) of 0.997564. Since Cohen and Swerdlik (2010) and Nunnally et al. (1978) recommend a minimum acceptable reliability coefficient of 0.70, the test instrument used in this study satisfied this criteria and was considered highly reliable and appropriate for data collection.

3.6 Data Collection Procedure

The researcher sought and received authorization to conduct research from the university of Nairobi and proceeded to procure a permit to conduct the research from the National Commission for Science, Technology and Innovation. Equipped with the permit and an introductory letter from the university, the researcher visited the county, sub-county and the local administrative offices for introduction and updated the officers of the intended

research, its purpose and timelines. The Kisumu county commissioner gave the researcher the go ahead and introduced him to respective sub county heads. The researcher recruited six research assistants and two data quality managers. They were all university graduates with experience in conducting qualitative and quantitative research. Data quality managers were master degree holders. The research staff were taken through a three day training on the pending research study and focused on an understanding of data collection tools, procedure for identifying respondents, data quality assurance, daily reporting procedures and etiquette of research. In day one, the researcher took the staff through every item in the questionnaire and focus group discussion guide, making a deliberate effort to develop a common understanding of the meaning of the items and the correct translation into the local Luo and Kiswahili languages. Day two focus on data collection procedure, identification of target homestead and households and respondents and data quality monitoring. The third day involved a review of research etiquette that included issues of courtesy and presentation, household entry behavior, respondents' confidentiality guarantees, how to avoid leading questions, biasness and time management, and the roles of the researcher, data quality managers and the research assistants.

Data collection proceeded with a reconnaissance visit of study area and mapping to identify WASH projects and landmarks that were subsequently used to identify homesteads and households that were eventually included in the pilot and the main study. Data collection lasted 3 months. In the morning of any day of data collection, the researcher held a briefing with his research team on study location and duties of research assistants and data quality managers. Data collection progressed from one sub-location to the next until the entire study area was covered. In every sub-location, villages were identified and three villages tackled at a time by the research assistants grouped in twos. A respective village elder was attached to every team to assist with introduction and household identification. The 2 Data quality managers monitored data collection by visiting randomly selected households based on the days schedule and attending questionnaire administration sessions to monitor quality of data collection process. They also followed up and updated records on data of households visited. The village elders were not in attendance in any of questionnaire administration sessions to reduce risk of distorted information. Questionnaire administration lasted on average 40-50 minutes, each research team being tasked to administer a maximum of 5 questionnaires per day. A systematic sampling method was used to identify the homesteads. In every village, a land mark was identified with the help of the village elder. The land mark was either a church, school, fish banda or market centre. From the land mark the research assistants

selected a household in every fourth homestead to the east and west and a household in every 3rd homestead to the north and south. The questionnaire was administered to the head of every household. In the absence of a head of that household, the research team moved to the next household in the same homestead and so on. In the event that non of the heads were available, the research assistants selected an adult member (above 18 years) in any of the households in that homestead who had lived in the household for the past 6 months for interview. The research was done on weekdays only. Before engaging respondents, their consent to voluntary participate in the interview was sought and a confirmation of the consent was registered by the respondents by signing a consent declaration sheet that was provided and retained by the interviewers. All questionnaires were administered by the research assistants on a face to face basis. By the end of each day a debriefing was conducted by the researcher to review progress, challenges and strategies for the following day. The researcher collected all completed questionnaires and made entries in his microsoft excel spreadsheet on daily basis. Alongside quantitative data collection, the researcher conducted a total of 15 focus group discussions within the three months period. Participants of the FDGs were sampled from ordinary members and beneficiaries of 14 sampled WASH projects in the study area.

3.7 Data Analysis Technique

3.7.1 Introduction

This section is organized into quantitative and qualitative data analysis subsections. Quantitative data analysis subsection discusses the organization of questionnaire that was used in data collection and the preparation of the questionnaire data for data analysis. It further presents a discussion on the chi-square test for independence and a justification for the choice of the test statistic for evaluating hypotheses H_I, H_{II}, H_{III}, H_{IV}. The subsection further discusses the simple binary logistic regression model and a justification for its choice in assessing the extent to which the independent variables singularly influenced the depended variable in the study. It proceeds to discuss the multiple binary logistic regression model and a justification of its choice in evaluating hypothesis H_V. For both models the subsection discusses the conditions for inferencing. The qualitative data analysis subsection discusses the procedure used qualitative data re-organisation and analysis.

3.7.2 Quantitative data analysis

Quantitative data was collected using a questionnaire. The questionnaire sought data on the four independent variables, the moderating variable and the dependent variable, which were the subject of investigation. It had a total of sixty items in the main body, structured to generate Likert response options that were measured on a five point ordinal scale that ranged from the lowest score "1" representing Strongly disagree (SD) to the highest score "5" representing Strongly agree (SA). For analysis of Likert responses, the study used a 5-point equidistance scale (Carifio and Perla, 2007) that provided the ranges between the points as follows: Strongly disagree ($1 < SD < 1.8$); Disagree ($1.8 < D < 2.6$); Neutral ($2.6 < N < 3.4$); Agree ($3.4 < A < 4.2$) and Strongly Agree ($4.2 < SA < 5.0$). Based on this scale, this study considered an item mean of above 3.2 to indicate that a majority of the respondents were in agreement with the opinion expressed in the item.

Every variable under investigation was expounded by ten (10) Likert items that were combined into a composite Likert scale, which provided a quantitative measure of the variable in an interval scale. This procedure was developed by Likert (Allen and Seaman, 2007) who recommended the use such composite score for advanced data analysis procedures. In this study, the combined 10 Likert items describing the variable contributed a maximum composite score of 50 and measured the strength of the variable in interval scale, where a score of 10 represented the weakest strength and 50 the strongest in the strength scale.

Preliminary data analysis involved encoding of questionnaire responses and entry in an excel spreadsheet for cleaning. The data was subsequently imported to SPSS data management and analysis package (Statistical Package for the Social Sciences), Version 17 and re-organized by first converting the dependent variable data, in continuous form, into binary data, where sustainable was represented by value "1" and unsustainable value "0". The binary value "0" represented continuous values ranging from 10-32 while binary value "1" represented continuous values ranging from 33-50. Similarly, the continuous independent and moderating variables data was converted into new categorical variables grouped into three strength groups: 1= Strong (representing continuous values ranging from 36-50); 2 = Moderate (representing continuous values ranging from 26-35) and 3 = Weak (representing continuous values ranging from 10-25). The groupings were based on summated scores derived from Likert scale. The purpose of the categorization was to enable data analysis with Chi-square test for independence and the binary logistic regression both of which require data in category form.

Data analysis proceeded in steps. Firstly, preliminary data analysis involved calculation of the mean and standard deviation for all every questionnaire item, and the mean of means, mean standard deviation, skewness and kurtosis for the composite scores for each study variable (thematic variable in the questionnaire). This provided initial insights into the structure of the data. Secondly, analysis involved the assessment of the relationship between each independent variable and dependent variable using a 2 x 2 cross tabulation. To facilitate the analysis, data for both variables were converted from the continuous data format to categorical form. The format took the form of weak, moderate, strong for independent variable and sustainable and unsustainable for the dependent variable. Thirdly, hypotheses H_I, H_{II}, H_{III} and H_{IV} were tested using the chi-square test for independence. Fourthly, a simple logistic regression model was subsequently used to test the extent to which every independent influenced the dependent variable. Lastly, a final multiple logistic regression model was used to test hypothesis H_V

3.7.2.1 Chi-square test for independence

Chi-square test for independence was used to test the association between the independent variables singly and the dependent variable represented by hypotheses H_I, H_{II}, H_{III} and H_{IV}. Agresti (2007) recommended the use of this technique for analysis where there are two categorical variables from a single population, and a researcher is interested in determining if there is a significant association between the two variables. In this study, the researcher was interested in testing if a significant association existed between individual independent variables in categorical form and the dependent variable in binary form. This satisfied the requirement of the test statistic.

Values for the independent variable were grouped into three levels; Strong, moderate and weak, and the dependent variable into two levels; sustainable and unsustainable. Using sample data, a chi-square test for independence was performed at 0.05 level of significance to evaluate hypotheses 1, 2, 3 and 4. The hypotheses were stated in the following order:

H_0: Independent variable A and the dependent variable are independent.

H_a: Independent variable A and the dependent variable are not independent.

The null hypothesis stated that knowing the level of the independent variable A could not help in predicting the level of the dependent variable while the alternative hypothesis held

that knowing the level of the independent variable A could help in predicting the level of the dependent variable.

Evaluation of the null hypothesis required the calculation of chi-square test statistic. For instance, for the two interacting variables: community participation (CP) and sustainability (S) at the levels moderate (m) and sustainable (s) respectively, the chi-square statistic is given by a random variable (X^2), which is defined by the following equation.

$$X^2 = \Sigma \left[(O_{m,s} - E_{m,j})^2 / E_{m,s} \right]$$

Where, $O_{m,s}$ is the observed frequency count at level *m* of variable CP and level *s* of variable S,

$E_{m,s}$ is the expected frequency count at level *m* of variable CP and level *s* of variable S.

The expected frequency counts (E_{ms}) were computed separately using the following formula.

$$E_{m,s} = (n_m * n_s) / n$$

Where, $E_{m,s}$ is the expected frequency count for level *m* of Variable CP and level *s* of Variable S,

n_k is the total number of sample observations at level *m* of Variable CP,

n_s is the total number of sample observations at level *s* of Variable S,

n is the total sample size.

The χ^2 statistic has approximately a chi-squared distribution, for large sample. For m rows and n columns, the degrees of freedom (df) is given by $(m-1)(n-1)$.

Once the analysis was run, the results were interpreted by comparing the P-value of the chi-square test statistic to the level of significance that was set at 0.05. The null hypothesis was rejected when the P-value was less than the level of significance.

3.7.2.2 Binary Logistic Regression model

In binary logistic regression, the dependent variable (y) takes a value of either 0 or 1.

3.7.2.2.1 Simple Logistic Regression model

An assessment of the influence of the different strength levels of the independent variables singly on the dependent variable was performed using a simple binary logistic regression test method. The analysis involved assessing the unadjusted association of every single independent variable to the dependent variable at 95% confidence level and 5% level of significance. Rencher and Schalje (2008) recommends logistic regression for data where the dependent variable is binary and the independent variables are either continuous/ discrete or categorical, and the researcher is interested in assessing the association that may exist. These conditions were applicable in this analysis making the technique a suitable choice.

In a simple logistic regression model, for a response binary variable Y, there is a single explanatory variable X, which is quantitative.

$$y_i = \beta_0 + \beta_1 x_i + \epsilon_i, \qquad y_i = 0,1; i = 1,2, \dots, n$$

Since y_i is 0 or 1, the mean $E(y_i)$ for each x_i becomes the proportion of observation at x_i for which $y_i = 1$. This give:

$$E(y_i) = \pi(x) = \beta_0 + \beta_1 x_i$$

Where the variance of y_i is given $E[y_i - E(y_i)]^2$ and depends on the value of x_i and $E(y_i) = \pi(x)$ is a probability and is limited linearly by $0 \leq \pi(x) \leq 1$. When the equation $E(y_i) = \pi(x) = \beta_0 + \beta_1 x_i$ is fitted by least squares, we obtain $\hat{p} = \hat{\beta}_0 + \hat{\beta}_1 x_i$, where $\hat{p}$ may be less than 0 or greater than 1 for some values of x_i. To convert it to binary where $E(y_i)$ is bounded between 0 and 1 asymptotically (instead of linearly), we use the expression below (Rencher and Schalje, 2008).

$$\pi(x) = \frac{\exp(\beta_0 + \beta_{1x_i})}{1 + \exp(\beta_0 + \beta_1 x_i)} = \frac{1}{1 + \exp[-(\beta_0 + \beta_1 x_i)]}$$

In this formula, $\pi(x)$ increases or decreases as an S-shaped function of x. When this is linearized by logit transformation, we obtain the simple binary logistic regression model where β_0 and β_1 are the intercept and the regression coefficient

$$\text{logit}\,[\pi(x)] = \ln\left\{\frac{\pi(x)}{1-\pi(x)}\right\} = \beta_0 + \beta_1 x_i$$

The parameters β_0 and β_1 are typically estimated by the method of maximum likelihood. The likelihood function is given as:

$$L(\beta_0,\beta_1) = \prod_{i=1}^{n} P_i^{y_i}(1-P_i)^{1-y_i}$$

The results of the test are given by the Likelihood Ratio test values. Test statistic has asymptotic chi-square distribution with k degrees of freedom. It is given by:

$$\chi^2 = -2[\log(\ell_0) - \log(\ell_1)]$$

Then

$$\text{df} = \dim(\Omega_1) - \dim(\Omega_0)$$

It has an approximate chi-square distribution with k degrees of freedom when $\log(\ell_0)$ and $\log(\ell_1)$ from two nested models differ only by chance. The degrees of freedom (df) k is the difference between the number of parameters estimated to calculate each log-likelihood value

In this study, the model was used to analyse the influence of different strength levels of a single independent variable on the dependent variable. The model used was given by:

$$\log\left\{\frac{\pi(x)}{1-\pi(x)}\right\} = \beta_0 + \beta_1 x_{i1}, \qquad y_i = 0,1; i = 1$$

where : β_0 is the intercept

$\beta_1, \beta_2 \ldots$ are the regression coefficients.

x_{i1} is the specific independent variable

The regression coefficients β_i estimated the magnitude of each independent and dependent variable relationship. The exponential of the regression coefficients gave the associated odds ratios e^{β_i}.

Inference for simple binary logistic regression

For significance of a simple Binary logistic regression model involving a single independent variable, we tested the hypothesis expressed as:

$$H_0: \beta_1 = 0 \text{ against } H_1: \beta_1 \neq 0$$

In this study, the model was used to test the unadjusted effect of a single independent variables on the dependent variable. The test statistic was conducted at 95% confidence level and 5% level of significance. The resultant *p* value was compared to 0.05 level of significance. Whenever the *p* value was less than 0.05, the test was significant and suggested that the independent variable contributed significantly to the prediction of the outcome.

3.7.2.2.2 Multiple Binary Logistic Regression Model

This model was used to test hypothesis H_V. The purpose was to assess the moderation effect of community ownership on the relationship between community intervention strategies and sustainability of projects. For purposes of the analysis, the dependent variable data was presented in binary form- sustainable and unsustainable while the independent variables were in categorical form in the classes of weak, moderate and strong. This classification met the conditions recommended by Rencher and Schalje (2008) for the application of multiple binary logistic regression model. The first part of the analysis involved the determination of the simultaneous effect of all the independent variables, adjusted for confounding factors, on the dependent variable at 95% confidence level and 5% level of significance. The second part assessed the interaction effect of the independent variables on the dependent variable. A final binary logistic regression model was then

developed that was used to analyse the moderation effect of community ownership on the relationship between the independent variables and the dependent variables at 95% confidence level and 5% level of significance

A multiple binary logistic model is represented as:

$$\log\left\{\frac{\pi(x)}{1-\pi(x)}\right\} = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik}, \qquad y_i = 0,1; i = 1,2, \ldots, n$$

Where, $x_1, x_2, \ldots, x_k$ are the multiple independent variables

In this study, the model was given by:

$$\log\left\{\frac{\pi(x)}{1-\pi(x)}\right\} = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_5 x_{i5}, \qquad y_i = 0,1; i = 1,2, \ldots, 5$$

where :

β_0	is the intercept
$\beta_1, \beta_2 \ldots$	are the regression coefficients.
x_{i1}	community participation
x_{i2}	community empowerment
x_{i3}	community capacity building
x_{i4}	conflict management
x_{i5}	community ownership

The regression coefficients β_i estimated the magnitude of each independent and dependent variable relationship after adjusting for all other independent variables in the model. The exponential of the regression coefficients gave the associated adjusted odds ratios e^{β_i}. The parameters in the model were estimated by the method of maximum likelihood.

Inference for multiple binary logistic regression

For significance of the overall multiple logistic regression model, the following hypothesis is tested:

$$H_0: \beta_1 = \beta_2 = \cdots = \beta_k = 0 \text{ against } H_1: \beta_j \neq 0, \text{ for at least one } j, j = 1,2, \ldots, k$$

Two likelihood-based statistics, likelihood ratio test and Wald's test, each having asymptotic chi-square distribution with k degrees of freedom are used to test the hypothesis. The likelihood ratio test (LRT) compares the maximized log-likelihood of the full model ℓ_1(i.e. with all predictors included) to the maximized log-likelihood of the null model ℓ_0(a model with only the intercept).

The likelihood ratio test statistic is given by:

$$-2\log\left(\frac{L_0}{L_1}\right) = -2[\log(\ell_0) - \log(\ell_1)] = -2(\ell_0 - \ell_1)$$

Then

$$\mathrm{df} = \dim(\Omega) - \dim(\Omega_0)$$

The test statistic has an approximate χ^2 distribution with k degrees of freedom (where k is the number of predictors in the full model). If significant, it suggests that taken together, the predictors contribute significantly to the prediction of the outcome. Analysis of deviance is to compare the logistic regression models M_0 and M_1, such that M_0 is a special case of M_1. Given that the more complex model (M_1) holds, the likelihood ratio test statistic for testing that the simpler model (M_0) holds is:

$$-2(\ell_0 - \ell_1) = \mathrm{Deviance}_0 - \mathrm{Deviance}_1$$

where ℓ_0 and ℓ_1 refer to the log-likelihood of simpler and complex models respectively. The models is then compared by comparing their deviances. This is an approximate chi-squared statistic with degrees of freedom given by the number of extra parameters in the complex model. A large test statistic and small P value indicate that simpler model fits poorly than complex one.

The Wald's test statistic is expressed as :

$$\chi^2 = \hat{\beta}'\left[\text{var}(\hat{\beta})\right]^{-1}\hat{\beta}$$

This has also a chi-square distribution with k degrees freedom as for the LRT.

In this study, the model was used to test simultaneous effect of the independent variables on the dependent variable, adjusting for confounding factors. The test statistic was conducted at 95% confidence level and 5% level of significance. The resultant *p* value was compared to 0.05 level of significant. Whenever the *p* value was less than 0.05, the test was significant and suggested that the independent variables contributed significantly to the prediction of the outcome after adjusting for confounding factors. For all significant test results, the odds ratios (e^{β_i}) for the different levels of the independent variables were determined. The odds ratios measured the effect of higher strength levels of an independent variable when compared to its weak strength level on the dependent variable. The weak strength level was used as the control group.

3.7.3 Qualitative Data Analysis

The study adopted an inductive approach to data analysis where the actual data was used to derive the structure of analysis without following a pre-determined framework. However, the FGD guide was pre-organized by overall theme and information sought in-order to make it easier to review individual responses to a topic and specific questions therein and subsequently pick out emerging concepts and ideas. Data was processed manually using a thematic content analysis method that followed a focus by question approach. The approach reviewed the groups' responses to individual questions in the interview guide and identify themes, consistencies and differences. The responses were subsequently put together and parallels drawn. Analysis allowed themes and categories to emerge from the data, and were constantly adjusted as new categories emerged.

Data analysis proceeded primarily by transcribing the interviews from tape to paper, and reviewing the written transcript for completeness. During transcription and translation, care was taken to retain the grammar as was used (verbatim) without modification. This was to enable the translations to be as close to the original speech patterns as possible and provide the best reflection of the original conversation. Each of the transcribed data was worked through and notes made in the script margins of words and short phrases that summed up what was said in the text. This created the initial open coding framework. The words and

phrases from all of the scripts were collected together onto clean set of pages and worked through to remove duplications and overlapping and subsequently summarized into categories. The categories were further refined and reduced by collapsing them together to form a final category system of seven categories. The seven categories were finally used to divide up all the interviews. Each category was allocated an identity coloured pen. Each transcript was then worked through, responses for every question reviewed and key or frequently used words identified and highlighted using highlighter.

The process involved assessing adequacy, credibility, usefulness and consistency of information, and establishing relationships and patterns. The themes/ ideas that came from the responses including the stories narrated by the respondents were picked-up and those fitting under a particular category encircled with its corresponding colour. Completed data analysis was subjected to verification and validation by supervisors to eliminate possible researcher biases and improve theme development. Ultimately, all sections of the data bearing a particular colour and falling under a particular category were cut out and pasted on an A4 sheet. The pastings were tabulated to form the final coding framework (Appendix IV) from which qualitative study findings were interpreted. The qualitative findings were reported verbatim under every theme corresponding to a specific objective. In this document, the findings are fused with quantitative data for detail understanding of data and interpretation. The results of the analyses for both qualitative and quantitative data are reported for every study objective.

3.8 Ethical Consideration

The research was handled in a professional way and all relevant ethical issues were considered in an effort to uphold integrity and protect the interest of the respondents. At the onset, the consent of respondents was sought. They were made to understand that their participation in the research was purely voluntary. No influence whatsoever was used to solicit this consent. The research was done with utmost confidentiality. Information obtained from respondents was used only for academic purposes. At all times anonymity was maintained and respondents identity was kept secret in the entire report. Care was taken to ensure that items in data collecting instruments were sensitive to the psychological well being of respondents. Embarrassing or threatening items in data collection instrument or statement that could elicit negative emotions were avoided during data collection. Lastly, the research was conducted with utmost honesty within the confines of the law.

3.9 Operationalisation of the Variable

Table 3.6 presents the operational definition of variables that include their respective indicators, data collecting instruments, scales of measurement and data analysis

Table 3.6: Operationalisation of the Variables

Objectives	Variables	Indicators	Data Collecting Instruments	Scale of measurement	Research Approach	Types of data analysis	Method of analysis
	Sustainability of community WASH projects	1. Effectiveness in Project management 2. Level of community support to the project 3. Adequacy of resources for operation and maintenance	Questionnaire Interview guide	Interval	Mixed methods	Parametric	Binary Logistic Regression Chi square test for independence Thematic content analysis
1.0 To examine the extent to which community participation strategy influences sustainability of WASH projects	Community participation	1. Level of participation in choosing project leadership 2. Availability of platforms for decision making 3. Level of community consultation/information provision 4. Level of engagement of community promoters 5. Willingness by	Questionnaire Interview guide	Interval	Mixed methods	Parametric	Chi Square test for independence Binary Logistic regression Thematic content analysis

			community to engage in project activities					
2.0	To assess the extent to which community capacity building strategy influences sustainability of WASH projects	Community capacity building	1. Existence and effectiveness of project promoters 2. Adequacy of training in operation and maintenance (O&M) and follow-ups 3. Adequacy and relevance of project information 4. Availability of local skills on project maintenance 5. Adequacy of training on project structures' establishment	Questionnaire Interview Schedule	Interval	Mixed methods	Parametric	Chi Square test for independence Binary Logistic regression Thematic content analysis
3.0	To examine the extent to which community empowerment strategy influences sustainability of WASH projects	Community empowerment	1. Level of awareness of project progress and challenges 2. Capacity to find solutions 3. Capacity to make and cause implementation of decisions 4. Authority to elect and replace project leadership 5. Ability to ensure accountability for project operations	Questionnaire Interview Schedule	Interval	Mixed methods	Parametric	Chi Square test for independence Binary Logistic regression Thematic content analysis

4.0	To establish how conflict management strategy influences sustainability of WASH projects	Community Conflict management	1. Existences and operationalisation of Conflict Management Structures (CMS) 2. Effectiveness of the CMS 3. Capacity to manage conflicts within the projects 4. Adequacy of decision making processes in the project	Questionnaire Interview Schedule	Interval	Mixed methods	Parametric	Chi Square test for independence Binary Logistic regression Thematic content analysis
5.0	To determine the extent to which community ownership influences the relationship between the community intervention strategies and sustainability of WASH projects	Community Ownership	1. Level of knowledge and acceptance of the project by the community 2. Level of community support to the project 3. Level of commitment to project activities 4. Level of satisfaction with project benefits 5. Level of significance of project to communities	Questionnaire Interview Schedule	Interval	Mixed methods	Parametric	Chi Square test for independence Binary Logistic regression Thematic content analysis

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents analysis of the questionnaire return rate and profile of the respondents in terms of distribution of respondents by type of project, relationship of respondents to the projects, level of priority of the projects to the respondents and reasons for respondents involvement in the projects. It also presents analysis of the period of the projects' complete reliance on internal funding, test for multicollinearity and analysis of Likert-scale data. The main study findings are organized in subsections presented under each study objective. The subsections are sustainability of WASH projects, community participation and sustainability of WASH projects, community capacity building and sustainability of WASH projects, community empowerment and sustainability of WASH projects, community conflict management and sustainability of WASH projects and community ownership and sustainability of WASH projects.

4.2 Questionnaire Return Rate

A sample size of 384 homesteads were selected from a population of 148494 households in the study area as recommended by Krejcie and Morgan (1970) for such population sizes at 95% confidence level and 5% margin of error. The study administered 384 questionnaires on a face – to- face administration to the heads of the households, alternative heads or in their absence adult persons above 18 years in a household who had lived in the household for the past 6 months, in an effort to achieve higher response rates. Questionnaire administration covered a period of three months and was carried out by six research assistants. As a result, 100% questionnaire return rate was achieved. It is widely held by researchers that the best way to obtain unbiased survey estimates is to achieve a high response rate (Dillman, 2000; Heberlein & Baumgartner, 1978). A 100% response rate would thus provide the best reliable survey estimates. Further, 15 focus group discussions were held. The focus groups comprised members and beneficiaries of 15 sampled WASH projects drawn from a population of 50 WASH projects in the study area.

4.3 Tests for Statistical Assumptions and Analysis of Likert-Type Data

This section explores the significance of multicollinearity in regression analysis, the different methods of remedying multicollinearity situations and test results for multicollinearity analysis. The section further discusses the use of likert scale in data analysis.

4.3.1. Test for Multicollinearity

Collinearity refers to a situation where at least two independent variables in a statistical model are linearly related such that the correlation coefficient (r) is either greater or less that zero (Alin, 2010). This signifies the non independence of predictor variables, especially in regression type analysis. Multicollinearity, however, exists when two or more independent variables are inter-correlated. In all studies, with an exception of certain designed experiments, collinearity or multicollinearity will always be present. What is of concern to researchers therefore is not its presence but the impact it has on the analysis (Baguley, 2012). Pedace (2013) observes that multicollinearity has significant impact only when the correlation coefficient of the interacting independent variables is equal to or greater than 0.7. Whereas multicollinearity has no impact on the overall regression model and associated statistics such as R^2 and p values, or the general predictions made using the overall model, it is a problem if a researcher is interested in assessing the effects of individual independent variables on the dependent variable when performing multiple regression, unless their degree is small or the sample size is very large (Gujarati and Porter, 2009; Baguley, 2012).

When high multicollinearity occurs, the independent variables tend to share substantial amounts of information and compete to explain a similar variance making it difficult to assess the effect of an individual variable on the dependent variable (Kutner *et al.,* 2005, Meloun *et al*. 2002). Additionally, extrapolation is likely to be erroneous since the parameter estimates may be unstable and standard errors on estimates inflated leading to inaccurate tests of significance for the independent variables and biased inference statistics (Ohlemuller *et al*., 2008; Wheeler 2007). However, this may be remedied by either d*ropping one of the collinear variable (*Gujarati and Porter, 2009), *combining or transforming the* highly correlated independent variables into a single variable (Allison, 1999) or removing multicollinearity source variables (Zainodin *et al.,* 2011). It may also be overcome by detecting, quantifying and adjusting the regression coefficients for the effects of multicollinearity in a data base using principal components analysis (PCA) technique (Lafi

and Kaneene, 1992) or by modifying the method of least squares to allow biased estimators of the regression coefficients to remedy the multicollinearity problem using ridge regression technique (Kutner *et al.* 2005).

Unless remedied, most statistical programmes will estimate the effect of an individual independent variable by holding the other correlated variable constant, ignoring the shared variance between them. This effectively reduces the variability of the independent variable of interest and its influence, the effective amount of information available to assess the unique effects of the variable, the effective sample size for the effects of individual independent variables and the statistical power for estimating the individual independent variable (Baguley, 2012). A small effective sample size tend to be less similar to the population than a large sample size leading to problems of stability of estimates (Baguley, 2012). In this study, pair-wise collinearity of the independent variables was performed and the resultant correlation matrix is presented on Table 4.1.

Table 4.1: Multicollinearity Matrix of Independent Variables

	Community Participation	**Community Capacity building**	**Community empowerment**	**Community Conflict management**	**Community ownership**
Community Participation	1.0000000	0.3049805	0.3658484	0.3475753	0.2807753
Community Capacity building	0.3049805	1.0000000	0.4532048	0.4209718	0.1225572
Community empowerment	0.3658484	0.4532048	1.0000000	0.4214226	0.3651549
Community Conflict management	0.3475753	0.4209718	0.4214226	1.0000000	0.3710128
Community ownership	0.2807753	0.1225572	0.3651549	0.3710128	1.0000000

Table 4.1 shows that when community participation was correlated with community capacity building it yielded 0.30, it produced 0.37 with community empowerment, 0.35 with community conflict management and 0.28 with community ownership. Similarly, the

correlation between community capacity building and community empowerment yielded 0.45, produced 0.42 with community conflict management and 0.12 with community ownership. Community empowerment and community conflict management produced 0.42, 0.37 with community ownership while the correlation between community conflict management and community ownership was 0.37. All the correlations were below 0.7, the lower limit for significant multicollinearity of independent variables (Pedace, 2013), it indicated that the independent variables shared no significant amount of information that would make them compete to explain a variance in the dependent variable. It was thus possible to assess the influence of each independent variable on the dependent variable (sustainability of WASH projects) without the risk of factoring in shared variance between the independent variables. The research concluded that the independent variables were independent of each other and appropriate for entry in the regression analysis model.

4.3.2 Analysis of Likert-Scale Data

The study used a survey to collect quantitative data. The questionnaire was designed in a Likert format and contained 60 likert items organized into groups of 10 (Frauke et al., 2008), each addressing one of the six variables under study. Each Likert item generated a response from an ordinal 5-point Likert response categories; Strongly Disagree = 1, Disagree = 2, neutral = 3, Agree = 4 and Strongly Agree = 5. For each variable, a composite score was generated by summing up the scores of the 10 Likert items extricating a particular variable to create an interval Likert scale (Cariffio and Perla, 2008, 2007; Maurer and Pierce, 1998) with a lowest score of 10 and a maximum of 50. These scores were subsequently categorised into three strength groups of weak, moderate and strong. The categories were created by summing the scores for the categories Strongly Disagree and Disagree to a new category Weak, Neutral category to a new category Moderate and categories Strongly Agree and Agree to a new category Strong.

The combinations were made with slight adjustments to ensure that each category had sufficient data (cases) to enable applicable of the logistic regression model. The new categories had the following range of score: Weak (10-25), Moderate (26-35), Strong (36-50). For the dependent variable, sustainability, a binary category was created: Non sustainable (10-32) and Sustainable (33-50). This data was then subjected to parametric tests such as the chi-square test and binary logistic regression. As Cariffio and Perla (2008) and Creswell (2008) pointed out, parametric tests can be performed on summed up scores of Likert scale data (that assumes interval scale) provided that the data is of appropriate shape

and size and multiple categories are developed within a scale with equality of variance. Norman (2010) while agreeing with them on the application of the methods on Likert data, demonstrated that sample sizes, normality and ordinal- level measurement could not hinder the use of parametric methods due to their robustness. He concluded that the methods could be used without the fear of coming to the wrong conclusion.

4.4 Profile of the Respondents

This section profile the respondents in terms of their distribution by type of WASH project, relationship to the project, rating of projects in terms of priority and motivation for initial engagement in the projects. The projects were further profiled in terms of period of sole reliance on internally generated funds for operation and maintenance.

4.4.1 Distribution of Respondents by Type of Project

The study sought for information on the distribution of respondents by type of government or donor funded WASH projects in the locality. The purpose was to assess the respondents' perception of the level of sustainability of the various types of projects in order to establish the type of projects that were more sustainable the areas. Respondents were asked to indicate the type of the project they were involved in by checking on the options provided. The responses are presented in Table 4.2

Table 4.2: Distribution of Respondents by Type of Project

Type	Frequency	Percentage
Water pan/Dam	69	18.0
Borehole/ hand dug	276	71.9
Spring	39	10.2
Total	**384**	**100.0**

The results in table 4.2 show that 69 respondents representing 18.0% of sample population were involved in Water pan/ dam projects, 276 (71.9%) were engaged in Borehole/ hand dug wells projects while 39 (10.2%) were involved in spring projects. This shows that majority of the respondents were beneficiaries of boreholes and hand dug wells' projects and had, therefore, greater access to improved water as borehole water is considered safer than water from springs and water pans/dams which are more vulnerable to surface contamination. However, boreholes had greater challenges of operation and maintenance

when compared to springs and water pans/dams. Focus group discussions established that boreholes used pumping machines that consumed a lot of power and generated high electricity bills that were always a challenge to service from the merger projects resources. The pumps also required regular maintenance and repair. This was articulated by a respondent from Rabuor water project who said "*..the project cannot raise enough resources to meet operation and maintenance cost. Electricity bill and repair cost for pumps are very high…*".

Besides being expensive, the spare parts were not readily available in the villages or local towns and often required sourcing from Nairobi city, over 350 km away, straining project resources in term of spare parts cost, transport, meals and accommodation for the purchasing official(s). This was presented by a respondent from Gorogoro women group who remarked "*…the equipment sometimes break down and spare parts are not available here. We are required to travel to Kisumu or even Nairobi city for the spare parts and this is very expensive..*" Borehole equipment repairs also required expert service that was not available in the villages and whenever an expert was sourced, service fee was usually high. This was articulated by a respondent from Rabour water project who retorted "*..when we bring technicians to repair the pump, they charge us and it is not cheap. There was a time we were not able to raise the money..*"

Perceived sustainability of WASH projects was then cross tabulated with the type of project. The purpose was to establish if there existed a relationship between perceived sustainability and the type of WASH projects that were implemented. The results of the cross tabulation are presented in Table 4.3.

Table 4.3: Perceived Sustainability Against Type of WASH Project

Type	**Sustainable**		**Unsustainable**		**Total**
	Frequency	**Percentage**	**Frequency**	**Percentage**	
Water pan/Dam	28	40.6	41	59.4	69
Borehole/ hand dug wells	197	71.4	79	28.6	276
Spring	0	0	39	100.0	39
Total	**225**		**159**		**384**

The results in Table 4.3 show that none (0%) of the 39 respondents considered spring projects sustainable, only 28 (40.6%) considered water pan/Dam projects sustainable while

a majority 197 (71.4%) felt that borehole/ hand dug wells projects were sustainable. Respondents perceived boreholes and wells as more sustainable than water pans and dams while springs were deemed unsustainable. This was despite boreholes requiring regular and expensive maintenance in terms of spare parts, servicing of electricity bills and hire of expert technicians. Focus group discussion findings revealed that springs were considered natural sources that had existed over the years with minimal management requirement. Little investment were subsequently made to protect the springs and the communities were hardly sensitize on the new management requirements.

As a result, communities continued to view them as natural water sources 'free for all' subjecting them to mismanagement. In contrast, boreholes were considered more technical projects and the initiators ensured that the completed projects were handed over to the communities through established management committees. Some level of effort was also made across all projects to build the capacities of the management committees in the projects' management. The level of effort was less for water pans/ dams projects and much less for spring projects and this is likely to have contributed to the observed low sustainability probabilities for water pans/ dams and spring projects.

4.4.2 Relationship of Respondent to the Project

The study sought information on the relationship of respondents to the WASH projects they were involved in. It sought to establish if respondents were officials, ordinary members or merely beneficiaries of the projects. This information was relevant in assessing how respondents' relationship with the projects influenced their perception of projects' sustainability. Respondents were asked to indicate their relationship to the projects by selecting among the options provided. The results of the analysis are presented in Table 4.4

Table 4.4 Relationship of Respondent to the Project

Relationship	Frequency	Percentage
Chairman	4	1.0
Vice chairman	2	0.5
Secretary	6	1.6
Vice secretary	1	0.3
Treasurer	2	0.5
Ordinary Member	116	30.2
Beneficiary	253	65.9
Total	**384**	**100**

The results in Table 4.4 show that 15 (3.9%) respondents were officials of the projects. 4 (1.0%) were chairmen, 2 (0.5%) were vice chairmen, 6 (1.5%) were secretaries, 1 (0.3%) was vice secretary and 2 (0.5 %) were treasurers. In addition, 116 (30.2%) respondents were ordinary members of the projects while 253 (65.9%) were project beneficiaries. Since majority of the respondents were project beneficiaries and ordinary project members 369 (96.1%), it indicated that the overall respondents' perception on sustainability of the projects was uninfluenced by the official project responsibilities.

Respondents' relationship with the project was subsequently cross tabulated with their perception of projects' sustainability to assess if an individual position in the project influenced his judgment on sustainability of the project. The results are presented in Table 4.5

Table 4.5: Respondents' Perception of Projects' Sustainability Against Position Held in the Project

Position	**Sustainable**		**Unsustainable**		**Total**
	Frequency	**Percentage**	**Frequency**	**Percentage**	
Project Officials	7	46.7	8	53.3	23
Ordinary project members	78	67.2	38	32.8	116
Project beneficiaries	140	55.3	113	44.7	253
Total	**225**		**159**		**384**

Table 4.5 shows that 7 (46.7%) project officials considered their projects sustainable as was 78 (67.2) ordinary members and 140 (55.3%) project beneficiaries. The findings show that ordinary projects members were the most positive about the projects' sustainability followed by project beneficiaries. Ironically, project officials who were charged with managing the projects were the least positive about their sustainability. Focus group discussion findings revealed that there were some level of dissatisfaction among officials with the manner in which the projects were managed and at times personal differences within the management team. Indeed, an official from Alendu water project retorted *"..chairman acts like the committee often making decisions without seeking consensus .."* Similar sentiments were expressed by an official from Kadongo water pan who remarked *"…the committee has no cohesion. In fact, most members lack the requisite skills to execute their roles.."* This kind of dissatisfaction with the management of the projects and competence of project officials by their own colleagues could have contributed to the observed low confidence among officials on projects' sustainability. This shows that projects officials

were privy to certain information that was not available to either ordinary members of the projects or project beneficiaries but which was a threat to the long term sustainability of the projects

4.3.3 Rating of WASH Projects in Order of Respondents' Priority

Data was sought on the respondents' rating of WASH projects in terms of priority. The purpose was to assess if projects' level of rating influenced respondents' perception of their sustainability. Respondents were asked to rate the projects against a 4-point scale; not a priority, low priority, moderate priority and high priority. The results of the analysis are presented in Table 4.6

Table 4.6: Rating of WASH Projects in Order of Priority

Level of priority	Frequency	Percentage
High priority	305	79.4
Medium Priority	65	16.9
Low priority	8	2.1
Not a priority	6	1.6
Total	**384**	**100**

The results in Table 4.6 show that 305 (79.4%) respondents considered WASH projects a high priority, 65 (15.4%) felt they were of moderate priority, 8 (2.1%) rated them as low priority while 6 (1.6%) felt they were not a priority to them and the community. The findings show that WASH projects were, indeed, high priority projects in the communities within which they are implemented. This finding confirms previous studies that have shown that, among rural communities, WASH projects are ranked top in the order of the communities priorities and are seen as offering the greatest potential to improving the peoples' lives among other developmental projects (McPeak *et al., 2009).* As priority projects, it was expected that the communities would endeavour to sustain them as they were a lifeline. Focus group discussion findings established that these projects, being of high priority, attracted active involvement and support of the communities at initiation and early development stages. However, subsequent communities engagement in the projects depended on the prevailing operational circumstances of individual projects.

Further, projects' rating in order of priority was cross tabulated with the respondents' perception of the projects' sustainability. The purpose was to establish if there was a

relationship between the importance attached to WASH projects by the respondents and their perceived sustainability. The results are presented in Table 4.7.

Table 4.7: Perceived Sustainability against Projects' priority rating

Level of Priority	Sustainable		Unsustainable		Total
	Frequency	Percentage	Frequency	Percentage	
High priority	187	48.7	118	30.7	305
Medium Priority	35	9.1	30	7.8	65
Low Priority	3	0.8	5	1.3	8
Not Priority	2	0.5	4	1.0	6
Total	**225**		**159**		**384**

In Table 4.7, it is evident that project viewed as of high priority were also considered to be sustainable by 187 (48.7%) respondents. Those considered to be of medium priority were viewed as sustainable by 35 (9.1%) respondents. Low priority projects were considered sustainable by 3 (0.8%) respondents while projects that were seen as non priority were considered sustainable by only 2 (0.5%) respondents. The results show that projects that were considered high priority were also seen as sustainable by a majority of respondents. These percentages decreased with a decrease in projects rating in order of priority. FDG revealed that the communities endeavoured more to sustain the projects that were key priority to them as evident from a respondent from Obambo women group who made the following remark "..the community are very supportive. They pay water bills wells. In fact when there was a major breakdown and we lacked the funds, the community organised an harambee..".

4.4.4 Respondents Motivation for Engagement in WASH Projects

Data was also sought on the respondents' initial motivation for joining and engaging in the activities of the WASH projects. The purpose was to assess how different motivational factors affected respondents' perception of the sustainability of the projects. Respondents were asked to indicate the reasons that attracted them to the project by choosing from the options that were offered. The results of the analysis are presented in Table 4.8

Table 4.8: Respondents Motivation for Engaging in WASH Projects

Motivation	Frequency	Percentage
My groups' project	23	6.0
Promotional effort by government/donors	96	25.0
My own interest	200	52.1
Influence from friends/ relatives	13	3.4
Perceived benefits	52	13.5
Total	**384**	**100.0**

Table 4.8 shows that 23 respondents representing 6.0% of sample population were involved in the projects by default, being members of the institutions that were implementing the projects, 96 (25.0%) were attracted by promotional efforts by project initiators (the government and donors) while 200 (52.1%) respondents were involved out of personal interest. Another 13 (3.4%) respondents were involved due to influence from friends and relatives while 52 (13.5%) were attracted by perceived project benefits, which they explained as expected access to good quality water. The findings show that a majority 252 (65.6%) respondents joined the projects out of personal interest and perceived benefits. 23 (6.0%) participated as a condition of the projects' implementing institutions while only 109 (28.4%) were externally influenced by relatives and promotional activities of donors. This shows that a majority of respondents had from own interest willingly joined the projects and were therefore expected to put more effort in sustaining the projects activities. Promotional activities accounted for only 28.4% involvement in projects indicating that such efforts had less effect in influencing and sustaining community interest in the projects and required redesigning going into the future.

Further, respondent's motivation for initial engagement with WASH projects was cross tabulated with their perception of the projects' sustainability. The purpose was to assess if the type of motivation to initially participate in the projects influenced respondents perceived sustainability of the projects. The results are presented in Table 4.9

Table 4.9: Perceived Sustainability of Projects Against Motivation for Initial engagement in the projects

Motivation	Sustainable		Unsustainable		Total
	Frequency	%	Frequency	%	
A project of my group	10	2.6	13	3.4	23
Promotion by government/ donor	51	13.3	45	11.7	96
My own interest	110	28.6	90	23.4	200
Influence from friends/ relatives	6	1.6	7	1.8	13
Perceived Benefits	33	8.6	19	4.9	52
Total	**225**		**159**		**384**

The results in Table 4.9 show that of the respondents who joined the projects because their organisations were implementing institutions, 10 (2.6%) felt that the projects were sustainable. Similarly, those respondents who engaged in the projects' initial activities out of influence from friends and relatives, 6 (1.6%) considered them sustainable. However, of those who joined the projects out of promotional activities by the initiators, 51 (13.3%) considered the projects sustainable, those who joined out of own interest, 110 (28.6%) felt they were sustainable while those who considered expected benefits, 33 (8.6%) felt the projects were sustainable. The findings indicate that respondents who joined the projects willingly motivated by perceived project benefits, own interest or promotional activities by project initiators were more positive about the projects sustainability than those who were influenced by friends and relatives, and group responsibilities.

This implies that voluntary participation in project activities motivated by expected gain had a better chance of sustaining projects than less voluntary and peer influenced community engagement that lacked motivation by expected personal gain. These observations confirm findings of previous studies that linked initial community involvement and continued participation in projects to perceived project benefits (Maraga *et al*., 2010, Pollnac and Porneroy, 2005; Victor and Bakare, 2004 and Maskey et al., 2003). Maraga et al.(2010) observed that not only was the relationship between community participation and the expected benefits significant (X^2_ 0.05 = 0.000), it was also strong and positive (X2 measure of association = 0.628). Pollnac and Porneroy (2005) observed further that perception of benefits and actual initial benefits influenced early involvement of the communities in coastal projects and this participation was sustained as benefits were continuously realised.

4.4.5 Period of Project's Reliance on Internal Funding

Data was sought on the period the projects have been in existence since external funding ceased. The purpose was to assess the length of time the projects have sorely depended on internally generated funds for operation and maintenance in order to facilitate predicting of the projects sustainability probabilities under their operating environment. Respondents were asked to state the source of their projects' funds for operation and maintenance by checking the options privided. The results of the analysis are presented in Table 4.10

Table 4.10 Source of Funding for Projects' Operation and Maintenance

Source	Frequency	Percentage
External	0	0.0
Internal	301	78.4
Don't Know	83	21.6
Total	**384**	**100.0**

Table 4.10 shows that none of the respondents indicated that their projects received external funding for operation and maintenance. Another 83 (21.6) were not aware if external funds were in use while 301 (78.4%) were confident that no external funds were in use for operation and maintenance. Respondents who indicated that their projects had received no external funding were subsequently asked to state the duration the projects have been in operation since receiving the last external funding. The results of the analysis are presented on Table 4.11

Table 4.11: Duration Since Phase Out of External Funding for Operations and Maintenance

Duration	Frequency	Percentage
Less than one year	42	13.8
Less than two years	17	5.7
Less than five years	21	7.0
More than five years	214	71.1
Not sure	7	2.3
Total	**301**	**100.0**

Table 4.11 shows that 214 (71.1%) respondents were in agreement that the projects had existed for more than five years after the last external funding and was relying solely on internal funding for operation and maintenance. Another 21 (7.0%) reported that the projects had lasted less than 5 years while 17 (5.7 %) reported less than 2 years. An additional 42 (13.8%) reported less than one year while 7 (2.3%) were not sure of the period the projects had relied sorely on internal funding. Since a majority of respondents 294 (97.7%) confirmed that the projects were relying on internal funding for operation and maintenance, it signified that the long term sustainability of the projects depended largely on, among other factors, their ability to generate internal funding for operation and maintenance. Sustainability of the projects was subsequently cross tabulated with the duration the projects were in operation while depending sorely in internally generated funds. The purpose was to assess if a relationship existed between the duration of existence and sustainability of the projects. The results of the cross tabulation are presented in Table 4.12

Table 4.12: Perceived Sustainability against Duration of Projects' Dependency on Internally Generated Funds

Duration	Sustainable		Unsustainable		Total
	Frequency	%	Frequency	%	
Less than 1 year	7	1.8	35	9.1	42
Less than 2 years	9	2.3	8	2.1	17
Less than 5 years	13	3.4	8	2.1	21
More than 5 years	144	37.5	70	18.2	214
Not sure	2	0.5	5	1.3	7
Total	**175**		**126**		**301**

The results in table 4.12 show that only 7 (1.8%) respondents considered projects that had existed for less than one year on internally generated funds as sustainable when compared to 35 (9.1%) that that felt they were unsustainable. Similarly, 9 (2.3%) respondents considered the projects that had existed for less than 2 years as sustainable against 8 (2.1%) that considered them unsustainable. Another 13 (3.4%) respondents believed that the projects that had existed for less than 5 years were sustainable as compared to 8 (2.1%) that considered them unsustainable. An additional 144 (37.5%) respondents believed that projects that had relied on internally generated funds for more than 5 years were sustainable as opposed to 70 (18.2%) who felt they were unsustainable. It is evident therefore that majority

of respondents perceived projects that had existed for less than 1 year on internally generated funds as more unsustainable than sustainable.

This perception changed for projects that had existed for more than one year as more respondents considered them sustainable than unsustainable. The perception of sustainability improved as the number of years increased from 1 to 5 years. This implies that a communities' perception of projects' sustainability improved with the length of time that the projects existed on purely internally generated funds for operation and maintenance. It was concluded therefore that projects that generated funds internal funds to meet operation and maintenance cost were generally considered sustainable and the chances of sustainability increased with the length of time that the projects were in operation on such conditions.

4.5 Perception of Sustainability of Water Sanitation and Hygiene Projects

This section presents a descriptive analysis of perception of sustainability of WASH projects identified as the dependent variable. Specifically, it evaluates the means of the individual questionnaire response (items), the mean of means of all items extricating the variable and the respondents' perception on sustainability of WASH projects. Sustainability was identified as dependent on five community intervention strategies- community participation, empowerment, ownership, capacity building and conflict management, in line with literature that associate sustainability of projects to a number of predictor variables (Nikkah and Redzuan, 2009; Tango international, 2009; Rizkallah and Bone, 1998; Goodman and Steckler, 1987/88).

In this study, three indicators of sustainability were analysed; effectiveness in project management, level of community support to the projects and adequacy of internally generated resources for operation and maintenance. These indicators were assessed using 10 Likert items in the survey questionnaire that were numbered from 7.1 to 7.10. The mean of the individual items was calculated to assess the degree to which a proportion of respondents agreed with view expressed in the item, the mean of means was calculated to assess the extent to which the respondents agreed with the level of sustainability of WASH projects in the study area while frequencies and percentages were determined to quantify respondents according to those that considered the projects' sustainable or unsustainable. The results of analysis of means and the mean of means are presented in Table 4.13.

Table 4.13: Mean Analysis of Perceived Sustainability of Water Sanitation and Hygiene Projects

No	ITEM	N	SD	D	N	A	SA	Mean	Std. Dev.
1	The project is managed by a committee that shows a strong capacity to manage it into the future	384	47 (12.2%)	39 (10.2%)	32 (8.3%)	145 (37.8%)	121 (31.5%)	3.66	1.340
2	Project implementation is going on smoothly without frequent and sometimes violent conflicts.	384	34 (8.9%)	56 (14.6%)	37 (9.6%)	170 (44.3%)	87 (22.7%)	3.57	1.235
3	The project is generating enough resources for operation and maintenance from internal sources	384	78 (20.3%)	62 (16.1%)	35 (9.1%)	93 (24.2%)	116 (30.2%)	3.28	1.534
4	The financial flow for maintenance and replacement of project's infrastructure is steady and can be sustained into the future	384	86 (22.4%)	56 (14.6%)	33 (8.6%)	118 (30.7%)	91 (23.7%)	3.19	1.506
5	Members of the community are beneficiary of the project and are willing to contribute resources to support the project in to the future	384	37 (9.6%)	20 (5.2%)	25 (6.5%)	153 (39.8%)	149 (38.8%)	3.93	1.236
6	The community has adequate technical skills on operation and maintenance of the project facilities to sustain it in the future	384	139 (36.2%)	103 (26.8%)	25 (6.5%)	64 (16.7%)	53 (13.8%)	2.45	1.462
7	There is adequate and ongoing grassroots mobilization in support of the project	384	67 17.4%	144 37.5%	29 7.6%	111 28.9%	33 8.6%	2.74	1.281
8	There are clear strategies for long term maintenance of the project facilities	384	66 (17.2%)	83 (21.6%)	57 (14.8%)	101 (26.3%)	77 (20.1%)	3.10	1.401
9	The community has confidence in the management of the project	384	60 (15.6%)	51 (13.3%)	24 (6.3%)	151 (39.3%)	98 (25.5%)	3.46	1.402
10	There is a great likelihood that the project will continue to exist long in the future	384	38 (9.9%)	30 (7.8%)	24 (6.3%)	122 (31.8%)	170 (44.3%)	3.93	1.307

Item 1in Table 4.13 assessed the capacity of the project management committee in managing the project. The results recorded a mean score of 3.66 and a standard deviation of 1.340. These show that majority of the respondents believed the project committees had adequate capacity to manage the projects. Item 2 sought to establish the extent to which project implementation was run without violent conflicts. The results presented a mean score of 3.57 and standard deviation of 1.235. These indicate that majority of the respondents were similarly confident that the projects were running smoothly. Item 3 reviewed the source of funds for operation and maintenance and examined if the projects were generating enough internal resources for that purpose. A mean score of 3.28 and standard deviation of 1.534 was obtained. The results indicate that an almost equal number of respondents were indifferent whether the projects were generating adequate internal resources for operation or maintenance.

Item 4 assessed if the financial flow for maintenance and replacement of projects infrastructure could be steadily sustained over a long period. The item recorded a mean score of 3.19 and a standard deviation of 1.506. Again, the results indicate that an almost equal number of respondents either supported or negated the position that the financial flow in the projects was steady and could be sustained over a long period. Item 5 sought to establish if members of the community who were beneficiaries of the projects were willing to contribute resources to support the projects. The item recorded a mean score of 3.93 and a standard deviation of 1.236. The results show that majority of the respondents were in agreement that the community were willing to support the project whenever they were called upon. Item 6 on the other hand assessed whether the community had adequate technical skills for projects operation and maintenance. A mean score of 2.45 and a standard deviation of 1.462 was obtained. The results shows that a majority of respondents believed that adequate skills for operation and maintenance of project facilities were lacking within the community.

Item 7 assessed whether adequate grassroot mobilization in support of the project was ongoing. The mean score was 2.74 and a standard deviation of 1.281. Again, the results indicate that a majority of the respondents believed that there was no adequate ongoing community mobilization in support of the project. Item 8 sought to assess whether clear strategies for long term maintenance of project facilities existed. The mean score was 3.10 and the standard deviation was 1.401. It shows that almost an equal number of respondents either affirmed or failed to affirm that such strategies existed. Item 9 assessed community confidence in the projects' management. The mean score was 3.46 while the standard deviation was 1.402. The results show that only a slight majority of the respondents were

confident the management of the projects. The final item 10 assessed the likelihood that the project would still be in existence long into the future. The mean score was 3.93 with a standard deviation of 1.307. The results show that majority of the respondents were in agreement that the projects could exist long into the future.

The findings show that a majority of the respondents identified lack of technical skills for projects' operation and maintenance and inadequate community mobilization in support of the project as the major obstacles to the projects' sustainability. They were, however, positive that the projects could still extent into a distant future given that members of the communities were still willing to contribute personal resources to support the projects, the management committees had reasonable capacity to manage the projects and that project implementation was generally smooth with minimal violent conflicts.

The observations in table 4.13 were subjected to further analysis by evaluating mean of means of all the 10 items that extricated sustainability variable. The results are presented in Table 4.14.

Table 4.14: Summary statistic of Perception of Sustainability of WASH projects

	Statistic
Mean of means	3.33
Mean standard deviation	1.37
Skewness	-0.384
Kurtosis	-0.789

Table 4.14 shows that the mean of means was 3.33 and the mean standard deviation was 1.37. The score distribution was marginally negatively skewed (-0.384) with the peak of the unimodal frequency distribution slightly flatter than a normal distribution (-0.789). This suggest that the scores has a near normal distribution that allows application of parametric statistics. The mean of means implies that a majority of respondents were generally of the view that the projects under study were sustainable. To quantify respondents in terms of perception of projects' sustainability, the composite scores were classified into binary categories of sustainable and unsustainable. The unsustainable class contained composite scores in the range of 10-32 while the sustainable category had a range of scores between 33-50. Results of the analysis based on this classification are presented in Table 4.15

Table 4.15: Perception of Respondents on Sustainability of WASH Projects

Perception	Frequency	Percentage
Sustainable	225	58.6
Unsustainable	159	41.4
Total	384	100.0

Table 4.15 shows that 225 (58.6%) respondents were positive that WASH projects were sustainable while 159 (41.4%) considered the projects unsustainable. The results similarly confirmed that a majority of respondents (58.6%) were in agreement that the projects were sustainable despite the many challenges that existed. This positive community attitude towards the projects presented a good opportunity that could be harnessed to boost community support for the projects and improve on their sustainability.

Focus group discussions revealed that sustainability of projects in terms of resources and performance was dependent on a number of factors, some of which were outside the scope of this study. Specifically, the factors included: effective management of the projects, generation of adequate finances for operation and maintenance, development of strong constitutional provisions, rules and regulations governing projects operations and ensuring adequate involvement of the community including aggressive community mobilization. Other factors included the need to nurture community appreciation of the project, improving skills on operation and maintenance and financial management. Security of project equipment, inequitable water billing of beneficiaries, improving water yields and expansion of water distribution were other critical factors influencing sustainability of projects.

This observation was explicitly captured by three participants in Gorogoro women group FDG who, upon being asked which of the five variables contributed most to project sustainability, responded

> *" …you know, all this things go together. We need to have a strong management committee. This should be a committee that we have ourselves appointed and we should have the authority to question them or remove any or all of them from office if need be.." "..members of this committee should also have the skills to run the project well and bring people together. Conflicts really create divisions in a project and the committee must have away of handling it in a professional way.." "..they should also be open with our*

money and allow us to question its use. Only then will we feel close to the project and support it..".

The responses provided insight on how the different variables under consideration contributed to sustainability of projects. Specifically, the communities considered sustainability of WASH projects to be dependent more on effectiveness of management, level of community involvement in management and community authority over management. In addition community ownership of the projects, conflict management strategies and competency, and effectiveness in financial management and accountability over funds were equally important. This in essence called for effective community participation in management and election of management officials, empowerment of the communities to take control of the project and hold management to account and capacity building of the communities on financial and conflict management. Community ownership of the projects was similarly important as this enabled the communities to considered project resources as "their money".

4.6 Community Participation Strategies and perception of Sustainability of Water Sanitation and Hygiene Projects

This section presents analysis of the influence of community participation strategy on sustainability of WASH projects. Community participation strategy is identified as an independent variable that is predictive of the dependent variable-sustainability of WASH projects. In this study, the strength of community participation in WASH projects was measured by the level of community participation in choosing projects' leadership, availability of platforms for decision making, level of community consultation and information provision, level of engagement of community promoters and the willingness of the community to engage in project activities. These indicators were evaluated by ten (10) questionnaire items and the findings presented under two sub-sections. The first sub-section provides an analysis of means while the second subsection presents analysis of the relationship between community participation strategy and sustainability of WASH projects with a discussion comparing findings with those of previous studies.

4.6.1 Mean Analysis of Community Participation Strategy

This subsection investigates the adequacy and strength of community participation strategy in WASH projects by evaluating the questionnaire items explicating the strategy. It specifically evaluates the means of the individual items, the mean of means, the mean of composite scores and the respondents' perception on adequacy of community participation strategy in WASH projects as articulated in focus group discussions. The strategy was measured by five indicators that were evaluated by ten questionnaire items numbered from 2.1 to 2.10. The mean of the individual items evaluated the degree to which a proportion of respondents agreed with view expressed in the item. The mean of means and the mean of the composite scores assessed the extent to which the respondents agreed with the adequacy of community participation in WASH projects while frequencies and percentages were determined to quantify respondents in terms of their perception of the strength of community participation in the projects. The results of the analysis of means and the mean of means are presented in Table 4.16.

Table 4.16: Mean Analysis of Community Participation Strategies

No	ITEM	N	SD	D	N	A	SA	Mean	Std. Dev
1	You participate in the activities of the project actively and willingly and not because you are asked to do so by the promoters of the project	384	27 (7.0%)	14 (3.6%)	18 (4.7%)	118 (30.7%)	207 (53.9%)	4.21	1.151
2	The promoters of the project always provide solutions to the challenges that you face in the project	384	104 (27.1%)	28 (7.3%)	115 (29.9%)	44 (11.5%)	93 (24.2%)	2.98	1.498
3	You are provided with adequate information about the project activities	384	100 (26.0%)	68 (17.7%)	25 (6.5%)	104 (27.1%)	87 (22.7%)	3.03	1.550
4	You are well informed of your role in the project	384	39 (10.2%)	82 (21.4%)	21 (5.5%)	152 (39.6%)	90 (23.4%)	3.45	1.326
5	You are consulted regularly on issues of operation and maintenance of the project operations	384	119 (31.0%)	88 (22.9%)	23 (6.0%)	85 (22.1%)	69 (18.0%)	2.73	1.531
6	The project is managed by a management committee that you and colleagues set up	384	39 (10.2%)	39 (10.2%)	52 (13.5%)	103 (26.8%)	151 (39.3%)	3.75	1.338
7	The project provide platforms where you and colleagues deliberate on issues concerning the operations of the projects	384	107 (27.9%)	61 (15.9%)	25 (6.5%)	125 (32.6%)	66 (17.2%)	2.95	1.513
8	The decisions of such meetings is final in determining the direction of the project	384	44 (11.5%)	116 (30.2%)	51 (13.3%)	84 (21.9%)	89 (23.2%)	3.15	1.374
9	The management committee implement the decisions that you and colleagues arrive at in the meetings of the projects	384	63 (16.4%)	112 (29.2%)	37 (9.6%)	89 (23.2%)	83 (21.6%)	3.04	1.431
10	The project has appointed champions from the community that mobilise the community to support projects operations	384	99 (25.8%)	77 (20.1%)	55 (14.3%)	68 (17.7%)	85 (22.1%)	2.90	1.514

Item 1 in Table 4.16 assessed the participation of community members in the project and whether this participation was done willingly or influenced by project promoters. The results recorded a mean score of 4.21 and a standard deviation of 1.151. This indicated that majority of the respondents were in agreement that they were willingly participating in the activities of the projects without influence. Item 2 gauged the extent to which project promoters were involved in resolving project challenges. The item had a mean score of 2.98 and a standard deviation of 1.498. The results showed that the respondent were divided over the issue, with one half holding that the promoters indeed provided solutions to project challenges while the other half negating this position. Item 3 examined the adequacy of information that was given to the community on project activities. A mean score of 3.03 and standard deviation of 1.550 was obtained. Similarly, the results presented an equal division in the respondents' view. One half believed that they received adequate information about the activities of the project the other half negating the position.

Item 4 examined whether the respondents were adequately informed of their role in the project. It recorded a mean score of 3.45 and a standard deviation of 1.326. The results indicated that a majority of respondents understood adequately the role they played in the project. Item 5 assessed whether the respondents were consulted regularly on matters of operation and maintenance of projects' operations. It recorded a mean score of 2.73 and a standard deviation of 1.531. This indicated that only a minority of the respondents felt they were adequately consulted. A majority were in disagreement and felt consultation was inadequate. Item 6 looked at the management of the project and whether it was run by a committee appointed by the community. The results recorded a mean score of 3.75 and a standard deviation of 1.338. This indicated that a majority of respondents believed that the projects were run by management committees that were set up by the communities themselves.

Item 7 examined whether the projects provided platforms where the community could deliberate on issues on projects' operations and maintenance. It had a mean of 2.95 and a standard deviation of 1.513. This indicated that the respondents were almost equally divided over the issue, with one half confirming and another negating that adequate platforms were available for consultation. Item 8 assessed whether final decisions on project directions were taken in consultative meetings with the communities. The scores recorded a mean score of 3.15 and a standard deviation of 1.374. The results indicated that a slight majority of the respondents were in agreement that decisions on projects' direction were made in consultative meetings. Item 9 investigated whether the management committees of projects

implemented the decisions reached in consultative meetings. The results recorded a mean score of 3.04 and a standard deviation of 1.431. It showed that respondents were equally divided over the issue with one half in agreement and the other contesting that such decisions were implemented by the committees. The final item 10 assessed whether the projects engaged champions from within the communities to mobilise community support for the projects. A mean score of 2.90 and a standard deviation of 1.514 was recorded. The results indicated that less than half of the respondents were in agreement that the projects had engaged champions who were tasked with mobilizing the support of the communities for the projects.

These findings show that majority of the community members participated in the projects actively and willingly with minimal influence from project promoters or other external sources. They were confident that the projects were managed by committees appointed by themselves and that they were reasonably knowledgeable of their roles in the projects. These were the key driving forces for community participation in the WASH projects that contributed more to sustainability of the projects. However, limited community consultation on issues of operation and maintenance, inadequate community project promoters and inadequate platforms for addressing concerns over projects' operations stood out as the major impediment to community participation and subsequent sustainability of the projects.

The mean of means for all the 10 items that extricated community participation variable was further evaluated and the results presented in Table 4.17

Table 4.17: Community Participation Strategy Summary Statistics

	Statistic
Mean of Means	3.22
Mean of Standard deviation	1.423
Skewness	0.189
Kurtosis	-1.171

Table 4.17 shows that the mean of means was 3.22 while the mean standard deviation was 1.423. The scores distribution was slightly positively skewed (0.189) and the peak of the unimodal frequency distribution marginally flatter than that of a normal distribution (-1.171). This suggests that the composite scores had a near normal distribution and allowed

application of parametric statistics. The result indicates that only slight majority of the respondents believed that community participation in the projects was adequate while a large proportion were unconvinced. This implies that the communities were generally more confident that their level of participation was adequate to sustain the projects. Considering that participation was made willingly, provision of adequate opportunities for participation could create a bigger impact on project sustainability

The study further quantify respondents in terms of their perception of the strength of community participation within the projects. To facilitate the analysis, the composite scores were classified into three strength categories of weak (10-25), Moderate (26-35) and Strong (36-50) and analysed for frequencies and percentages. The results are presented in Table 4.18

Table 4.18: Perception of Respondents on Strength of Community Participation in WASH Projects' Activities

Perception	Frequency	Percentage
Strong	151	39.3
Moderate	104	27.1
Weak	129	33.6
Total	384	100.0

The results in Table 4.18 show that 151 (39.3%) respondents believed that community participation in WASH projects was strong, 104 (27.1%) felt the participation was moderate and 129 (33.6%) considered it weak. The findings show that majority of respondents 255 (66.4%) viewed strength of community participation in WASH projects as either moderate or strong. Focus group discussions revealed that strength of community participation was gauged by the extent to which communities participated in appointment or elections of project management committees, how regular and effective was consultation between project management and the community on issues of operation and maintenance and the extent of community participation in training, especially, on project operation and maintenance. Extent of cost sharing during project construction and operation, participation in identification and provision of public land for establishment of the projects and in fixing and reviewing water user fees were other critical opportunities of participation.

4.6.2 Relationship between Community Participation Strategy and Perceived Sustainability of Water Sanitation and Hygiene Projects

This subsection presents analysis of the relationship between community participation strategy and sustainability of WASH projects. The first part of the sub- section assesses the relationship using cross tabulation. In the second part of the subsection, the study hypothesis is evaluated using the chi-square test for independence statistic. In addition, the effect of the increasing strength of community participation strategy on sustainability of WASH projects was tested using simple binary logistic regression**.**

4.6.2.1 Cross tabulation of Perception of Sustainability of WASH projects by Community Participation Strategy

This subsection presents a 2 x 2 cross tabulation of community participation strategy and sustainability of WASH projects. Cross tabulation explored how different strength levels of community participation influenced sustainability of WASH projects in terms of frequencies and percentages. To facilitate this analysis, the composite scores for community participation data set were categorized into three strength bands of weak (10-25), moderate (26-35) and strong (36-50). Similarly, sustainability composite scores were categorized into binary classes of unsustainable (10-32) and sustainable (33-50). Table 4.19 presents the results of the cross tabulation.

Table 4.19: Cross Tabulation of Sustainability by Strength of Community Participation

Strength	Sustainability				Total	
	Sustainable		Unsustainable			
	Frequency	%	Frequency	%	Frequency	%
Strong	126	32.8	25	6.5	151	39.3
Moderate	48	12.5	56	14.6	104	27.1
Weak	51	13.3	78	20.3	129	33.6
Total	225	58.6	159	41.4	384	100.

Table 4.19 shows that among the respondents that felt that community participation in WASH projects was weak, 51 (13.3%) considered the projects sustainable while a majority 78(20.3%) considered them unsustainable. Similarly, of the respondents who believed that the strength of community participation in the projects was moderate, 48 (12.5%) considered the projects sustainable while a majority 56 (14.6%) felt the projects were unsustainable. However, among the respondents who considered community participation in the projects as

strong, a majority 126 (32.8%) felt that the projects were sustainable and only 25 (6.5%) considered them unsustainable.

It is observed therefore that among the respondents who considered community participation in the projects weak a majority also felt that the projects were unsustainable. Of those that considered community participation moderate, just a slight majority considered the projects unsustainable while among those that believed that community participation was strong only minority 25 (6.5%) considered the projects unsustainable. It is similarly observed that weak and moderate strengths of community participation produced rather less sustainable projects 99 (25.8%) when compared to unsustainable projects 134 (34.9%). However, strong community participation efforts had a remarkable improvement on sustainability of projects 126 (32.8%) sustainable against 25 (6.5%) unsustainable projects.

Overall, community participation in WASH projects resulted in upto 58.6% sustainable projects compared to 41.4% unsustainable ones. Only strong community participation was responsible for more sustainable projects (32.8%) than unsustainable projects (6.5%). The findings revealed that strong community participation increased the chances of projects' success over failure 5 fold implying that a community participation strategy in WASH projects was able to deliver significant impact on projects sustainability probabilities only when participation was effectively incorporated in the projects. Similarly, the observation that moderate and weak community participation resulted in less sustainable projects (25.8%) than unsustainable projects (34.9%) implied that a general low or moderate community participation was in fact an impediment to the long term sustainability of the projects.

4.6.2.2 Test of the hypothesis One

This subsection tested the hypothesis that **t**here is a significant relationship between community participation strategy and sustainability of WASH projects in the informal settlements in Kisumu City and rural surroundings. The null hypothesis was stated as follows:

H_o I: There is no significant relationship between community participation strategy and sustainability of water sanitation and hygiene projects in informal settlements in Kisumu city and rural surroundings

A chi-square test for independence was conducted to examine if a significant relationship existed between the variables on the sample data at 5% level of significance. The results are presented in Table 4.20.

Table 4.20: Chi-squared Test for Sustainability of Projects against Community Participation

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	64.381	2	.000
Likelihood Ratio	68.708	2	.000
Linear-by-Linear Association	56.894	1	.000
N of Valid Cases	384		

Table 4.20 presented a p-value (0.000) less than the level of significance (0.05).This provided evidence for rejection of the null hypothesis. The null hypothesis was therefore rejected and the study concluded that there was a significant association between community participation and sustainability of WASH projects (Pearson $X^2_2 = 64.38$, $p < 0.001$) at 5% level of significance. This observation was confirmed by the likelihood ratio test (LRT $X^2_2 = 68.71$, $p < 0.001$). The table further shows that trend analysis established a significant linear trend in the association between community participation and sustainability of WASH projects ($X^2_1 = 56.89$, $p < 0.001$).

This observation was supported by focus group discussion findings that associated active community participation in WASH projects activities to sustainability. The discussions revealed that communities' participation in election of project committee members, skills enhancement trainings, decision making and regular consultation on projects' operation and maintenance as the key participation opportunities that enhanced effective management of the projects and increased sustainability probabilities. This was in addition to community participation in enforcement of management accountability, consensus building on major project decisions, cost sharing in project construction and operation, and participation as community project champions. These observations were consistent with the observations by Wright (1997) and Narayan (1995) who identified community contribution, informed choice, representation, participation in decision-making, responsibility, authority and control as the indicators of community participation. Kaliba and Norman (2004) and Lombardo (1998) on their part established, through qualitative approaches, a marked relationship between community participation and sustainability of community projects. Similarly, Buykx *et al.* (2012), Ofuoku (2011), UNICEF (2011), Ngondi *et al.* (2010) and Boyce and Lysack (2000) established a significant association between community participation and sustainability of projects using quantitatively approaches.

Specifically, FGDs revealed that communities viewed their participation in electing committee members as key to ensuring good management of the project. This was evident from a participant who remarked

> " *…in General Meetings that happen every two years we elect committee members. But, in our other project meetings we review project performance and demand for accountability. You know that the committee are responsible for managing the project on our behalf. If they fail we elect new people*".

The discussions further showed that projects with effective management committees were more stable with good prospects of survival. An effective committee ensured that regular consultation with community members were done on operational issues and were able to carry the community along with them, improving community commitment and the prospect of sustaining the projects longer. This aspect was well capture by a participant in Obambo water project FGD who upon being asked how she would gauge the participation of the community in the project, retorted *"…our participation is good. We elect our management committee which in turn engage us frequently through project meetings. This way all of us contribute on the direction the project is taking and we are happy with it"*. This observation was consistent with the findings of Sara and Katz (1997) who observed that community's participation in decision making and implementation was an effective means of improving sustainability of water projects.

The use of community champions was seen as critical in sustaining communities participation and community ensuring ownership of the projects. The sentiments were expressed in Miguye water project FGD by a participant who remaked

> *"..when the project was starting, we were mobilised well. They even had promoters from among us. The promoters encouraged us to labour for free. We also collected ballast and stones. Some even provided food. We considered the project our own and worked very hard..*"

This was consistent with the findings by Buykx *et al.* (2012) who observed that the involvement of community members as champions in project promotional activities facilitated community acceptance and active participation in the projects thereby enhancing ownership of the project processes. Consensus building on major project decisions was another important means of sustaining project operations. For instance, projects that were able to build consensus on the need to pay water user fees and the amount of fees to be charged ensured that the community understood the need for such payments and committed

to raising and paying the charges without default. In projects where consensus was never reached nor consultation made on water charges, the default rates were high denying the projects the necessary funds for maintenance. This was evident from a participant in Kadongo water pan FDG who in response to the question whether he felt the level of community involvement in the project was sufficient, responded

> *"the committee does not involve us much. For example, one day they woke up and decided that we shall be paying a certain fee for water withdrawn. It was not much but where did they get that. They did not seek our opinion yet they expected us to pay. We have not and because the project is ours anyway, they could not stop us from collecting the water. When they closed the taps, people were breaking the fence and collecting it directly from the open pan. At some point they started breaking the padlocks and the management had to give up the idea ".*

Focus group discussion further revealed that use of community project promoters and cost sharing during project construction, either through provision of free labour or locally available materials was an important means of engaging the community from initial stages and in sustaining their participation. Where the communities participated in this manner, they tended to identify with the projects more as belonging to them and in turn made additional effort to ensure that the projects were functional over a longer period. This perception was articulated by a participant in Miguye water project FGD who stated

> *" When the project was starting, we were mobilised well. They even had promoters from among us. The promoters encouraged us to provide free labour. We also collected ballast and stones. Some even provided food. We considered the project our own and we were keen to see it running well ".*

This observation was consistent with the findings by Mann (2003) who observed that sustainability of any technology depended more on commitment by the local community to financially contribute to the cost of operation and maintenance. This contribution was an essential means to building social cohesion and community ownership (Harvey and Reed, 2006; Kaliba and Norman, 2005) that was necessary for project's sustainability (Okungu, 2012). Community involvement in site selection was another critical aspect of participation that was observed as essential for sustainability. When decisions on where to locate a projects was reached by consensus or the communities involved in identifying and availing public land as project site, it promoted a sense of ownership of the process and increased the chances of sustainability. Communities expressed greater ownership for projects that were

established in public land as opposed to private land. In observed cases where projects were located in private land, whenever the management committees faltered, projects management reverted to the owner of project site, compromising community ownership and long term sustainability of the project. This position was articulated by a participant in Alendu water project FGD who remarked *"..when the committee collapsed, the landlord took over management of the project for some years. We later renegotiated to have it back.."* This observation was consistent with the findings of Osland (2010) in a study of water wells in Las Trancas village, El Salvador, who concluded that lack of community-held land titles threatened the long-term sustainability of the projects. Mann (2003) observed too that community involvement in site selection promoted a sense of ownership of the process. Improved ownership enhanced community participation in training and in making financial contribution to the cost of repair and maintenance of the water pumps thus increasing chances of sustainability.

On the contrary, projects that were considered less successful during implementation were often operating with an ineffective committee. This often occurred when the community lost authority to regularly elect committee members. Such committees tended to remain in office for far too long by avoiding elections, exhibited ineffectiveness and were unwilling to provide accountability. They operated either without meetings or irregular ones and in some cases were individual controlled and hardly consulted with the community. Ineffective committees were seen to frustrate community engagement with the project and commitment to its cause. These was evident from the remarks of three participants in Kadongo water pan FGD who stated: *".. the community nolonger get the opportunity to elect new leaders.."; "..the committee has been in office for too long and they no longer call community meetings for fear that the community may demand elections..";"..the project is poorly managed and may not last for long. The committee is divided and lack passion.."*

Simple Binary Logistic Regression was further used to investigate the influence of different strengths levels of community participation strategy on sustainability of WASH projects. Table 4.21 presents results of the single variable Wald's

Table 4.21: Odds Ratio for Logistic Regression of Perceived Sustainability on Community Participation

Strength							95% C.I.for EXP(B)	
	B	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Community part.			57.176	2	.000			
Community part. (Strong)	2.042	.230	51.900	1	.000	7.708	4.422	13.436
Community part. (Moderate)	.271	.267	1.031	1	.310	1.311	.777	2.211
Constant	-.425	.180	5.567	1	.018	.654		

The results in Table 4.21 confirmed that the combined effect of community participation strategy had a significant effect on sustainability of WASH projects [Wald's test: $X^2_{\ 2} = 57.18$, $p < 0.001$] at 5% level of significance. In addition the tables shows that the odds ratios of sustainability at 95% confidence level for strong community participation was 7.71 (CI from 4.42 to 13.44) and 1.3 (CI from 0.78 to 2.21) for moderate community participation. This implies that strong levels of community participation were 7.7 times more likely to increase sustainability probabilities of WASH projects than weak levels whereas moderate levels were 1.3 times more likely to increase sustainability probabilities of WASH projects when compared to weak levels, and before accounting for confounding factors. The study concluded that different strength levels of community participation (weak, moderate and strong) were significant in explaining variability in sustainability probabilities. This relationship took a positive dimension where an increasing strength of community participation significantly increased sustainability probabilities of WASH projects.

This study thus demonstrated that an increasing strength of community participation from weak, moderate to strong levels significantly increased WASH projects sustainability. Strong and moderate levels of community participation increased projects' sustainability probabilities by about 8 and 1.3 times respectively over weak community participation levels. These observations could not be compared to previous findings has no study was identified that specifically analysed the extent of these relationship. Nonetheless, Ahmad and Abu Talib (2014) in a study done in the province of Khyber Paktunkhawa, Pakistan established that an increasing strength of community participation as a component of empowerment significantly increased sustainability of community-driven projects. They did not, however, quantify the extent of this influence nor consider the influence of community participation independently on sustainability of the projects

4.7 Community Capacity Building Strategies and Perceived Sustainability of Water Sanitation and Hygiene Projects

This section presents analysis of the influence of community capacity building strategy on sustainability of WASH projects. Community capacity building strategy is identified as an independent variable predictive of the dependent variable-sustainability of WASH projects. In this study, community capacity building strategy was measured by the existence of project promoters in WASH projects, opportunities for training in operation and maintenance (O&M), opportunities for follow-up trainings, adequacy and relevance of information on WASH project, availability of local skills on operation and maintenance of WASH projects and opportunity for training on projects' structure establishment. These indicators were evaluated by ten (10) questionnaire items and the findings presented under three sub-sections. The first sub-section presents a descriptive analysis of community capacity building strategy, the second analyses the relationship between community capacity building strategy and sustainability of WASH projects while the third subsection presents a discussion of the observed relationships and compares the findings with previous studies.

4.7.1 Mean Analysis of Community Capacity Building Strategy

This subsection investigates the adequacy and strength of community capacity building strategy in WASH projects by evaluating the questionnaire items explicating the strategy. It evaluates the means of the individual items, the mean of means, the mean composite score and the respondents' perception on adequacy of community capacity building strategy in WASH projects as articulated in focus group discussions. The strategy was measured by five indicators that were evaluated by ten questionnaire items numbered from 3.1 to 3.10. The mean of the individual items assessed the degree to which respondents agreed with view expressed in the items. The mean of means assessed the extent to which the respondents agreed with the adequacy of community capacity building efforts in WASH projects while frequencies and percentages were determined to quantify respondents in terms of their perception of the strength of community capacity building measures in the projects. The results of the analysis of means and the mean of means are presented in Table 4.22

Table 4.22: Mean analysis of Community Capacity Building Strategies

No	ITEM	N	SD	D	N	A	SA	Mean	Std. Dev.
1	There are programmes that promote the construction, operation and maintenance of water sanitation and hygiene projects within the community	384	179 (46.6%)	71 (18.5%)	33 (8.6%)	58 (15.1%)	43 (11.2%)	2.26	1.450
2	Your capacity to operate and maintain of project facilities has been strengthened	384	73 (19.0%)	164 (42.7%)	22 (5.7%)	51 (13.3%)	74 (19.3%)	2.71	1.419
3	There are follow-up training of operation and maintenance	384	172 (44.8%)	95 (24.7%)	19 (4.9%)	51 (13.3%)	47 (12.2%)	2.23	1.442
4	The project has champions that create awareness among community beneficiaries on project operation and maintenance	384	123 (32.0%)	109 (28.4%)	23 (6.0%)	72 (18.8%)	57 (14.8%)	2.56	1.469
5	Your capacity is developed in resource mobilization for project facility maintenance and replacement	384	109 (28.4%)	131 (34.1%)	19 (4.9%)	66 (17.2%)	59 (15.4%)	2.57	1.444
6	The project has developed your capacity in leadership and management of the project	384	105 (27.3%)	111 (28.9%)	19 (4.9%)	62 (16.1%)	87 (22.7%)	2.78	1.552
7	Your capacity and skills to engage with others in joint project activities has been strengthened	384	118 (30.7%)	103 (26.8%)	18 (4.7%)	76 (19.8%)	69 (18.0%)	2.67	1.521
8	There are project update meetings that you attend	384	117 (30.5%)	97 (25.3%)	15 (3.9%)	73 (19.0%)	82 (21.4%)	2.76	1.569
9	Project initiators built capacity for establishing project structures and constitution	384	165 (43.0%)	89 (23.2%)	32 (8.3%)	52 (13.5%)	46 (12.0%)	2.28	1.434
10	The project has built capacity of the project management committee in managing the activities of the project	384	101 (26.3%)	121 (31.5%)	22 (5.7%)	63 (16.4%)	77 (20.1%)	2.72	1.504

Item 1 in Table 4.22 assessed the existence of promotional programmes for construction, operation and maintenance of WASH projects within the community. An evaluation of the score provided a mean score of 2.26 and a standard deviation of 1.450. This indicated that majority of the respondents were of the view that there were inadequate promotional programmes within the projects. Item 2 reviewed individual capacity to operate and maintain project facilities and whether this capacity had been strengthened. An evaluation of the item scores registered a mean score of 2.71 and a standard deviation of 1.419. This implies that a slight majority of the respondents were in disagreement and felt that their capacity had not been adequately strengthened for the purpose. Item 3 examined whether follow-up trainings on operation and maintenance were done for the community. A mean score of 2.23 and standard deviation of 1.442 was obtained. The results showed that a majority of the respondents' were in disagreement that such follow-up trainings existed. Item 4 assessed whether the projects engaged promotional champions from within the communities. An evaluation of the item scores recorded a mean score of 2.56 and a standard deviation of 1.469. The results similarly indicated that a majority of respondents believed that community champions were rarely engaged.

Item 5 reviewed projects' capacity to generate internal revenue by assessing whether the respondents' capacity had been developed for this purpose. The results indicated a mean score of 2.57 and a standard deviation of 1.444. Again, the results imply that a majority of the respondents were in disagreement that their capacity to mobilise resources for the projects had been developed. Item 6 reviewed the capacity of respondents in leadership and management by assessing whether this capacity had been developed by the projects. An evaluation of the item scores recorded a mean of 2.78 and a standard deviation of 1.552. This indicates that a slight majority of respondents were in disagreement that their capacity had been developed. Item 7 examined the capacity and skills of respondents to engage with others in joint project activities and whether this capacity had been strengthened by the project. A mean score of 2.67 and a standard deviation of 1.521 was obtained. The result indicates that majority of the respondents were in disagreement that their capacity on effective engagement had been strengthened. Item 8 further assessed whether project update meetings were organized and attended by the communities. An evaluation of the scores recorded a mean of 2.76 and a standard deviation of 1.569. The results indicate that a slight majority of the respondents were in disagreement that such meetings existed. Item 9 examined whether Project initiators had built community capacity for establishing project structures and constitution. The results recorded a mean score of 2.28 and a standard deviation of 1.434.

These imply that a majority of respondents were in agreement that the initiators had not built the capacities of the communities for that purpose. Finally, item 10 assessed whether the projects built capacities of management committees in project implementation and management. An evaluation of the item scores recorded a mean of 2.72 and a standard deviation of 1.504. The results show that a slight majority of the respondents believed the projects had not adequately built the capacities of the committees to effectively manage the projects.

The findings show that respondents were more concerned about inadequacy of programmes that promoted construction, operation and maintenance of WASH projects, inadequate follow-up training on operation and maintenance and inadequate capacity building on the establishment of projects structures and the constitution. These factors stood out as the key capacity gaps that largely hampered sustainability of projects. However, respondents were slightly more in agreement that the projects had developed their capacity in leadership and management, and provided opportunities for project update meetings, but still less than half of the respondents shared this view. This in effect shows that majority of the respondents were concerned that community capacity building was inadequate to effectively sustain the projects.

The mean of means for all the 10 items that extricated community participation variable was further evaluated and the results presented in Table 4.23.

Table 4.23: Community Capacity Building Strategy Summary Statistics

	Statistic
Mean of means	2.55
Mean of Standard deviation	1.480
Skewness	0.578
Kurtosis	-1.100

Table 4.23 shows that the mean of means was 2.55 while the mean standard deviation was 1.480. The score distribution was marginally positively skewed (0.578) with the peak of the unimodal frequency distribution more flatter than a normal distribution (-1.100). This suggests that the scores had a near normal distribution that allowed application of parametric statistics. This finding indicates that less than half of the respondents believed that community capacity building was adequate to realize a successful implementation of the projects. The study further quantified respondents in terms of their perception of the strength

of community capacity building strategy in the projects. To facilitate the analysis, the composite scores were classified into three strength categories of weak (10-25), Moderate (26-35) and Strong (36-50) and analysed for frequencies and percentages. The results are presented in Table 4.24

Table 4.24: Perception of Respondents on Strength of Capacity Building in WASH Projects

Perception	Frequency	Percentage
Strong	97	25.3
Moderate	63	16.4
Weak	224	58.3
Total	384	100.0

The results in Table 4.24 show that 97 (25.3 %) respondents believed that capacity building in WASH projects was strong, 63 (16.4 %) considered it moderate and a majority 224 (58.3%) felt it was weak. This implies that majority of the respondents did not believe that community capacity building strategies in WASH projects were adequate. This observation was supported by focus group discussion that revealed that community capacity building measures in projects varied in adequacy and scope. While some projects facilitated capacity building, in the form of training, to only project management committees, other expanded it to the larger community in addition to providing mentorship. Further, while projects provided different levels of training especially in the operational areas of financial management, organizational management and conflict management, none of the projects offered training on the technical areas of equipment servicing and repair.

Adequacy of training in these fields informed participants perception of the strength of community capacities in undertaking project operations. This observation was expressed in a Rabour water project FGD by a participant who stated *"….No one in the community can repair the equipment when they break down. We call in technicians from Kisumu. You see, when training was done, our people were not told how to repair the equipment when damaged….."*.

Further, while some projects offered training to the management committees on project operations, only a few projects involved the larger community it its training programme while others lacked training programmes altogether. It was essential that training is extended to the wider community to expand the skill pool as relying on the skills and knowledge of a small number of individuals was likely to impede sustainability of the water

systems when trained personnel existed the project. These sentiments were expressed in Ranjira water project FDG by a participant who retorted *"..when we replaced the initial committee with a new one, the new people were not trained and they lacked the competency to manage the project. We were just fumbling.."* Projects that had an expanded training programme were thus seen as strong in building community capacities.

Additionally, among projects that offered training, a majority offered training as a single training event just before the projects were handed over to the communities. In a few, follow-up trainings programmes were implemented while others had experts attached to project management for mentorship. Follow-up trainings were done over a period of time after the projects were handed over to the communities and ensured that the communities were able to operate and maintain the projects long after the donors had exited. Projects that attached experts purposed to establish mentorship in management. Such experts were available for consultations and support whenever challenges arose in the projects. Yet others projects provided an operation and maintenance manual that was used to guide the communities on operation and maintenance issues. The extent to which these measures were implemented determined the strength of capacity building strategies of the various projects.

4.7.2 Relationship between Community Capacity Building and Perception of Sustainability of Water Sanitation and Hygiene Projects

This subsection presents analysis of the relationship between community capacity building strategy and sustainability of WASH projects. It opens with a discussion on cross tabulation of the two variables. Cross tabulation was performed to establish how different strength levels of community capacity building strategy influenced sustainability of WASH projects in terms of frequencies and percentages. It proceeds to present a test for the hypothesis on the relationship between the two variables. The hypothesis was tested using the chi-square test for independence statistic and sought to establish if a significant association existed in the relationship. It closes with a presentation on analysis of the strength of the relationship of the two variables as evaluated by a simple binary logistic regression model.

4.7.2.1 Cross Tabulation of Perceived Sustainability by Capacity Building Strategy

This subsection presents a 2 x 2 cross tabulation of community capacity building strategy and sustainability of WASH projects. Cross tabulation explored how different strength levels of community capacity building influenced sustainability of WASH projects in terms of frequencies and percentages. To facilitate this analysis, the composite scores for

community capacity building data set were categorized into three strength bands of weak (10-25), moderate (26-35) and strong (36-50). Similarly, sustainability composite scores were categorised into binary classes of unsustainable (10-32) and sustainable (33-50). The results of the cross tabulation are presented in Table 4.25.

Table 4.25: Cross Tabulation of Perceived Sustainability by Strength of Capacity Building Strategy

Strength	Sustainability				Total	
	Sustainable		Unsustainable			
	Frequency	%	Frequency	%	Frequency	%
Strong	89	23.2%	8	2.1%	97	25.3%
Moderate	38	9.9%	25	6.5%	63	16.4%
Weak	98	25.5%	126	32.8%	224	58.3%
Total	225	58.6%	159	41.4%	384	100.0

Table 4.25 shows that out of 224 (58.3%) respondents who considered as weak community capacity building strategies in WASH projects, only 98 (25.5%) felt that the projects were sustainable. A majority 126 (32.8%) considered the projects unsustainable. Similarly, out of 63 respondents who believed that the strength of community capacity building strategy in the projects was moderate, 38 (9.9%) considered the projects sustainable while a minority 25 (6.5%) felt the projects were unsustainable. Further, of the 97 respondents who believed community capacity building strategy in the projects was strong, a majority 89 (23.2%) felt that the projects were sustainable while only 8 (2.1%) considered the projects unsustainable.

The findings further show that among respondents who believed that community capacity building strategy in projects was weak, majority felt that the projects were unsustainable while those who believed that the capacity building strategy was moderate and strong, majority felt that the projects were sustainable. It is further observed that majority of respondents 224 (58.3%) considered capacity building measures in the projects as weak while only 160 (41.7%) rated capacity building efforts as moderate to strong. This in essence meant that most respondents were unconvinced that the level of capacities in the projects were sufficient to enable effective operation and maintenance of the WASH projects.

It is further demonstrated that the confidence toward sustainable projects increased considerably as perception on the strength of community capacity building strategy increased from weak(25.5% sustainable against 32.8% unsustainable) to moderate (9.9% sustainable against 6.5% unsustainable) and strong (23.2% sustainable against 2.1% unsustainable). It is similarly observed that weak community capacity building strategy resulted in more unsustainable projects than sustainable ones. Only moderate and strong community capacity building strategy resulted in more sustainable projects than unsustainable ones and the ratio was much higher for strong strategies. This suggests that sustainability probabilities increased with the strengthening of capacity building strategies and that realization of sustainable projects was more certain only when communities' capacities were strongly build, other determinants held constant.

The study concluded that an increase on the strength of community capacity building strategy in projects from weak, moderate and strong resulted in a corresponding increase in sustainability probabilities of WASH projects. Only strong and moderate community capacity building strategies had higher chances of generating sustainable rather than unsustainable projects when other determinants are kept constant.

4.7.2.2 Testing of Hypothesis Two

This subsection tests the hypothesis that **t**here a significant relationship between community capacity building strategy and sustainability of projects in the informal settlements in Kisumu City and rural surroundings. In order to test this hypothesis, the null hypothesis was stated as follows:

H_o II: There is no significant relationship between community capacity building strategy and sustainability of water sanitation and hygiene projects in informal settlements in Kisumu city and rural surroundings

A chi-square test for independence was conducted to examine if a significant relationship existed between the variables on the sample data at 5% level of significance. The results are presented in Table 4.26.

Table 4.26: Chi-Squared Test for Perceived Sustainability of Projects against Community Capacity Building

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	64.380	2	.000
Likelihood Ratio	74.036	2	.000
Linear-by-Linear Association	63.051	1	.000
N of Valid Cases	384		

Table 4.26 shows that the Pearson chi-Square test results recorded a p-value (0.000) less than the level of significance (0.05). This provided evidence for rejection of the null hypothesis. The study therefore rejected the null hypothesis and concluded that a significant association existed between community capacity building and sustainability of projects (Pearson $X^2_2 = 64.38$, $p < 0.001$) at 5% level of significance. This observation was confirmed by the likelihood ratio test (LRT $X^2_2 = 74.04$, $p < 0.001$). The linear trend analysis further suggested that the association between community capacity building and sustainability of WASH projects was likely to reflect a linear trend in the population ($X^2_1 = 63.05$, $p < 0.001$). This was consistent with the observation by Low and Devenport (2012), Bwisa and Nyonje (2012), Care International (2010), Hoko *et al.* (2009), USAID (2008), Mann (2003) and Holder and Moore (2000) that training which improve communities understanding of projects and capacity to effectively manage projects' operations was essential in sustaining the projects.

The findings were further supported by focus group discussions that associated an improvement in community skills in projects management, financial management and book keeping, equipment repair and servicing, and conflict management to improved sustainability of projects and projects' equipment. The FGDs revealed that capacity building on operation and maintenance in the form of training of project officials and larger community was crucial in sustaining the life of the projects. Projects that had good training programmes and follow-ups were perceived by the community to be handling operation processes more satisfactorily than those whose management lacked operational skills and were likely to be operational over a longer period. This view was expressed by a participants in Gorogoro women group FGD who observed

> "*….The donor took the committee and some community members to a number of trainings. They also followed up for some time to see how we*

were doing. I can say they are running the project well. We are only worried most of them are getting old and there is need to train a new group.."

This observation was consistent with previous findings by Bwisa and Nyonje (2012), Waisbord (2006), Tang *et al.* (2005) and Land (2000) who observed that capacity building programmes were more successful and sustainable when conducted in a process approach rather than as a single event. Tang *et al.* (2005) observed further that training delivered by a consistent consultant over a period of time had more sustainable effects than ad hoc consultancies. This confirmed that effective capacity building was one delivered consistently over a period of time. Such trainings also ensured that replacements that were made in the management committees over time received training as the old officials improved skills.

FGDs further associated training on equipment maintenance to sustainability of the projects. Lack of training especially on maintenance meant that whenever project equipment was damaged, management contacted external technicians for repair. The technicians charged high fees increasing operation cost, and at times beyond the capacity of the project to manage with internally generated funds. This observation was captured by a participant in Ranjira water project FGD who stated "…*When we bring technicians to repair the pump. They charge us and it is not cheap. There was a time when we were not able to raise the money and the community really suffered from lack of water..*". This observation was consistent with the findings of Hoko *et al*. (2009) and Narayan and Shah (2000) who observed that availability of skills and expertise on equipment maintenance was critical in ensuring regular functioning of the system for posterity. Mann (2003) further observed that providing a sustainable water supply to rural populations, neither begun or ended with drilling boreholes, but significantly depended on the knowledge, capacity and confidence of the local communities to repair and maintain the equipment and manage the financial contributions for ongoing costs.

In some projects, operation and maintenance manual was given to the community. Such projects had a head start in boosting community operation and maintenance skills as the documents served as reference material for consultation whenever challenges emerged. Establishment of project management structures including the constitution was equally important in sustaining the life of WASH projects. FGDs revealed that most project initiators emphasized on establishing projects but laid minimal effort in establishing structures that grounded the projects. Majority initiated the establishment of community management committees, which the projects were handed over. However, little effort was directed towards grounding the committees in well developed structures supported by organization constitution

nor the relationship between the project, committees and the communities properly defined. Such shortcomings created conflicts in projects, within management and in the communities hindering the smooth project operations and long term existence of the WASH projects. This observation was captured by a participant in Alendu water project FGD who remarked

> *"…we were asked to elect the management committee to run the project. We were not informed how the committee was to run the project, the rules they were to follow and how they would related to us. This created a lot of difficulties in managing the project..".*

This observation was consistent with the findings of Barron *et al*. (2007) who observed that increased knowledge of the rules, processes and aims of the project tended to limit the number of projects' malfunction conflicts and improved its chances of sustainability.

In instances where training was provided, no system was put in place to subsequently train new officials that joined the management team upon the exist of the original individuals gradually eased off by attrition, creating a skills gap. As captured in the Ranjira water project FGD quoted earlier, new officials that joined the projects never got trained creating a skills gap and malfunctioning of management. Training focused more on operations and much less on equipment maintenance, financial management and general organization management. As a result most projects degenerated to instability as a result of poor financial accountability and ineffective management committee. Yet other projects suffered from equipment breakdowns occasioned by inability to maintain them or raise sufficient funds for operation and maintenance.

Further, the influence of the different strength levels of community capacity building on sustainability of WASH projects was similarly analysed using a simple binary logistic regression model. The results of the single variable Wald's test are presented in Table 4.27

Table 4.27: Odds Ratio for Logistic Regression of Perceived Sustainability on Capacity Building

Strength							95% C.I.for EXP(B)	
	B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Capacity Building			47.402	2	.000			
Capa. Build (Strong)	2.661	.393	45.851	1	.000	14.304	6.622	30.895
Capa. Build (Moderate)	.670	.291	5.316	1	.021	1.954	1.106	3.454
Constant	-.251	.135	3.482	1	.062	.778		

The results in Table 4.27 confirms that the combined effect of community capacity building significantly influenced sustainability of projects (Wald's test: X^2 (2) =47.40, $p <$ 0.001). Similarly, the table shows that the odds ratios for strong community capacity building was 14.30 (CI: 6.62 to 30.90) and 1.95 (CI: 1.11 to 3.45) for moderate capacity building. This implies that strong capacity building was 14 times more likely to increase sustainability probabilities of WASH projects than weak levels while moderate levels were 2 times more likely to increase sustainability probabilities than weak levels, before accounting for confounding factors, implying that only strong communities capacities had a remarkable chance of sustaining the projects. This finding was consistent with the findings of Ahmad and Abu Talib (2014) in a study done in the province of Khyber Paktunkhawa, Pakistan who established that an increasing strength of community capacity building as a component of empowerment significantly increased sustainability of community-driven projects.

The two, however, did not consider the influence of capacity building independently on sustainability nor the impact of various strength levels of capacity building on sustainability of projects. This study concluded that for sustainable management of WASH projects, it becomes necessity that consistent capacity building programme is established for training the management committee and the larger community over an extended period of time during project life. The training should provide adequate skills on the areas on project management, financial management, technical skills and organization establishment and management. It is only then that the community could acquire adequate capacity to sustain the operations of WASH projects.

4.8 Community Empowerment Strategy and Perceived Sustainability of Water Sanitation and Hygiene

This sections presents analysis of the influence of community empowerment strategy on sustainability of projects. Community empowerment strategy is identified as an independent variable predictive of the dependent variable-sustainability of WASH projects. In this study, community empowerment strategy was measured by five indicators namely; the level of awareness by the community on the progress and challenges faced by their WASH projects, the capacity of the communities to find solutions to the challenges, capacity of the communities to make and cause implementation of decisions, community ability to elect and replace project leadership and their ability to ensure that project management are accountable for project operations. These indicators were evaluated by ten (10) questionnaire items and the findings presented under three sub-sections. The first sub-section provides a descriptive analysis of the community empowerment strategy, the second analyses the relationship between the empowerment strategy and sustainability of WASH projects while the third subsection discusses the observed relationship between the strategy and sustainability of WASH projects and compares findings with those of previous studies.

4.8.1 Mean Analysis of Community Empowerment Strategy

The subsection investigates the adequacy and strength of community empowerment strategy in WASH projects by analyzing the questionnaire items that explicated the strategy. It specifically evaluates the means of the individual items, the mean of means, the mean composite score and the respondents' perception on adequacy of community empowerment strategy in WASH projects as articulated in focus group discussions. The strategy was measured by five indicators that were evaluated by ten questionnaire items numbered from 4.1 to 4.10. The mean of the individual items evaluated the degree to which a proportion of respondents agreed with view expressed in the item. The mean of means assessed the extent to which the respondents agreed with the adequacy of community capacity building in WASH projects while frequencies and percentages were determined to quantify respondents in terms of their perception of the strength of community empowerment in the projects. The results of the analysis of means and the mean of means are presented in Table 4.28.

Table 4.28: Mean analysis of Community Empowerment Strategies

No	ITEM	N	SD	D	N	A	SA	Mean	Std. Dev
1	You have a good understanding of the challenges facing the project	384	30 (7.8%)	14 (3.6%)	31 (8.1%)	147 (38.3%)	162 (42.2%)	4.03	1.164
2	You and colleagues in the project can provide solutions to most of the challenges facing the project	384	88 (22.9%)	75 (19.5%)	28 (7.3%)	107 (27.9%)	86 (22.4%)	3.07	1.512
3	You and colleagues are able to ensure that action is taken on the decisions you make	384	44 (11.5%)	138 (35.9%)	33 (8.6%)	95 (24.7%)	74 (19.3%)	3.04	1.356
4	You and colleagues have authority to elect or replace management of project	384	53 (13.8%)	94 (24.5%)	29 (7.6%)	113 (29.4%)	95 (24.7%)	3.27	1.419
5	You and colleagues in the project have a good working relationship	384	37 (9.6%)	36 (9.4%)	21 (5.5%)	97 (25.3%)	193 (50.3%)	3.97	1.343
6	The project has a management committee that has the ability to coordinate project operations on behalf of the beneficiaries	384	48 (12.5%)	33 (8.6%)	36 (9.4%)	133 (34.6%)	134 (34.9%)	3.71	1.353
7	The project has benefits that are appreciated and enjoyed by yourself and other members of the community	384	8 (2.1%)	33 (8.6%)	18 (4.7%)	175 (45.6%)	150 (39.1%)	4.11	0.979
8	Project beneficiaries willingly and actively participate in the project activities	384	17 (4.4%)	34 (8.9%)	19 (4.9%)	174 (45.3%)	140 (36.5%)	4.01	1.082
9	You and colleagues can readily hold project management accountable for their actions	384	122 (31.8%)	68 (17.7%)	19 (4.9%)	93 (24.2%)	82 (21.4%)	2.86	1.591
10	You are confident that you can operate and maintain project facilities over a long period	384	85 (22.1%)	68 (17.7%)	19 (4.9%)	72 (18.8%)	140 (36.5%)	3.30	1.621

Item 1 in Table 4.28 examined the respondents' level of understanding of the challenges facing the projects. A mean score of 4.03 and a standard deviation of 1.164 was obtained. The results show that a majority of the respondents were in agreement that they had a good understanding of challenges facing the project. Item 2 assessed the capability of respondents and other project members or beneficiaries in providing solutions to the challenges facing the project. The analysis recorded a mean score of 3.07 and a standard deviation of 1.512. The finding shows that respondents were equally divided over the issue, either agreeing or disagreeing with the position. Item 3 examined whether respondents and the larger community were able to ensure that action was taken on the decisions they made over the project. Analysis of the item recorded a mean score of 3.04 and standard deviation of 1.356. The results similarly, presented an indifference opinion on respondents' view. While one half felt that they could cause action to be taken over their decision, the other half was in disagreement.

Item 4 examined whether the community had the authority to elect or replace members of the projects' management. The analysis returned a mean score of 3.27 and a standard deviation of 1.419. The results indicate that a slight majority of respondents were in agreement that the community had authority to appoint and replace members of the projects' management committees. Item 5 assessed the nature of the working relationships, good or otherwise, that existed among members of the project and beneficiaries. A mean score of 3.97 and a standard deviation of 1.343 was obtained. The results indicate that a majority of the respondents felt that they had good working relationships among themselves. Item 6 reviewed the management committee and whether it had the ability to coordinate project operations on behalf of the beneficiaries. The analysis returned a mean score of 3.71 and a standard deviation of 1.353. This shows that majority of respondents believed the projects were run by management committees that had the capacity to handle their responsibilities.

Item 7 reviewed project benefits and whether they were enjoyed and appreciated by members of the community. A mean score of 4.11 and a standard deviation of 0.979 was obtained. The result indicates that a majority of respondents were in agreement that they and the entire community enjoyed and appreciated the benefits of the projects. Item 8 assessed the willingness of project beneficiaries to participate in project activities. It recorded a mean score of 4.01 and a standard deviation of 1.082. The results show that a majority of the respondents were in agreement that project beneficiaries willingly participated in project activities. Item 9 assessed whether the community had authority to hold project management accountable for their actions. The results recorded a mean score of 2.86 and a standard

deviation of 1.591. These indicate that an equal number of respondents were in agreement and disagreement that they had such authority over the management committee. The final item 10 assessed the confidence of members of the community in operating and maintaining the project over a long period of time. A mean score of 3.30 and a standard deviation of 1.621 was recorded. The results show that a slight majority of the respondents were in agreement that the communities could indeed operate and maintain the projects into the distant future.

The findings show that the communities became more empowered when they appreciated and enjoyed the benefits of the projects, had a good understanding of the challenges facing the project, enjoyed good working relationships and participated willingly in the activities of the project. These were the areas of empowerment that contributed most in improving sustainability of the projects. However, a compromised ability of the community to hold project management accountable for their actions, ensure that action is taken on the decisions they make and provide solutions to the challenges facing the projects were the major community empowerment weakness that compromised projects sustainability probabilities.

The mean of means for all the 10 items that extricated community empowerment variable was further evaluated and the results presented in Table 4.29

Table 4.29: Community Empowerment Strategy Summary Statistics

	Statistic
Mean of means	3.54
Mean Standard deviation	1.342
Skewness	-0.326
Kurtosis	-0.527

Table 4.29 shows that the mean of means was 3.54 while the mean standard deviation was 1.342. The score distribution was marginally negatively skewed (-0.326) with the peak of the unimodal frequency distribution slightly flatter than a normal distribution (-0.527). This suggests that the composite scores had a near normal distribution that allowed application of parametric statistics. The mean of means signified that a majority of the respondents believed that the communities were adequately empowered to manage the projects. The study further quantified respondents based on their perception of the strength of community empowerment within the projects. To facilitate the analysis, the composite scores were

classified into three strength categories of weak (10-25), Moderate (26-35) and Strong (36-50) and analysed for frequencies and percentages. The results are presented in Table 4.30

Table 4.30: Perception of Respondents on Strength of Community Empowerment in WASH Projects

Perception	Frequency	Percentage
Strong	189	49.2
Moderate	145	37.8
Weak	50	13.0
Total	384	100.0

The results in Table 4.30 shows that 189 (49.2 %) respondents believed that community empowerment strategy in WASH projects was strong, 145 (37.8 %) felt the empowerment was moderate and only 50 (13.0%) considered it weak. This indicates that 87% of the respondents were confident that the strength of community empowerment strategy in WASH projects ranged from moderate and strong. An empowered community was therefore better able to manage their projects, understand challenges facing them and devise solutions. Such communities were therefore more able to sustain their projects for much longer periods. This observation was supported by focus group discussions which revealed that community level of empowerment varied with their ability to control project's processes. More empowered communities were able to easily overcome operation and maintenance challenges, relying on the good working relationship with the community to raise financial resources from water charges often paid without default, and at times raising additional funding by either temporarily increasing water user charges or through fund raising drives (Harambee). Empowered communities were perceived to have a controlling voice over project operations. They had authority over project decisions, how they are made and provided policy directions to the management committees. This was well articulated by a participant from Miguye water project FGD who stated

> *"..we can say we are empowered because we have the full authority over what happens in this project. We make our decisions and the committee implements. When they are not sure of anything, they organize a community meeting where decisions are made.."*

Empowered communities participated in regular appointment of project officials and were able to demand accountability on project performance from the leadership. This was elaborated by a participant from Rabour water project FGD who remarked '*..the community*

has authority. We replace non performing officials during annual meetings. In case of a serious mistake, a special can be convened where the community take necessary measures..". Such a community was also capable of finding solutions to project challenges, could demand and cause project management to organize project meetings, was committed to project activities and made follow-ups on progress.

Enthusiasm to attend project meetings was identified as good indicator for community empowerment. Large attendance of project meetings was indicative that community members appreciated and believed in the projects. That, they were aware they had an input to make and believed the project would provide opportunity for airing such views. This view was expressed by a participant in Obambo water project FGD who remarked "*…people are always ready to make an input that can improve the project. This can be seen in the large numbers that attend project meetings whenever they are organized. And people make good contribution..*". In other projects, empowered community were engaged in day to day project operations such as selling water to the other members of the community and were able to account for the funds realised. Yet in others, the community provided security for project equipment on routine basis and could arrest anyone involved in stealing or destruction of project property. This was clear from a participant in Gorogoro women group FGD who stated "*..all community members take responsibility for the project. Should one be found to destroy project property, any member can report you to the police or local administration..*"

However, communities were less empowered when they lost the ability to elect, replace or discipline officials in the management committee who then became powerful, took full control of the projects, made decisions and took actions that affected the project without consultation or reference to the community. Such communities were reduced to mere observers of project management and lacked authority to take any corrective action even in cases where the projects were failing. This scenario was well captured by a participant in Ranjira water project FGD who said "*..things are going wrong. The project is failing . What can we do. Who is there to listen..*".

4.8.2 Relationship between Community Empowerment and Perception of Sustainability of Water Sanitation and Hygiene Projects

This subsection presents analysis of the relationship between community empowerment strategy and perception of sustainability of WASH projects. It opens with a discussion on cross tabulation of the two variables to establish how the different strength levels of community empowerment strategy influenced sustainability of WASH projects in terms of frequencies and percentages. It proceeds to present a test for the hypothesis on the relationship between the two variables. The hypothesis was tested using the chi-square test for independence statistic and sought to establish if a significant association existed in the relationship. It closes with a presentation on analysis of the strength of the relationship of the two variables as evaluated by a simple binary logistic regression model.

4.8.2.1 Cross tabulation of sustainability by community empowerment

This subsection presents a 2 x 2 cross tabulation of community empowerment strategy and sustainability of WASH projects. Cross tabulation explored how different strength levels of community empowerment influenced sustainability of WASH projects in terms of frequencies and percentages. To facilitate this analysis, the composite scores for community empowerment data set were categorized into three strength bands of weak (10-25), moderate (26-35) and strong (36-50). Similarly, sustainability composite scores were categorised into binary classes of unsustainable (10-32) and sustainable (33-50). The results of the cross tabulation are presented in Table 4.31.

Table 4.31: Cross Tabulation of Perceived Sustainability by Strength of Community Empowerment

Strength	Sustainability				Total	
	Sustainable		Unsustainable			
	Frequency	%	Frequency	%	Frequency	%
Strong	157	40.9	32	8.3	189	49.2
Moderate	65	16.9	80	20.8	145	37.8
Weak	3	0.8	47	12.2	50	13.0
Total	225	58.6	159	41.4	384	100.0

Table 4.31 shows that out of 50 respondents who believed community empowerment strategy in WASH projects was weak, only 3 (0.8%) felt that the projects were sustainable. A majority 47 (12.2%) considered the projects unsustainable. Similarly, out of 145 respondents who held that community empowerment strategy was moderate, 65 (16.9%) considered the projects sustainable while 80 (20.8%) felt the projects were unsustainable. However, of the 189 respondents who believed that community empowerment strategy in projects was strong, a majority 157 (40.9%) felt that the projects were sustainable while only 32 (8.3%) considered them unsustainable. This suggests that an increasing strength of community empowerment from weak, moderate and strong levels significantly increased sustainability probabilities.

It is further evident that among the respondents who believed that community empowerment strategies in the projects were weak, majority also felt that the projects were unsustainable. This was the same case with moderate community empowerment efforts although the percentage difference between those who felt that the projects were either sustainable or unsustainable reduced considerably. However, among the respondents who believed that community empowerment strategy in projects was strong, majority felt that the projects were sustainable. This implies that sustainability probabilities of WASH projects increased with an increasing community empowerment.

It is further observed that weak and moderate levels of community empowerment generated less chances of sustaining projects (17.7%) than they contributed to unsustainable projects (33.0%). However, only strong empowerment provided a higher chance of sustaining projects (40.9%) than unsustainable ones (8.3%) signifying a five fold improvement in project sustainability. This observation reconfirmed that the probability of achieving sustainable projects became more definite when communities got more empowered. FGDs revealed that a community was empowered when it had authority over project decisions and how they were made, provided policy directions to the management committees, regularly appointed project officials and were able to demand accountability on project performance. It was concluded therefore that an increasing strength in community empowerment strategy in WASH projects result in a corresponding increase in the probabilities of sustaining the projects and that only a strong community empowerment strategy had a higher chance of generating more sustainable than unsustainable ones.

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4.8.2.2 Test of Hypothesis Three

This subsection tests the hypothesis that **c**ommunity empowerment strategy has a significant influence on sustainability of WASH projects in the informal settlements in Kisumu City and rural surroundings. The null hypothesis was stated as follows:

H_o III: Community empowerment strategy has no significant influence on sustainability of water sanitation and hygiene projects in informal settlements in Kisumu City and rural surroundings.

In order to evaluate this hypothesis, a chi-square test for independence was conducted on the sample data at 5% level of significance. The results are presented in Table 4.32.

Table 4.32: Chi-Squared Test for Perceived Sustainability of Projects Against Community Empowerment

	Value	Df	Asymp. Sig. (2- sided)
Pearson Chi-Square	114.997	2	.000
Likelihood Ratio	126.870	2	.000
Linear-by-Linear Association	114.695	1	.000
N of Valid Cases	384		

Table 4.32 shows Pearson chi-square test *p*-value (0.000) was less than the level of significance (0.05). This provided evidence for rejection of the null hypothesis. The null hypothesis was therefore rejected and the study concluded that a significant association existed between community empowerment strategy and sustainability of WASH projects (Pearson $X^2_2 = 115.00$, $p < 0.001$) at 5% level of significance. This observation was confirmed by the likelihood ratio test (LRT $X^2_2 = 126.87$, $p < 0.001$). Linear trend analysis further provided the significant association between the variables had a probable linear trend in the population ($X^2_1 = 114.70$, $p < 0.001$). This was consistent with previous findings by Ahmad and Abu Talib, (2014), ACP-EU (2012), Government of Zambia (2011), Partington and Totten (2012), Ogari (2012) and Edwards *et a*l (2007) that community empowerment had a positive significant influence on sustainability of projects and that empowered communities were better able to manage projects.

This observation was also supported by focus group discussion that associated community empowerment to sustainability of WASH projects. An empowered community took control of project decisions, was able to appoint project management, were committed to

the project objectives and directed project processes. In this manner, they were able to collectively overcome operation and maintenance challenges, easily raising financial resources from water user fees without default or at times raising additional funding from contributions through fund drives. This views were expressed by two participants in Miguye water project and Obambo women group FGDs as follows:

> *"we can say we are empowered because we have the full authority over what happens in this project. We make our decision and the committee implements. When they are not sure of anything, they organize a community meeting where decisions are made*" (Miguye Water project FDG).
>
> *"we are comfortable with the management and that is why we pay water user fee without default. When there is a major problem with the project, we can agree to collect funds among ourselves through harambee as we ones did"* (Obambo women group FDG).

A disempowered community in contrast exhibited poor interest in project activities, compromising management accountability and facilitating non- transparency and ineffectiveness. An Ineffective management attracted little commitment from the larger community and encountered frequent operational challenges that eventually compromised project performance and sustainability. Lack of interest in the projects was evident in the numbers that attended project meetings whenever they were organised. This was evident from a participant in Alendu water project FGD who equipped *"..the way this project is run has pissed off everyone. People no longer come for meeting even when invited..*".

In other projects, authority for decision making shifted from the community to the local administration or partially shared with the administration. In instances where the local administration took full control and hired an administrator to manage the project, the community had completely no voice in the management of the project. They became passive actors and made no effort or sacrifice to sustain projects activities even at points of imminent failure. Upon the collapse of such projects, members of the community reverted to periodical and unimproved water sources often found in distant places. Yet, the same community made no effort to revive the collapsed one. This scenario was captured by a participant in Yenga project FGD who retorted

> " *..this project was run by an administrator. As community we could only watch from a distance. When it initially broke down, it took too long to be repaired and we suffered for months. It was broken down again and we are really suffering yet we can do nothing..*"

The influence of different strength levels of community empowerment strategy on sustainability of WASH projects was further analysed using a simple binary logistic regression model. The results of a single variable Wald's test are presented in Table 4.33.

Table 4.33: Odds Ratio for Logistic Regression of Perceived Sustainability on Community Empowerment

Strength							95% C.I.for EXP(B)	
	B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Community Empowerment			78.911	2	.000			
Comm. Emp (Strong)	4.342	.626	48.067	1	.000	76.865	22.523	262.312
Comm. Emp (Moderate)	2.544	.618	16.919	1	.000	12.729	3.788	42.779
Constant	-2.752	.595	21.350	1	.000	.064		

The results in Table 4.33 confirms that community empowerment significantly influenced sustainability of projects [Wald's test: X^2 (2) =78.91, $p < 0.001$]. In addition, the odds ratios for strong community empowerment was 76.87 (CI: 22.52 to 262.31) and 12.73 (CI: 3.79 to 42.78) for moderate empowerment. The ratios show that strong levels of community empowerment were 77 times more likely to increase sustainability probabilities in WASH projects than weak levels while moderate levels were likely to increases sustainability probabilities in WASH projects 13 times more than weak levels before accounting for confounding factors. The study concluded that different strength levels of community empowerment had significant influence on sustainability variability in WASH projects. This relationship was positive and suggested that as strength levels of community empowerment increased from weak, moderate and strong sustainability probabilities of WASH projects increased significantly. These findings are consistent with the findings of Ahmad and Abu Talib, (2014) who, in a study done in the province of Khyber Paktunkhawa, Pakistan, observed that the increasing strength of community empowerment increased significantly the sustainability of community-driven projects. However, they were not able to establish the extent to which the different strength levels of empowerment influenced sustainability of community driven projects.

This study thus concludes that strong community empowerment does independently influence sustainability of WASH projects significantly. This influence is much higher with strong empowerment indicating that WASH projects must endeavour to significantly empower the local communities in order to realize sustainability in the long run

4.9 Community Conflict Management Strategies and Perception of Sustainability of Water Sanitation and Hygiene Projects.

This section analyses the influence of community conflict management strategy on sustainability of projects. Community conflict management strategy is identified as an independent variable predictive of the dependent variable-sustainability of WASH projects. In this study, community conflict management strategy was measured by the existence of conflict management structures (CMS) within WASH projects, level of operationalisation of CMS, capacity to manage conflicts within the projects and adequacy of decision making processes in the project. These indicators were evaluated by ten (10) questionnaire items and the findings presented under three sub-sections. The first sub-section provides a descriptive analysis of the community conflict management strategy, the second analyses the relationship between conflict management strategy and sustainability of WASH projects while the third subsection discusses the observed relationship between the strategy and sustainability of WASH projects and compares the findings with those of previous studies.

4.9.1 Mean Analysis of Community Conflict Management Strategy

In this subsection, adequacy and strength of community conflict management strategy used in WASH projects is determined. It specifically analyses the means of the individual items, the mean of means, the mean composite scores and the respondents' perception on adequacy of community conflict management strategy in WASH projects as articulated in focus group discussions. The strategy was measured by five indicators that were evaluated by ten questionnaire items numbered from 5.1 to 5.10. The mean of the individual items assessed the degree to which a proportion of respondents agreed with view expressed in the item. The mean of means evaluated the extent to which the respondents agreed with adequacy of community conflict management strategy in WASH projects while frequencies and percentages quantified respondents in terms of their perception of the strength of community conflict management strategy in the projects. The results of the analysis of means and the mean of means are presented in Table 4.34

Table 4.34: Mean analysis of Conflict Management Strategies

No	ITEM	N	SD	D	N	A	SA	Mean	Std. Dev.
1	There exist a mechanism to ensure equitable use of the project resources by project beneficiaries	384	39 (10.2%)	45 (11.7%)	47 (12.2%)	127 (33.1%)	126 (32.8%)	3.67	1.314
2	Meetings are held where project beneficiaries priorities and interests are discussed and reconciled	384	70 (18.2%)	81 (21.1%)	55 (14.3%)	94 (24.5%)	84 (21.9%)	3.11	1.433
3	Project management account for their actions in the meetings of the project	384	52 (13.5%)	118 (30.7%)	32 (8.3%)	130 (33.9%)	52 (13.5%)	3.03	1.316
4	Decisions are taken on project operations in a manner that is acceptable to majority of the project beneficiaries	384	43 (11.2%)	86 (22.4%)	45 (11.7%)	112 (29.2%)	98 (25.5%)	3.35	1.365
5	There is commitment by beneficiaries to decisions taken on project operation and maintenance	384	43 (11.2%)	78 (20.3%)	26 (6.8%)	153 (39.8%)	84 (21.9%)	3.41	1.327
6	Differences in the project are handled in a manner acceptable to the majority	384	58 (15.1%)	43 (11.2%)	27 7.0%)	131 (34.1%)	125 (32.6%)	3.58	1.425
7	There are forums for articulating beneficiaries views over the project	384	90 (23.4%)	85 (22.1%)	29 (7.6%)	114 (29.7%)	66 (17.2%)	2.95	1.465
8	There is a conflict management structure in place for resolving conflicts	384	46 (12.0%)	74 (19.3%)	107 (27.9%)	99 (25.8%)	58 (15.1%)	3.13	1.234
9	The conflict management structure is manned by individuals with skills in conflict resolution	384	51 (13.3%)	75 (19.5%)	99 (25.8%)	102 (26.6%)	57 (14.8%)	3.10	1.257
10	Conflicts are identified early and resolved before they worsen	384	145 (37.8%)	56 (14.6%)	41 (10.7%)	65 (16.9%)	77 (20.1%)	2.67	1.589

Item 1 in Table 4.34 examined the existence of a mechanism that could ensure equitable use of project resources by project beneficiaries. An evaluation of the item recorded a mean score of 3.67 and a standard deviation of 1.314. This indicates that majority of the respondents were in agreement that such a mechanisms existed. Item 2 assessed whether meetings were organized to discuss and reconcile priorities and interests of project beneficiaries. The item registered a mean score of 3.11 and a standard deviation of 1.433. The results show that an almost equal number of respondents were either in agreement or disagreement that beneficiary priorities and interest were reconciled in meetings of the project. Item 3 examined accountability for actions and whether projects' management were held to account in projects' meetings. The item analysis recorded a mean score of 3.03 and standard deviation of 1.316. The result indicates that an almost equal number of respondents were either in agreement or disagreement that the management were held to account in project meetings.

Item 4 reviewed how project decisions on operation and maintenance were made and whether such decisions were taken in a manner acceptable to the majority of project beneficiaries. The item mean score was 3.35 and standard deviation was 1.365. The results indicate that a slight majority of respondents believed that project decisions were arrived at in a popular manner. Item 5 assessed whether there was commitment by the beneficiaries to the decisions taken on project operation and maintenance. A mean score of 3.41 and a standard deviation of 1.327 was obtained. Similarly, only a slight majority of the respondents were in agreement that the beneficiaries showed commitment to the decisions made in the projects. Item 6 assessed whether differences in the projects were handled in a manner acceptable to the majority. A mean score of 3.58 and a standard deviation of 1.425 was obtained from the analysis. The results show that a majority of respondents were in agreement that conflicts in the projects were handled in a manner acceptable to the majority.

Item 7 investigated whether there existed fora where deliberations on project operations and progress were made by the beneficiaries. The results had a mean score of 2.95 and a standard deviation of 1.465. This indicates that an almost equal number of the respondents were either in agreement and disagreement that such fora existed. Item 8 looked at the existence of conflict management structures within the projects. The analysis recorded a mean score of 3.13 and a standard deviation of 1.234. The results similarly show that just about half of the respondents were positive that such conflict management structures existed within the projects. Item.9 investigated whether the conflict management structures were manned by individuals with skills in conflict resolution. The results recorded a mean score of

3.10 and a standard deviation of 1.257. Again, an almost equal number of respondents were either in agreement or disagreement that conflict management officials in the projects had the relevant skills for the assignment. The final item 10 assessed whether projects were able to identify conflicts well in time to enable early resolution before they worsen. The item analysis recorded a mean score of 2.67 and a standard deviation of 1.589. The results reveal that respondents were equally in agreement and disagreement that conflicts were identified and resolved in their early stages.

The findings show that employment of mechanism that ensured equitable use of the project resources and resolution of project conflicts through a popular initiative were the two conflict management strategies that contributed largely to managing conflicts in projects. However, delays in identifying and resolving conflicts and inadequate fora for articulating beneficiaries views were some of the obstacles to effective management of conflicts.

This observation was subjected to further analysis by evaluating the mean of means of the 10 items that extricated community conflict management strategy variable. The results are presented in Table 4.35

Table 4.35: Community Conflict Management Strategy Summary Statistics

	Statistic
Mean of means	3.20
Mean standard deviation	1.373
Skewness	-0.165
Kurtosis	-1.114

Table 4.35 shows the mean of means was 3.20 while the mean standard deviation was 1.373. The score distribution was marginally negatively skewed (-0.165) with the peak of the unimodal frequency distribution more flatter than a normal distribution (-1.114). This suggests that the scores had a near normal distribution that allowed application of parametric statistics. The mean of means indicated that respondents were not fully certain that conflict management strategies employed by the projects were effective in managing conflicts. The study further quantify respondents in terms of their perception of the strength of community participation within the projects. To facilitate this analysis, the composite scores were classified into three strength categories of weak (10-25), moderate (26-35) and strong (36-50) and analysed for frequencies and percentages. The results are presented in Table 4.36

Table 4.36: Perception of Respondents on Strength of Conflict Management Strategy in WASH Projects

Perception	Frequency	Percentage
Strong	161	41.9
Moderate	100	26.0
Weak	123	32.0
Total	384	100.0

The results in Table 4.36 show that 161 (41.9 %) respondents believed that conflict management in WASH projects was strong, 100 (26.0 %) felt that it was moderate and123 (32.0%) considered it weak. Overall, 261 (67.7%) respondents rated conflict management strategies as either strong and moderate implying that the communities considered the existing conflict resolution strategies in the projects were adequate. Strong conflict management strategies ensured that conflicts were effectively resolved before they could become violent and substantially improved the chances of the projects existing smoothly into the distant future.

This observation is supported by focus group discussions that revealed that the strength of conflict management strategies varied across projects and depended on adequacy of conflict management structures that were in use and capacities to manage the structures within the projects. Different conflict management mechanisms were employed in different projects to manage conflicts in a project environment. Some projects relied of their constitution as the initial mechanism for managing emerging conflicts. Constitutions that had strong provisions on role and responsibilities of project officials, and rules of procedure were perceived to provide stronger conflict deterrence than constitutions with weak provisions or where non existed. This observation was captured from a participant from Gorogoro women group who said "*our constitution has strong provisions on roles and responsibilities of officials and regulations that guide our project. This reduces our differences*".

Once conflicts occurred, some projects utilized internal management structures such as committee meetings, general meetings and community meetings as avenues for managing conflicts. These structures varied in strength and in projects where they were strong, they provided opportunity for parties in conflict to air grievances and seek arbitration before the conflicts could escalate to destructive levels. Projects that lacked the structures or where the

structures were moribund showed inability managed most immerging conflicts often leading to major disagreement among members.

Other projects used suggestion boxes as points of collecting comments and complaints in real time for review. Such avenues offered opportunities for airing concerns anonymously and aided in reducing potential conflicts. Yet in other projects external conflict resolution structures, sorely or in combination with the internal structures were used. Local administration and local water department were the preferred external structures for conflict resolution. Projects that had internal structures and local administration as two levels of conflict resolution registered a more effective way of managing conflicts than those where only one structure existed. However, projects where internal structure existed but were moribund and the local administration came out strongly as the main point of redress were less effective in managing conflicts. This observation was expressed by a participant from Kadongo water pan FGD who, upon being asked what the level of conflict in the project was retorted

> " *conflict levels are very high. The management committee which should be addressing them is ineffective and biased. The local administration has taken advantage and now is interfering with the running of the project. This has created even more division in the project*".

In other projects, local administrative structures formed an advanced conflict management level that was only engaged when internal structures failed. This approach was perceived to be more successful in managing conflicts than in projects where local administration was used as a first point of conflict resolution. This view was captured from the responses of two participants from Soko Komanji water project and Kadongo water pan FGs who had these to say

> *"..you see, our committee understand us and are able to bring us to an understanding even when there are major differences. In instances where they fail or where one party is dissatisfied, they recommend or even fix a meeting with the local administration for arbitration and it works well for us*".

The other remarked

> "*..conflicts get out of hand because some people do not have faith in our committee members. When a conflict arise and the committee invite parties for arbitration, before it is resolved you hear one party as reported to the local administration for a parallel arbitration. This only worsen the differences*".

It was further evident that conflict management skills of persons charged with the responsibility of managing conflict, either within internal structures or at the local administration level, were critical. Projects that had good conflict management skills were better able to manage conflicts within its ranks than those with poor conflict management skills. This view was presented by one participant from Soko Komanji water project FGD who said "*our officials handle any differences in the project well. We have not seen cases when the differences get out of hand*". It is concluded therefore that the extent to which conflict management structures are applied in projects and the abilities to manage them determine the strength of conflict management strategy employed by the projects.

4.9.2 Relationship between Conflict Management Strategy and Perception of Sustainability of WASH Projects

This subsection presents analysis of the relationship between community conflict management strategy and sustainability of WASH projects. It opens with a discussion on cross tabulation of the two variables. Cross tabulation was performed to establish how different levels of strength of community conflict management strategy influenced sustainability of WASH projects in terms of frequencies and percentages. It proceeds to present a test of the hypothesis on the relationship between the two variables. The hypothesis was tested using the chi-square test for independence statistic and sought to establish if a significant association existed in the relationship. It closes with a presentation on analysis of the strength of the relationship of the two variables as evaluated by a simple binary logistic regression model.

4.9.2.1 Cross Tabulation of Perceived Sustainability by Community Conflict Management

The subsection presents a 2 x 2 cross tabulation of community conflict management strategy and sustainability of WASH projects. Cross tabulation explored how different strength levels of community conflict management influenced sustainability of WASH projects in terms of frequencies and percentages. To facilitate this analysis, the composite scores for community conflict management data set were categorized into three strength bands of weak (10-25), moderate (26-35) and strong (36-50). Similarly, sustainability composite scores were categorised into binary classes of unsustainable (10-32) and sustainable (33-50). The results of the cross tabulation are presented in Table 4.37

Table 4.37: Cross Tabulation of Perceived Sustainability by Strength of Conflict Management

Strength	Sustainability				Total	
	Sustainable		Unsustainable			
	Frequency	%	Frequency	%	Frequency	%
Strong	140	36.5	21	5.5	161	41.9
Moderate	61	15.9	39	10.2	100	26.0
Weak	24	6.3	99	25.8	123	32.0
Total	**225**	**58.6**	**159**	**41.4**	**384**	**100.0**

Table 4.37 shows that out of 123 respondents who considered community conflict management strategies in WASH projects weak, 24 (6.3%) felt that the projects were sustainable while a majority 99 (25.8%) considered the projects unsustainable. However, out of 100 respondents who believed that the strength of community conflict management strategy in the projects was moderate, 61 (15.9%) considered the projects sustainable while a minority 39 (10.2%) felt that the projects were unsustainable. Similarly, of the 161 respondents who believed that community conflict management measures was strong, a majority 140 (36.5) felt that the projects were sustainable while only 21 (5.5%) considered the projects unsustainable. Generally conflict management efforts accounted for 58.6% sustainable projects. Whereas weak and moderate conflict management efforts produced less sustainable projects (22.2%) than unsustainable projects (36.0%), strong conflict management strategies produced a 7 fold improvement on sustainability of projects (36.5% sustainable against 5.5% unsustainable). This suggested that the probability of achieving sustainable projects became more definite as community conflict management efforts were intensified.

It is further evident that among the respondents who believed that community conflict management strategies in projects were weak, majority also felt that the projects were unsustainable. Similarly, majority of the respondents who believed that conflict management efforts in projects were moderate and strong, also felt that the projects were sustainable. This implies that confidence toward sustainable projects increased considerably as perception on the strength of community conflict management increased from moderate (15.9% sustainable against 10.2% unsustainable) to strong (36.5 %sustainable against 5.5% unsustainable). The study concluded that an increase on the strength of community conflict management strategy in projects from weak, moderate and strong resulted in a corresponding increase in

sustainability probabilities of WASH projects. Additionally, only strong conflict management strategy was likely to guarantee project sustainability since weak and moderate strategies had higher probabilities of creating unsustainable projects.

4.9.2.2 Test of Hypothesis Four

This subsection tests the hypothesis that there exist a significant relationship between community conflict management intervention strategy and sustainability of WASH projects in the informal settlements in Kisumu City and rural surroundings. For purposes of evaluating this hypothesis, the null hypotheses were stated as follows:

H_o IV: There is no significant relationship between conflict management intervention strategy and sustainability of water sanitation and hygiene projects in informal settlements in Kisumu city and rural surroundings

In order to test this hypothesis, a chi-square test for independence was conducted on the sample data at 5% level of significance. The results are presented in Table 4.38.

Table 4.38: Chi-Squared Test for Perceived Sustainability of Projects Against Conflict Management

	Value	Df	mp. Sig. (2-sided)
Pearson Chi-Square	131.056	2	.000
Likelihood Ratio	141.088	2	.000
Linear-by-Linear Association	128.890	1	.000
N of Valid Cases	384		

Table 4.38 show that Pearson chi-square test results returned a *p*-value (0.000) less than the level of significance (0.05). This provided enough evidence for rejection of the null hypothesis. The study thus rejected the null hypothesis and concluded that there was a significant association between community conflict management strategies and sustainability of WASH projects (Pearson: $X^2_2 = 131.06$, $p < 0.001$) at 5% level of significance. This observation was confirmed by the likelihood ratio test (LRT: $X^2_2 = 141.09$, $p < 0.001$). Linear trend analysis further provided evidence that the association between community conflict management strategies and sustainability of WASH projects had a probable linear trend in the population ($X^2_1 = 128.89$, $p < 0.001$). The observation was consistent with earlier findings by Barron et al. (2007), Holahan and Mooney (2004), Warner (2000) and World Bank (1998)

that confirmed a significant association between conflict management strategies in projects and sustainability of the projects

This observation was supported by focus group discussion that associated community conflict management strategy to sustainability of WASH projects. FGDs revealed that elaborate conflict management mechanism had an influence in the long term and smooth management of projects. Projects where the structures were non existent, moribund or manned by biased officials, the membership and the larger beneficiary community were more dissatisfied and divided over the project's direction and performance. These projects faced major community participation challenges and were more susceptible to failure. The view was expressed by a participant in Alendu water project FGD and Kandongo water pan FGD who had this to say

> *"..the structures that could address conflict such as the committee are themselves divided."* (Alendu water project FGD). *"..conflicts get out of hand because some people do not have faith in our committee members. When a conflict arise and the committee invite parties for arbitration, before it is resolved you hear one party as reported to the local administration for a parallel arbitration. This only worsen the differences.."* (Kandongo water pan FGD)

Similarly, a project constitution was considered an important mechanism for minimizing project conflicts, which in turn enhanced project sustainability. A project constitution aided in preventing conflicts by defining roles and responsibilities of project officials and other stakeholders. This view was evident from an expression of participant in Gorogoro women group FGD who remarked "..our *constitution has strong provisions on roles and responsibilities of officials and regulations that guide our project. This reduces our differences*." This observation was consistent with the findings of Barron *et al.* (2007) and Holahan and Mooney (2004) that revealed a clear relationship between community knowledge of the project, conflict and sustainability of projects. Barron *et al*. (2007) in a study of the Kecamatan Development Project (KDP), Indonesia observed that increased knowledge of the rules, processes and aims of the project tended to limit the number of project malfunction conflicts—the most destructive form of development-triggered conflict in Indonesia.

In projects where conflict management skills were wanting or the officials were viewed as biased by the community, conflict levels were high and project performance was considerably down rated by the community. Such projects registered low community

confidence and commitment to its cause. This observation was expreseed by a participant in Rangira water project FGD who, when asked how conflict management should be improved in the project, responded " *we need training for our officials in conflict management. Some of these officials are themselves divisive and are more inclined to adding salt to an injury whenever issues arose"*.

This relationship was further investigated using a simple binary logistic regression model that assessed the effect of the different strength levels of community conflict management strategies on sustainability of WASH projects. The single variable Wald's tests results are presented in Table 4.39.

Table 4.39: Odds Ratio for Logistic Regression of Perceived Sustainability on Conflict Management

Strength							**% C.I.for EXP(B)**	
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Conflict Management			104.045	2	.000			
Conf. Magt (Strong)	3.314	.326	103.106	1	.000	27.500	14.505	52.138
Conf. Magt (Moderate)	1.864	.306	37.056	1	.000	6.452	3.540	11.759
Constant	-1.417	.228	38.790	1	.000	.242		

The results in Table 4.39 confirm that community conflict management strategy had a significant influence on the sustainability of WASH projects (Wald's test: X^2 (2) =104.05, $p < 0.001$). In addition, the odds ratios of sustainability at 95% confidence level were 27.5 (CI from 14.51 to 52.14) for strong conflict management measures and 6.5 (CI from 3.54 to 11.76) for moderate measures. The ratios show that strong levels of conflict management were 27.5 times more likely to increase sustainability probabilities in WASH projects than weak levels while moderate levels were 6.5 times more likely to increase sustainability probabilities in projects than weak levels, before accounting for confounding factors.

This implies that projects should endeavour to develop strong conflict management strategies in order to improve their chances of sustainability. Projects with weak conflict management mechanisms were more likely to become unsustainable than sustainable. These observation could, however, not be compared to previous studies as no study could be identified that examined the extent of these relationships. The study concluded that the different strength levels of conflict management strategy (strong, moderate and weak)

contributed significantly to explaining variability in sustainability probabilities. The relationship was positive and suggested that an increasing strength of community conflict management strategies significantly increased sustainability probabilities of WASH projects. Strong conflict management strategy had far better chances of sustaining WASH projects when compared to moderate or weak strategies.

4.10 Community Ownership and its Relationship with Community Intervention Strategies and Perception of Sustainability of Water Sanitation and Hygiene Projects

This section analyses the moderation effect of community ownership on the relationship between community intervention strategies and sustainability of WASH projects. Community ownership is identified as a moderating variable influencing the relationship between the intervention strategies (independent variables) and sustainability of WASH projects, the dependent variable. In this study community ownership of WASH projects was measured in terms of the level of community knowledge and acceptance of the projects, level of community support to the projects, level of commitment to the projects' activities, level of satisfaction with the projects' benefits and level of significance of the projects to communities. These indicators were evaluated by ten (10) questionnaire items and the findings presented under four sub-sections. The first sub-section presents a descriptive analysis of the community ownership strategy. The second subsection analyses the relationship between community ownership and sustainability of WASH projects while the third subsection presents analysis of the moderation effect of community ownership on the relationship between community intervention strategies on sustainability of WASH projects. The last subsection discusses this relationship and compares the findings with previous studies.

4.10.1 Mean Analysis of Community Ownership strategy.

This subsection examines the adequacy and strength of community ownership of WASH projects by evaluating the individual questionnaire items that explicated the strategy. It analyses the means of the individual items, the mean of means, the mean composite score and the respondents' perception on adequacy of community ownership strategy of WASH projects as articulated in focus group discussions. The strategy was measured by five indicators that were evaluated by ten questionnaire items numbered from 6.1 to 6.10. The mean of the individual items evaluated the degree to which a proportion of respondents agreed with view expressed in the item. The mean of means and the mean of the composite

scores assessed the extent to which the respondents agreed with the adequacy of community ownership of WASH projects while frequencies and percentages were determined to quantify respondents in terms of their perception of the strength of community ownership of the projects. The results of the analysis of means and the mean of means are presented in Table 4.40.

Table 4.40: Mean analysis of Community Ownership Strategies

No	ITEM	N	SD	D	N	A	SA	Mean	Std. Dev.
1	The project is run by the community with minimal influence from the sponsors	384	37 (9.6%)	6 (1.6%)	31 (8.1%)	78 (20.3%)	232 (60.4%)	4.20	1.256
2	The community appoints a committee that manage the project activities on their behalf	384	41 (10.7%)	19 (4.9%)	34 (8.9%)	163 (42.4%)	127 (33.1%)	3.82	1.245
3	The committee has final authority over the decisions they make	384	35 (9.1%)	68 (17.7%)	21 (5.5%)	119 (31.0%)	141 (36.7%)	3.68	1.362
4	You and colleagues clearly understand the purpose and benefits of the project to the community	384	11 (2.9%)	19 (4.9%)	26 (6.8%)	182 (47.4%)	146 (38.0%)	4.13	.943
5	The project addresses the community and your key water and sanitation priorities	384	24 (6.3%)	34 (8.9%)	20 (5.2%)	47 (12.2%)	259 (67.4%)	4.26	1.257
6	You are committed and participate in the activities of the project willingly	384	21 (5.5%)	23 (6.0%)	18 (4.7%)	119 (31.0%)	203 (52.9%)	4.20	1.128
7	You and members of the community provide your own resources to operate and manage the activities of the project	384	11 (2.9%)	24 (6.3%)	21 (5.5%)	149 (38.8%)	179 (46.6%)	3.49	1.560
8	You and Project beneficiary community appreciate the benefits of the project	384	46 (12.0%)	74 (19.3%)	107 (27.9%)	99 (25.8%)	58 (15.1%)	4.20	.997
9	The beneficiaries are satisfied with management of the Project	384	64 (16.7%)	34 (8.9%)	25 (6.5%)	130 (33.9%)	131 (34.1%)	3.60	1.451
10	You and local community identify with the project as your own and take pride in it	384	24 (6.3%)	39 (10.2%)	20 (5.2%)	115 (29.9%)	186 (48.4%)	4.04	1.228

Item 1in Table 4.40 examined the extent of community involvement in the management of the projects and the role of donors. The item mean score was 4.20 and a standard deviation was 1.256. The results indicate that a majority of respondents believed that the communities were in-charge of the projects' management and received minimal influence from donors. Item 2 assessed how the management committees were appointed and whether the appointments were made by the community. The item recorded a mean score of 3.82 and a standard deviation of 1.245. These results indicate that majority of respondents were in agreement that the community were responsible for the appointment of project management committees. Item 3 examined the level of authority that the management committees had over the decisions they made. The item mean score was 3.68 with a standard deviation of 1.362. This similarly indicates that majority of respondents were of the view that the committees had full authority over the decisions they made.

Item.4 examined whether the respondents and the larger community understood the purpose and benefits of the projects. The mean score of the analysis was 4.13 and the standard deviation was 0.943. This indicates too that a majority of the respondents believed they and rest of the community understood and appreciated the benefits of the projects. Item 5 assessed whether the project addressed key community water and sanitation priorities. The results recorded a mean score of 4.26 and a standard deviation of 1.257. Again, the results show that a majority of the respondents were in agreement that the projects addressed their priority water and sanitation needs. Item 6 reviewed the commitment to the respondents to the project and whether their participation was through their own will. The analysis mean score was 4.20 with a standard deviation of 1.128. This results show that a majority of respondents believed that the communities were committed to the project and participated in the activities of the projects willingly.

Item 7 assessed the extent to which communities provided resources for operation and maintenance of project activities. The item mean score was 3.49 with a standard deviation of 1.560. The results show that a small majority of respondents were in agreement that the communities contributed finances that were used for operation and maintenance in the projects. Item 8 the benefits of projects to the community and whether the community appreciated these benefits. The results mean score was 4.20 with a standard deviation of 0.997. The results indicate that a majority of the respondents were in agreement that communities appreciated the benefit of the projects. Item 9 looked at the beneficiaries satisfaction with the management of the project. The analysis returned a mean score of 3.60 and a standard deviation of 1.451. This indicate that a small majority of the respondents had

confidence with the management of the projects. Finally, item 10 examined the extent to which the communities identified with the projects as their own and took pride on them. It recorded a mean score of 4.04 and a standard deviation of 1.228. The results show that a majority of the respondents were indeed in agreement that they took pride in the projects, which they considered their own.

Overall, the findings show that minimal intervention by project sponsors on project implementation, projects' target on key community priorities, appreciated projects' benefits and commitment to project activities by members of the communities were the main enhancers of community ownership. However, less willingness by the communities to contribute resources for operation and maintenance, less satisfaction with the project management and the inability of the management committees to take full control of the decisions they make were the key obstacles to community ownership.

This observation was subjected to further analysis by evaluating the mean of means of the 10 items that extricated community ownership strategy variable. The results are presented in Table 4.41

Table 4.41: Community Ownership Strategy Summary Statistics

	Statistic
Mean	3.96
Standard deviation	1.243
Skewness	-1.298
Kurtosis	2.393

Table 4.41 shows that the mean of means was 3.96 while the mean standard deviation was 1.243. The scores distribution was negatively skewed (-1.298 with the peak of the unimodal frequency distribution more pointed than a normal distribution (2.393). The mean of means indicate that majority of the respondents believed that community ownership of the projects was adequate. The study further quantify respondents in terms of their perception of the strength of community participation within the projects. To facilitate the analysis, the composite scores were classified into three strength categories of weak (10-25), moderate (26-35) and strong (36-50) and analysed for frequencies and percentages. The results are presented in Table 4.42

Table 4.42: Perception of Respondents on Strength of Community Ownership in WASH Projects

Perception	Frequency	Percentage
Strong	301	78.4
Moderate	66	17.2
Weak	17	4.4
Total	384	100.0

The results in Table 4.42 show that 301 (78.4 %) respondents believed that community ownership of WASH projects was strong, 66 (17.2 %) considered the ownership moderate while 17 (4.4%) felt it was weak. Strong community ownership implied that communities had interest and support the projects which, was crucial for the long term sustainability of the projects. This observation was supported by focus group discussions that revealed that community ownership of the projects varied with the extent of community attachment to the projects. Projects were perceived as either community owned in cases of strong community ownership or as belonging to the management committee, individual members of the community and donors in cases of weak community ownership. From a simplistic perspective, a project was perceived as community owned when it bore the community name decided upon by the community. This view was evident in the remark of a participant in Miguye water project FDG who, upon being asked to what extent the community identified with the project, responded

> "*..there is no doubt the project belong to us. That is why it was given the community name. The problem is, however, that project benefits still trickle down to only few individuals located in close proximity to the project site and that is why a larger part of this community may still feel neglected. There is need to expand the project to cover every member so that many can appreciate the project*".

Yet other individuals felt more attached to a project merely at being sited on a public land donated by the community. This was evident from the sentiment of a participant in Miguye water project FGD who remarked "*.. the project is for the community that is why it is located on public land donated by the community*.." Projects sited on public land donated by the community enjoyed better community confidence than those constructed on private land,

and which the title deed remained with the private owner, whether he or she was a member of the project or not. The misgivings were that projects in private land always reverted back to the land owners whenever management faltered. This fear was expressed by a participant in Alendu water project FGD who remarked *"..when the committee collapsed, the landlord took over management of the project for some years. We later renegotiated to have it back.."* In one case where the management committee still active, the land owner who was also a member of the management committee assumed full control of the committee and had unrivaled influence over policy decisions.

An in-depth view considered community owned projects as those that the community has ability to regularly elect the management committee and hold the officials accountable. Such committees consulted regularly with the community and provide adequate feedback on project progress and challenges. These projects enjoyed higher community support and commitment. Water user fees were fixed by consensus and paid promptly, often with minimal defaults. The projects could also easily raise additional funds for operation and maintenance through funds drives. This view was expressed by two participants in Gorogoro women group and Obambo water project FGDs who remarked

> *" ..you know, all this things go together. We need to have a strong management committee. This should be a committee that we have ourselves appointed and we should have the authority to question them or remove any or all of them from office if need be.."* (Gorogoro women group). *"..we are comfortable with the management and that is why we pay water user fee without default. When there is a major problem with the project, we can agree to collect funds among ourselves through harambee as we ones did.."* (Obambo water project)

In contrast, projects viewed as committee owned had the management committees taken over project control, making and implementing decisions with minimal consultation with the community. Members of such committees were able to stay longer in offices by avoiding elections generally eroding community attachment to the projects. This view was presented by participants from Ranjira water project and Kadongo water pan FGDs who remarked as follows:

"..we see the project as belonging to the committee because they no longer inform or involve us in what they do yet, we are also not able to make any changes.." (Ranjira water project). *"..the committee has been in office for too long and they no longer*

call community meetings for fear that the community may demand elections.."(Kadongo water pan)

Some projects were individual controlled, often a powerful member of the committee or landlord for projects located in private land. Project decisions rested with the individual who operated with minimal consultation with the other committee members or the community. This sentiments were expressed by a participant from Alendu water project who stated "*..the project is controlled by the chairman. No one can oppose him in the committee..*" Yet other projects were perceived as donor owned. The donor appointed the administrator who took charge of project operations, collecting water user fees and utilising the proceeds without consultation or reference to the community. This was presented in Marango water spring FGD by a participant who retorted "*This project belongs to the government. They are the ones who brought the administrator. He charged water user fee and collected the money. But when the pump broke down, he simply disappeared without a word and we now suffe*r".

4.10.2 Relationship between Community Ownership and Perception of Sustainability of Water Sanitation and Hygiene Projects

This subsection presents analysis of the relationship between community ownership strategy and sustainability of WASH projects. It cross tabulates community ownership and sustainability of WASH projects to assess how the different strength levels of community ownership influence sustainability of WASH projects in terms of frequencies and percentages. This relationships is then tested for significance using the chi-square test for independence statistic. It closes with a presentation on the analysis of the extent to which community ownership influence sustainability of WASH projects as evaluated by a simple binary logistic regression model.

4.10.2.1 Cross Tabulation of Perceived Sustainability of WASH projects and Community Ownership

This subsection presents a 2 x 2 cross tabulation of community ownership strategy and sustainability of WASH projects. Cross tabulation explored how different strength levels of community ownership influenced sustainability of WASH projects in terms of frequencies and percentages. To facilitate this analysis, the composite scores for community ownership data set were categorized into three strength bands of weak (10-25), moderate (26-35) and strong (36-50). Similarly, sustainability composite scores were categorized into binary classes

of unsustainable (10-32) and sustainable (33-50). The results of the cross tabulation are presented in Table 4.43

Table 4.43: Cross Tabulation of Perceived Sustainability by Strength of Community Ownership

Strength	Sustainability				Total	
	Sustainable		Unsustainable			
	Frequency	%	Frequency	%	Frequency	%
Strong	214	55.7	87	22.7	301	78.4
Moderate	10	2.6	56	14.6	66	17.2
Weak	1	0.3	16	4.2	17	4.4
Total	225	58.6	159	41.4	384	100.0

Table 4.43 shows that 301 (78.4 %) of the respondents were in agreement that community ownership of the projects was strong , 66 (17.2%) considered the strength level moderate while only 17 (4.4 %) were convinced their ownership of the projects was weak. Among the respondents who believed that community ownership of WASH projects was weak, only 1 (0.3%) felt that the projects were sustainable. A majority 16 (4.2%) considered the projects unsustainable. Similarly, out of 66 respondents who felt that community ownership of the projects was moderate, 10 (2.6%) considered the projects sustainable while 56 (14.6%) felt that the projects were unsustainable. However, of the 301 respondents who believed that community ownership of the projects was strong, a majority 214 (55.7%) also felt that the projects were sustainable while only 87 (22.7%) considered the projects unsustainable.

It is evident that weak community ownership contributed to only 0.3% sustainable projects, moderate ownership accounted for 2.6% sustainable projects while strong community ownership resulted in 55.7% sustainable projects. This implies that the increasing strength of community ownership increased project's sustainability probabilities. Similarly, it is observed that a majority of respondents who believed that community ownership of the projects was weak, also felt that the projects were unsustainable. This was also the case with moderate community ownership efforts. However, among the respondents who believed that community ownership of the projects was strong, majority also felt that the projects were sustainable.

It is further observed that while overall community ownership accounted for 58.6% sustainable projects when compared to 41,4% unsustainable projects, weak and moderate community ownership strengths produced rather less sustainable projects (2.9%) than unsustainable projects (18.8%) and only strong community ownership produced more sustainable projects (55.7%) than unsustainable projects (22.7%). This implies that sustainability of projects was more likely to be guaranteed only when strong community ownership was achieved, other determinants held constant. Moderate and weak community ownership were more likely to generate unsustainable rather than sustainable projects. This study was however, not able to find previous studies that analyzed similar relationships for comparison. It was therefore concluded that an increasing strength in community ownership of WASH projects resulted in a corresponding increase in sustainability probabilities of projects. Weak and moderate community ownership had higher probabilities of generating unsustainable projects than sustainable ones whereas strong community ownership had a 2 fold probability of sustaining WASH projects.

A chi-square test for independence was performed on sample data to assess if a significance association existed between community ownership and sustainability of the projects at 5% level of significances. The results are presented in Table 4.44.

Chi-Squared Test for Perceived Sustainability of Projects Against Community Ownership

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	90.202	2	.000
Likelihood Ratio	95.212	2	.000
Linear-by-Linear Association	82.670	1	.000
N of Valid Cases	384		

The results in Table 4.44 show a significant association between community ownership and sustainability of projects (Pearson: X^2_2 =90.20, $p < 0.001$). Additionally, the association depicted a probable linear trend in the population (X^2_2 =82.67, $p < 0.001$). These findings are consistent with the findings by ACP-EU (2012), UNICEF (2007) and Arnold *et al*. (2009) that confirmed that community ownership significantly influence sustainability of projects. The findings were supported by focus group discussion that revealed an association of community ownership to sustainability of WASH projects. Projects that had strong community ownership enjoyed better community support and commitment. They were less prone to incidences of theft, vandalism and defaults in the payment of water user fees,

improving their chances of survival in the long run. However, projects that enjoy less community ownership, and seen as either committee, donor or individually owned received minimal community support and were more prone to incidences of theft, vandalism and defaults in payment of water user fees, compromising their sustainability.

The FGDs further revealed that cost sharing through provision of free labour and local materials had better influence on ownership. Communities that participated in cost sharing considered the projects as belonging more to them and made additional effort to sustain them. This sentiments were articulated by a participant from Soko Komanji project who said "*..KWAHO came without a drilling machine and asked community to provide labour through hand digging. We elected our committee to run the project and we have our project..*" Similarly, communities with a strong sense of project ownership were more purposeful in choosing project leadership and reviewing performance, always endeavouring to sustain project. In certain instances, the community participated in providing security to project property whenever faced with security challenges. This had the double effect of securing project equipment and reducing project operation costs, boosting sustainability probabilities. This was expressed by a participant in respondent who stated "*After the cases of theft, we resolved to guard the project in turn using a timetable. The homesteads near the project site were tasked with that responsibility"*. FGDs further revealed that projects that were sited in private land as opposed to public land enjoyed minimal community ownership that negatively impacted on their sustainability as the community was less committed to their course. This was consistent with observation by Osland (2010) in case study of water well in Las Trancas village, El Salvador who found that lack of community-held land titles threatened the long-term project sustainability if landowners withheld permission for entrance to the well or imposed conditions on use of the water.

4.10.2.2 Regression of Community Ownership on Perceived Sustainability of WASH projects

The extent to which community ownership influence sustainability of WASH projects was evaluated using a simple binary logistic regression model. The results of a single variable Wald's tests are presented in Table 4.45.

Table 4.45: Odds Ratio for Logistic Regression of Perceived Sustainability on Community Ownership

Strength							95% C.I. for EXP(B)	
	B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Community Ownership			61.790	2	.000			
Comm,Own (Strong)	3.673	1.039	12.505	1	.000	39.356	5.140	301.344
Comm. Own (Moderate)	1.050	1.086	.934	1	.334	2.857	.340	24.028
Constant	-2.773	1.031	7.235	1	.007	.063		

Table 4.45 shows that the combined effect of community ownership had a significant influence on sustainability of WASH projects (Wald's test: X^2 (2) =66.655, $p < 0.001$). It further shows the odds ratios of sustainability at 95% confidence level for strong Community ownership as 39.4 (CI from 5.14 to 301.34) and 2.9 (CI from 0.34 to 24.09) for moderate Community ownership. The odds ratios indicate that strong community ownership was 39 times more likely to increase sustainability probabilities of WASH projects than weak levels while moderate ownership was thrice as likely to increase sustainability probabilities of WASH projects as weak ownership, before accounting for confounding factors. It was concluded that the different strength levels of community ownership (weak, moderate and strong) significantly contributed to variabilities in sustainability probabilities. This is a positive association implying that an increasing strength of community ownership significantly increase sustainability of WASH projects. Strong ownership increased sustainability probabilities 39 times over weak probabilities and 13 fold over moderate levels.

4.10.3 Analysis of the Moderation Effect of Community Ownership on the Relationship between the Independent Variables and Perceived Sustainability of Projects

This subsection examines the moderation effect of community ownership on the relationship between community intervention strategies and sustainability of WASH projects. It begins with a presentation of the analysis of the simultaneous effect of all the intervention strategies on sustainability of WASH projects. It further evaluates interactions among the variables and closes with the analysis of the moderation effect of community ownership on the relationship between the independent and depended variables using final binary logistic regression model.

In order to examine the simultaneous effect of the independent and moderating variables on sustainability of WASH projects, adjusting for confounding factors, the variables were fitted in a final binary logistic regression model and analysed at 5% level of significance. The Wald's tests results are presented in Table 4.46.

Table 4.46: Output from Logistic Regression of Perceived Sustainability on All Independent Variables

							95% C.I.for	
	B	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Comm_Part_Cata			15.560	2	.000			
Comm_Part_Cata(strong)	-1.997	.579	11.916	1	.001	.136	.044	.422
Comm_Part_Cata(moderate)	-1.630	.444	13.470	1	.000	.196	.082	.468
Capa_Build_Cata			12.526	2	.002			
Capa_Build_Cata(strong)	1.846	.538	11.770	1	.001	6.335	2.206	18.186
Capa_Build_Cata(moderate)	.944	.449	4.414	1	.036	2.570	1.065	6.200
Comm_Emp_Cata			7.988	2	.018			
Comm_Emp_Cata(strond)	1.779	.787	5.111	1	.024	5.923	1.267	27.688
Comm_Emp_Cata(moderate)	.785	.704	1.243	1	.265	2.192	.552	8.705
Conf_Magt_Cata			22.940	2	.000			
Conf_Magt_Cata(strong)	2.405	.539	19.929	1	.000	11.080	3.854	31.852
Conf_Magt_Cata(moderate)	1.811	.433	17.490	1	.000	6.116	2.617	14.291
Comm_Own_Cata			28.690	2	.000			
Comm_Own_Cata(strong)	2.892	1.170	6.107	1	.013	18.022	1.819	178.582
Comm_Own_Cata(moderate)	.401	1.205	.111	1	.739	1.493	.141	15.843
Constant	-4.006	1.250	10.265	1	.001	.018		

Table 4.46 shows that community ownership contributed significantly in explaining sustainability probabilities in WASH projects after accounting for the effect of the remainder variables (Wald's: X^2_2 =28.69, p< 0.001). The same observation was recorded for capacity building (Wald's: X^2_2 =12.53, p = 0.002), community empowerment (Wald's: X^2_2 =7.99, p= 0.018), conflict management (Wald's: X^2_2 =22.94, p< 0.001) and community participation (Wald's: X^2_2 =15.56, p< 0.001). The Exp (B) for strong capacity building was 6.34, and represented the odds ratio of project sustainability comparing strong capacity building to weak capacity building. Exp (B) for moderate capacity building was 2.57, representing the odds ratio of project sustainability comparing moderate capacity building to weak capacity building. Similarly, strong community empowerment had an odds ratio of 5.92 against 2.19

for moderate empowerment. The odds ratio for strong conflict management was 11.08 and 6.12 for moderate conflict management while that of strong community ownership was 18.02 against 1.49 for moderate ownership. Further, strong community participation had an odds ratio of 0.14 compared to 0.20 for moderate participation

The odds ratios reveal that strong capacity building was 6.34 times more likely to influence sustainability probabilities in projects when compared to weak capacity building and 2.57 times for moderate capacity building when compared to weak capacity building at 5% level of significance and after adjusting for confounding effects. Similarly, strong community empowerment was 5.92 times more likely to influence sustainability probabilities in projects than weak community empowerment while moderate community empowerment was 2.19 times more likely to influence the probabilities than a weak one. The results further indicate that strong conflict management increased 11.08 times sustainability probabilities in projects when compared to weak management while moderate conflict management strategy had a 6.12 times more influence over a weak one.

Further, strong community ownership accounted for 18.02 times more sustainability probabilities in projects than weak ownership and 1.49 times more for moderate community ownership than a weak one. However, Strong and moderate community participation was 0.14 and 0.20 times respectively more likely to reduce sustainability probabilities than weak participation levels. These show that the increasing strength of community capacity building, empowerment, conflict management and ownership resulted in an increase on sustainability probabilities of WASH projects, after accounting for the effect remainder of the variables at 5% level of significance. In contrast, the increasing strength of community participation had a decreasing influence on sustainability of WASH project at 5% level of significance and after accounting for confounding factors. This could imply that certain aspects of community participation had some level of mediocrity which when enhanced had a diminishing effect on project sustainability.

This was consistent with the observation by Cole (2006) in a case study of the effect of information on empowerment that lead to sustainable tourism in eastern Indonesia. He observed that communities were able to effectively participate in decision making in development only when they understood the development processes and the variety of development options that were available, otherwise their participation rarely move beyond passive participation due to lack of knowledge, confidence, capital, skills and self-belief. Such uninformed lukewarm participation led to observed dismal performance of development projects. Similar scenarios observed in most African countries at their independence when

certain administrative functions taken over from the colonial governments were quickly run down by uninformed local participation.

Further analysis involved the examination of the interaction effect between the independent and moderating variables. The first step involved the analysis of two-way interactions. The results are summarized on Table 4.47

Table 4.47: LR Test Results for Assessing Two-Way Interaction Effects on Perceived Sustainability of Projects Probabilities

Interaction involving		**Likelihood Ratio Test**		
Variable 1	**Variable 2**	**Deviance Change**	**DF**	**p-Value**
Community ownership	Community participation	0.997	3	0.802
Community Ownership	Capacity Building	9.963	3	0.019
Community Ownership	Community empowerment	1.960	3	0.581
Community Ownership	Conflict management	2.746	3	0.433
Community Participation	Capacity Building	5.021	3	0.170
Community Participation	Community empowerment	18.922	4	0.001
Community Participation	Conflict management	21.857	4	0.000
Capacity Building	Community empowerment	2.466	2	0.291
Capacity Building	Conflict management	11.383	4	0.023
Community empowerment	Conflict management	4.894	2	0.087

Table 4.47 indicates that only the interactions between community ownership and capacity building (LRT: X^2_3 =9.963, p= 0.019), community participation and community empowerment (LRT: X^2_3 =18.922, p= 0.001), community participation and conflict management (LRT: X^2_4 =21.857, p< 0.001), and capacity building and conflict management (LRT: X^2_4 =11.383, p= 0.023) were significant in explaining sustainability probabilities in projects, the rest were insignificant.

In order to assess the moderation effect of community ownership on the relationship between the combined independent variables and the dependent variable, the study developed an appropriate and a final binary logistic regression model that was able to analyse the interaction effects among the variables. In developing the final model, all independent variables were included in the analysis up to the second interaction level. Then, using backward elimination non significant interactions and those with high p-values were removed

in a stepwise process until a reduced final model was developed. The model that was used to test hypothesis Five on the moderation effect of community ownership on the relationship between the independent and dependent variables in this study.

4.10.3.1 Test of Hypothesis Five

The study hypothesized that community ownership had a significant influence on the relationship between community intervention strategies and sustainability of water sanitation and hygiene projects in informal settlements in Kisumu City and rural surroundings. In order to evaluate this hypothesis, the null hypothesis was stated as follows:

H_o V: Community ownership has no significant influence on the relationship between community intervention strategies and sustainability of water sanitation and hygiene projects in informal settlements in Kisumu City and rural surroundings

The null hypothesis was evaluated using a final binary logistic regression model at 5% level of significance. Table 4.48 presents the results of the logistic regression.

Table 4.48: Output from Logistic Regression of Perceived Sustainability on All Independent Variables

	B	S.E	Exp(B)	95% CI for $e^{\hat{\beta}_i}$ Lower-Upper	Z	P
Intercept	-4.0272	1.0183	-	-	-3.955	7.66e-05
Com.Part	-1.1453	0.3693	0.3181	0.1543 - 0.6561	-3.101	0.00193
Cap.Build	3.5950	1.1319	36.416	3.9611 - 334.78	3.176	0.00149
Com.Emp	1.5200	0.3484	4.5722	2.3098 - 9.0508	4.363	1.28e-05
Conf.Magt	1.2055	0.4100	3.3384	1.4947 - 7.4565	2.940	0.00328
Com.Own	4.2196	1.0344	68.006	8.9550 - 516.45	4.079	4.52e-05
Cap.Build:Com.Own	-2.8033	1.1896	0.0606	0.0059 - 0.6239	-2.356	0.01845

Null deviance: 507.83, 374 df; Residual deviance: 320.26, 368 df

Table 4.48 shows that the overall model was appropriate and significant (deviance difference = 187.57, df = 6; P<0.001). The model is given by:

$$\log\left(\frac{\hat{\pi}(x)}{1-\hat{\pi}(x)}\right) = -4.0272 - 1.1453x_1 + 3.5950x_2 + 1.5200x_3 + 1.2055x_4 + 4.2196x_5 - 2.8033x_2x_5$$

Where, $x_i (i = 1,2,\ldots 5)$ are community participation, capacity building, community empowerment, conflict management and community ownership respectively.

Similarly, it indicates that the influence of community participation (P=0.002), capacity building (P=0.001), community empowerment (P<0.001), conflict management (P=0.003), community ownership (P<0.001) and the interaction between capacity building and community ownership(P<0.02) were significant at 5% level of significance. And because at least one of the partial regression coefficients was not zero, it provided enough evidence for the rejection of the null hypothesis. The null hypothesis was thus rejected and concluded that community ownership has a moderation effect on the relationship between capacity building and perceived sustainability of WASH projects. This effect was, however, not significant for the rest of the variables.

First, it is evident from Table 4.48 that community ownership had a significant moderation effect in the relationship between capacity building and perceived sustainability of WASH projects. This suggested that an improvement on the capacities of the communities in managing project activities improved community ownership of the projects that consequently led to sustainability. This was consistent with the findings by Waisbord (2006) who, in a review of Change Project Interventions designed to develop capacity in health promotion in Peru between 2002 and 2005, observed that long-term sustainability of capacity development in the projects promoted ownership that in-turn improved sustainability of the projects. The same observation was made by USAID (2008) in an evaluation of USAID sponsored WASH programme in Ethiopia. It was observed that improving community capacities enabled them to take over responsibility for management, operation and maintenance of project facilities and in the process improved their ownership of the projects and overall project sustainability.

Second, it is observed that community ownership had no significant moderation effect on the relationship between community participation, community empowerment, community conflict management strategies and perceived sustainability of WASH projects. This was

contrary to earlier findings by Ahmad and Abu Talib (2014), Partington and Totten (2012) and Buykx *et al.* (2012). Partington and Totten, in a case study of Rochdale community, UK who observed that through aggressive community engagement in project activities, effective capacity building, regular consultation and involvement in decision making, Rochdale community was adequately empowered. They took ownership of the project and were able to sustain it over the years. Buykx *et al.* in an evaluation study of Elmore Primary Health Service (EPHS) in rural Victoria, Australia observed too that the use of community champions in project promotional activities facilitated active community participation that led eventually to absolute ownership of the project processes. Ahmad and Abu Talib (2014) observed that the relationship between community empowerment and sustainability of community driven projects was strongest for individuals with strong sense of community. Given that the construct of community empowerment in their research was measured by community participation, community capacity building and community access to information, it implied that relationships between the variables and sustainability of community driven project were similarly moderated by sense of community, which had some aspect of community ownership.

Lastly, the findings however suggest that a strongly empowered community, one with informed participation and effective conflict management structures need not develop a community sense of project ownership in order to positively impact sustainability, sustainability can still be realized irrespectively. This imply that even in community projects where project initiation was poor and the community less identified with the projects, chances of sustaining the projects existed as long as the communities were strongly empowered, there were effective conflict management systems and the communities had an informed active participation. The study emphasize on informed participation which projects must ensure by educating, sensitizing and guiding the local communities on the available participation modalities.

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSION AND RECOMMEDATIONS

5.1. Introduction

This chapter presents the summary of findings, conclusion, contribution to the body of knowledge and recommendations. Summary of findings section presents summary of main findings and the hypothesis test results for each study objective. Based on these findings, conclusion are made and presented under each study objective. New information generated from this study and which does not confirm previous studies have been isolated and presented as the study contribution to the body of knowledge. The chapter closes with a presentation of the study recommendations derived from findings, emerging policy issues and identified gaps in knowledge that are recommended for further research.

5.2. Summary of Findings

This subsection presents a summary of findings based on the five objectives that guided the study. First, the study investigated the influence of community participation on perceived sustainability of WASH projects. The study noted that community involvement in appointment or elections of community project management committees, regular consultation between the management committee and the community on issues of operation and maintenance and community participation in training especially in operation and maintenance were most crucial participation opportunities that had major impact on projects perceived sustainability. It demonstrated that minimal influence from project promoters or other external sources, community confidence in the projects management committees appointed by themselves and an informed community knowledgeable of roles and responsibilities in the projects were crucial factors that enhanced projects perceived sustainability. Perceived sustainability was however, compromised by minimal consultation between the project and communities on issues of operation and maintenance, minimal use of community project promoters and inadequate platforms for articulating community concerns over project operations.

The study demonstrated that community participation significantly influenced perceived sustainability of WASH projects at 5% level of confidence ($P< 0.001$). The relationship was positive indicating that an increasing strength of community participation resulted in a corresponding increase in the projects' perceived sustainability probabilities. Specifically, strong and moderate community participation was more likely to increase

project perceived sustainability probabilities than weak participation by 8 and 1.3 times respectively. It was similarly observed that moderate and weak community participation generated more unsustainable projects (34.9%) than sustainable ones (25.8%) and only strong community participation was likely to guarantee sustainable projects (32.8%) over unsustainable ones (6.5%), other determinants held constant. This, in essence, meant that strong community participation increased five fold a project's chance of realizing perceived sustainability over unperceived sustainability.

Second, the study investigated the influence of community capacity building on perceived sustainability of WASH projects. It established that capacity building in the form of training on operation and maintenance, and establishment of project structures were the most important in sustaining the projects. Such trainings should involve the projects' management committee and a larger number of members of the community to extend the skills pool. Specifically, operational skills were crucial on financial management, project or organisational management and conflict management while equipment servicing and repair were key maintenance skills. It was also important that training is provided as a process with follow-ups rather than as a one-time event.

The absence of a programme that build capacity on these areas was the largest obstacle to realizing projects' perceived sustainability. It was demonstrated that community capacity building significantly influenced perceived sustainability of WASH projects at 5% level of confidence ($P< 0.001$). This relationship was positive and indicated that an increase in the strength of community capacity building resulted in a corresponding rise on perceived sustainability probabilities of the projects. Strong community capacity building was 14 times more likely to increase projects perceived sustainability probabilities and twice as likely for moderate levels than weak levels, before accounting for confounding factors. In addition, it was observed that only strong community capacity building measures could guarantee sustainable projects (23.2%) over unsustainable ones as moderate and weak capacities led to more unsustainable projects (39.3%) than sustainable ones (35.4%), other determinants held constant. This indicated that strong community capacity building was able to increase 10 fold the probability of sustaining WASH projects.

Third, the study analysed the influence of community empowerment on perceived sustainability of WASH projects. A community was considered empowered if it had authority over project decisions and how they were made, was capable of providing policy directions to the management committees, regularly appointed project management committees which they were also able to hold accountable. Such communities could cause project management

to organize project meetings, were capable of finding solutions to project challenges and committed to project activities and meetings evidenced by large attendance. In some projects such communities could engage in the day to day project operations or provide security for project equipment on structured basis, taking initiative to identify and hold to account anyone involved in the destruction of project property. The study established that community empowerment was more profound when communities appreciated and enjoyed the benefits of the projects, had a good understanding of the projects' challenges, enjoyed good working relationships amongst them and willingly participated in the activities of the project. However, a community that had limited ability to hold project management accountable for their actions, ensure that action is taken on the decisions they make and provide solutions to the challenges facing the projects were less empowered which, in turn compromised projects perceived sustainability probabilities.

The study demonstrated that community empowerment significantly influenced perceived sustainability of WASH projects at 5% level of confidence ($P< 0.001$). This association was positive indicating that an increasing strength of community empowerment resulted in a corresponding increase on the projects perceived sustainability probabilities. It was specifically demonstrated that strong and moderate community empowerment was more likely to increase projects perceived sustainability probabilities over weak empowerment levels by 77 times and 13 times respectively, other determinants held constant. Similarly, it was observed that while strong community empowerment could guarantee sustainable projects (40.9%) over unsustainable projects (8.3%), moderate and weak empowerment levels were more likely to lead to unsustainable projects (33.0%) than sustainable projects (17.7%). This in essence meant that strong community empowerment increased 5 fold the chances of sustaining projects.

Fourth, the study examined the influence of community conflict management on perceived sustainability of WASH projects. Conflict was perceived to arise majorly out of differences in sharing the limited water resources, biasness on the part of management in handling normal operation processes, poor accountability for project resources and limited space for consultation. Conflicts were exacerbated either by absence of conflict resolution mechanism, differences within the dispute resolution committee or biasness within the team. It was established that the use of mechanisms that ensured equitable use of the project resources and resolution of project conflicts through a popular initiative were the two major conflict management strategies that contributed largely to effective conflict management leading to enhanced project perceived sustainability. However, delays in identifying and

resolving conflicts and inadequate fora for articulating beneficiaries views were major obstacles to effective management of conflicts that compromised projects perceived sustainability probabilities.

The study demonstrated that community conflict management significantly influenced perceived sustainability of WASH projects at 5% level of confidence ($P< 0.001$). This association was positive denoting that an increasing strength of community conflict management strategy led to increased projects' perceived sustainability probabilities. Consequently, strong community conflict management strategies was 27.5 times more likely to increase projects perceived sustainability probabilities than weak levels and 6.5 times more likely for moderate levels, before accounting for confounding factors. It was further demonstrated that moderate and weak conflict management strategies were more likely to lead to unsustainable projects (36.0%) than sustainable projects (22.2%), and only strong strategies guaranteed sustainable projects (36.5%) over unsustainable ones (5.5%). This basically meant that strong community conflict management strategies increased project perceived sustainability probabilities 7 fold.

Lastly, the study analysed the influence of community ownership on perceived sustainability of WASH projects and its moderation effects on the relationship between community intervention strategies and perceived sustainability of the projects. Community ownership was perceived as a feeling by the community that a project belonged to them and that they had a voice over how it was run. From a simplistic view, a project was perceived as community owned when it bore the community name and was located in a public site donated by the community. A deeper view considered community owned projects as those which the community had authority to regularly elect the management committees and hold them accountable, and the committees made regular consultation and provided adequate information on project progress and challenges to the communities. Such projects incorporated cost sharing through provision of free labour and local materials, and enjoyed community support and commitment. Projects that suffered minimal community ownership were those which the communities lost control of the management committees. Such committees made and implementing project decisions without consultation with the community. The committee members were elections phobic and maintain their executive positions over long periods by avoiding elections. In some of these projects, project decisions were made by powerful individuals who operated with minimal consultation with other committee members or the wider community. Others were donor controlled or managed by administrators appointed by the donors.

The study established that minimal intervention by project initiators during project implementation, appreciated projects' benefits by the communities, commitment to project activities by members of the communities and community priority projects were the enhancers to community ownership. However, less satisfaction with project management, inability of the management committees to take control over decisions made and unwillingness by the communities to contribute resources for operation and maintenance were the major impediment to community ownership. It further demonstrated that community ownership significantly influenced perceived sustainability of WASH projects at 5% level of confidence ($p< 0.001$). This association was positive and indicated that an increasing strength of community project ownership resulted in an increased project perceived sustainability probabilities. Specifically, strong community Ownership was 39 times more likely to increase projects perceived sustainability probabilities than weak levels and 3 times more likely for moderate levels, before accounting for confounding factors. The study further demonstrated that moderate and weak ownership levels were more likely to lead to unsustainable projects (18.8%) than sustainable projects (2.9%), and only strong community ownership could guaranteed sustainable projects (55.7%) over unsustainable projects (22.7%), other determinants held constant. This basically meant that strong community ownership was able to increase 2 fold the probability of sustaining WASH projects.

The study further demonstrated that there was a significant simultaneous effect of all the independent variable; Community participation, community capacity building, community empowerment, community conflict management and the moderating variable-community ownership on perceived sustainability of projects at 5% level of significance ($p< 0.001$), after accounting for confounding effects. It was further demonstrated that community ownership had a significant moderation effect on the relationship between capacity building and perceived sustainability of WASH projects, after accounting for confounding effects ($p = 0.018$). No significant moderation effect was however, observed in the relationship between community participation, empowerment and conflict management with perceived sustainability of WASH projects.

5.3 Conclusion

This study analysed the influence of community intervention strategies on perceived sustainability of WASH projects. It specifically reviewed the influence of community participation, community capacity building, community empowerment and conflict management on perceived sustainability of WASH projects and the moderation effect of community ownership on the relationship between the invention strategies and perceived sustainability of WASH project. The study established that community participation, capacity building, empowerment, conflict management and ownership either independently or simultaneously, influenced perceived sustainability of WASH projects significantly at 5% level of significance. The increasing strength of the intervention strategies from weak, moderate and strong had a significant positive influence on perceived sustainability. However, when confounding factors were considered, the increasing strength of community participation decreased perceived sustainability probabilities. The study further established that community ownership had indeed a significant moderation effect on the relationship between community capacity building and perceived sustainability of projects. There was however no significant moderation effect on the relationship between community participation, empowerment and conflict management on perceived sustainability of WASH projects.

5.4 Recommendations

Based on its findings, this study makes the following recommendations. First, quality community participation has a significant contribution to projects perceived sustainability. Projects should endeavour to strength community participation through promotional activities, involvement of community champions, aggressive community engagement in project activities including appointment of project management and in decision making in order to achieve the highest possible level of participation since weak or moderate participation has an hindrance effect to project perceived sustainability. Projects should ensure adequate community involvement in all aspects of the project to improve on their perceived sustainability. Second, projects should ensure that the target communities are enabled to participate in the projects from an informed and skilled position otherwise their participation may negatively impact perceived sustainability of project implementation out of mediocrity. Third, Capacity strengthening of the project community is critical for successful implementation and perceived sustainability of projects. Capacity building should target both the project management and the wider community to expand a skills pool.

Fourth, capacity building should take the form of training and development of project structures such as the constitution, constitutional offices and management procedures. Training should focus on project operations and maintenance and should be delivered through a process approach as opposed to a one time event approach. Critical operation areas should include project and organization management, financial management and conflict management while capacity building on maintenance should focus on equipment servicing, replacements and spare parts acquisition. Firth, community empowerment is a significant determinant to WASH projects' perceived sustainability. Empowerment is realized when the community develops the ability to understand the challenges facing their projects and define solutions for them. Empowerment is developed when the communities are enabled to manage the project on their own with minimal external help, elect own project leadership, participate in project activities, contribute a portion of project resources in terms of labour, finances and materials and allowed to make project decisions. Sixth, strong community empowerment is critical in ensuring sustainable projects and projects must endeavour from project inception to empower the communities to take charge of the project activities and decisions affecting them with minimal assistance from foreign bodies.

Seventh, Community conflict management strategy are essential for sustainable project management. Effective strategies are critical in preventing conflicts, identifying developing conflicts at early stages and resolving or reducing their impact. Effective conflict management strategy demand application of different management strategies which may be either internal or external to the project. Internal conflict management structures should be the first line of conflict resolution and could incorporate external structures as the second level of conflict management.

Eighth, Internal structures should include an appropriate project or organisation constitution that describe internal power relationship and the relationship of the project and the community. Others structures should include opinion boxes, conflict committees and community conflict resolution fora. External structure may include the local administration and line government departments. These structures should be used only as second tier structures that only deal with arbitration. Ninth, conflict management committees should be manned by responsible officials equipped with effective conflict management skills. Such officials should uphold integrity and show unbiased handling of conflict issues.

Lastly, strong community ownership has a far better effect in sustaining WASH projects than moderate and weak ownership. Projects should therefore endeavour to ensure

that community ownership is realized at the highest possible level for improved perceived sustainability.

5.5 Recommendation for Future Research

The study recommends that future studies should examine how sole dependence on internally generated funds for operation and maintenance of WASH projects and a sustained injection of external funding in the projects influence project perceived sustainability. Empirical information is required to provide answers as to which of the two scenarios is more sustainable as most development agencies advocate for full community self reliance in managing local development projects.

5.6 Contribution to body of Knowledge

This study examined the extent to which community intervention strategies: participation, capacity building, empowerment, conflict management and ownership independently and simultaneously influence perceived sustainability of WASH projects and the moderation effect of community ownership on this relationship. Little information exist beyond establishing a significant association between individual independent variables and perceived sustainability of projects from previous studies. Neither has the moderation effect of community ownership on the relationship between the intervention strategies and perceived sustainability of WASH projects been investigated. The findings of this study thus provide significant contributions to the body of knowledge. The new findings are listed below.

No	Objective	Contribution to body of Knowledge
1	To examine the extent to which community participation strategy influence perceived sustainability of water sanitation and hygiene projects in peri-urban estates of Kisumu City and rural surroundings	1. In a strength scale of weak (10-25), moderate (26-32) and strong (33-50) on the Likert derived scale, strong community participation can increase five fold the chances of achieving sustainable project over unsustainable ones 5 % level of significance 2. Only strong community participation can guarantee sustainable projects, other determinants held constant. Weak and moderate community participation are more likely to generate more

		unsustainable projects than sustainable ones 3. The chances of sustaining WASH projects are increased 1.3 times when community participation is strengthened from weak to moderate levels and 8 fold when the strength levels are strong. 4. Active uninformed community participation hampers rather than enhance WASH projects perceived sustainability
2	To assess the extent to which community capacity building strategy influence perceived sustainability of water sanitation and hygiene projects in peri-urban estates of Kisumu City and rural surroundings	1. In a strength scale of weak (10-25), moderate (26-32) and strong (33-50) on the Likert derived scale, strong community capacity building can increase 10 fold the probability of realizing sustainable projects over unsustainable projects at 5 % level of significance 2. Only strong community capacity building can guarantee sustainable projects when other determinants are held constant. Weak and moderate community participation are more likely to generate unsustainable projects than sustainable ones 3. The chances of sustaining WASH projects are doubled when capacity building effort are intensified from weak to moderate levels and increased 14 fold by strong levels
3	To examine the extent to which community empowerment strategy influences perceived sustainability of water sanitation and hygiene projects in peri-urban estates of Kisumu City and rural surroundings	1. In a strength scale of weak (10-25), moderate (26-32) and strong (33-50) on the Likert derived scale, strong community empowerment can increase 5 fold the probability of attaining sustainable projects over unsustainable projects. 2. Only strong community empowerment can guarantee sustainable projects when other determinants are held constant. Weak and moderate community participation are more likely to generate unsustainable projects than sustainable ones

		3. The chances of sustaining WASH projects are increased 13 times when empowerment effort are enhanced from weak to moderate levels and 77 times when the efforts get to strong levels
4	To establish the extent to which community conflict management strategy influences perceived sustainability of water sanitation and hygiene projects in peri-urban estates of Kisumu City and rural surroundings.	1. In a strength scale of weak (10-25), moderate (26-32) and strong (33-50) on a Likert derived scale, strong community conflict management can increase 7 times the probability of realising sustainable projects over unsustainable projects. 2. Only strong community conflict management can guarantee sustainable projects when other determinants are held constant. Weak and moderate community participation are more likely to generate unsustainable projects than sustainable ones 3. The chances of sustaining WASH projects are doubled when conflict management efforts are upscaled from weak to moderate levels and increased 14 fold by strong levels
5	To determine the extent to which community ownership influences the relationship between the community intervention strategies and perceived sustainability of water sanitation and hygiene projects in peri-urban estates of Kisumu City and rural surroundings	1. In a strength scale of weak (10-25), moderate (26-32) and strong (33-50) on the Likert scale, strong community ownership can double the probability of achieving sustainable projects over unsustainable projects. 2. Only strong community ownership can guarantee sustainable projects when other determinants are held constant. Weak and moderate community participation are more likely to generate unsustainable projects than sustainable ones 3. Chances of sustaining WASH projects are tripled when community ownership improves from weak to moderate levels and increased 39 fold when ownership becomes strong. 4. Community ownership has moderation effect on

	the relationship between community capacity building and perceived sustainability of WASH projects. When the capacities of the communities are improved, they tend to develop more ownership of the projects and subsequently improve their perceived sustainability. 5. An improvement in community empowerment and conflict management strategies does not necessarily lead to improved community ownership of the projects

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APPENDICES

APPENDIX I: LETTER OF TRANSMITTAL

Dear Respondent,

RE: REQUEST TO INTERVIEW

I am Erastus Orwa, a PHD student at the University of Nairobi, department of Project Planning and Management based at the Kisumu Campus. I am conducting a research focusing on project implementation strategies and their influence on perceived sustainability of the projects. We shall focus on government or donor promoted/funded water sanitation and hygiene (WASH) projects implemented within peri-urban estates of Kisumu and the surrounding Kombewa, Maseno and Kadibo divisions. In this research, we intend to have interviews with representative of projects' sponsors, government officers in the Ministries of Health and Environment and Natural Resources, projects' members and sampled individual households implementing water and sanitation projects. The interview will seek your view on the level of community participation, capacity building and empowerment during project implementation. We shall also explore existing conflict management systems/structures within the projects and the level of community ownership. Your views together with others will enable the research team to determine the perfect combination of strategies that will in future guarantee perceived sustainability of WASH projects in this region.

Participating in this interview has no direct benefit to the participant and is purely voluntary. The interview should take approximately 40 minutes to complete, but you are free to withdraw, if need be, at any point without any penalty or risks. The information obtained will be held in confidence and only used for academic purposes. We shall also share with you the findings of this research. With this information, you may now need to decide if you will participate or not. If you accept to participate, kindly sign the participants statement below.

Thank you

Yours faithfully,

Erastus Orwa
PhD. Student-University of Nairobi

Participants Statement:
This research has been explained to me and the intent and purpose understood. I volunteer to participate.

Signature of respondent……. Date……..

APPENDIX II: SURVEY QUESTIONNAIRE

Project Implementation Strategies in Water, Sanitation and Hygiene Projects

SQ001: Survey Questionnaire

Target Participants: Head of Households

	Project Implementation strategies in Water, Sanitation and Hygiene Projects in Peri-urban estates in Kisumu Town and Rural Surroundings Survey Questionnaire		
	QUESTIONS	RESPONSES	INSTRUCTIONS
1.0	INTRODUCTIONS		
1.1	Date of Interview		DD/MM/YY
1.2	INTERVIEWER ID.		
1.3	RESEARCH AREA	☐ 1. Kanyawegi ☐ 2. Manyata B ☐ 3. BAR A ☐ 4. Korando B ☐ 5. Nyamware S. ☐ 6. Kochieng ☐ 7. Marera ☐ 8. North Alungo	Tick the most appropriate
1.4	Which type of government or donor funded WASH project is implemented in this area?	☐ Water pan/dam ☐ Bore hole ☐ Rain water harvesting system ☐ Sanitatation facilities ☐ Spring	
1.5	What is the name of the project ?		
1.6	What interest do you have in the project?	☐ Chairman ☐ Vice chairman ☐ Secretary ☐ Vice secretary ☐ Treasurer ☐ Ordinary Member ☐ Beneficiary ☐ Others	Tick as appropriate
1.9	When was the project started?		
1.10	Does the project continue to receive funding from its donor for operation and maintenance	☐ Yes ☐ No ☐ Don't Know	Tick as appropriate
1.11	If No, how long ago was	☐ Less than one year	Tick as appropriate

	the last external funding received for operations and maintenance	☐ Less than two years ☐ Less than 5 years ☐ More than five years ☐ Don't Know	
1.12	What attracted you involvement in the project activities?	☐ My group's project ☐ romotion effort by government or donor institutions ☐ My Own interest I ☐ luence from friends/ relatives ☐ Project benefits	Tick as appropriate
1.13	How do you rate the project in order of your priority?	☐ High priority ☐ Medium priority ☐ Low priority ☐ Not a priority	Tick as appropriate

	To what extent do you agree with the following statements. Please indicate your answer using the following 5-point scale where: **1. = Strongly Disagree (SD)** **2. = Disagree (D)** **3. = Don't Know (DK)** **4. = Agree (A)** **5. = Strongly Agree (SA)**	**SD**	**D**	**DN**	**A**	**SA**
2.0	**Community Participation**	**1**	**2**	**3**	**4**	**5**
2.1	You participate in the activities of the project actively and willingly and not because you are asked to do so by the promoters of the project					
2.2	The promoters of the project always provide solutions to the challenges that you face in the project					
2.3	You are provided with adequate information about the project activities					
2.4	You are well informed of your role in the project					
2.5	You are consulted regularly on issues of operation and maintenance of the project operations					
2.6	The project is managed by a management committee that you and colleagues set up					
2.7	The project provide platforms where you and colleagues deliberate on issues concerning the operations of the projects					
2.8	The decisions of such meetings is final in determining the direction of the project					
2.9	The management committee implement the decisions that you and colleagues arrive at in the meetings of the projects					
2.10	The project has appointed champions from the community that mobilise the community to support projects operations					

3.0	**Community Capacity Building**	**1**	**2**	**3**	**4**	**5**
3.1	There are programmes that promote the construction, operation and maintenance of water sanitation and hygiene projects within the community					
3.2	Your capacity to operate and maintain of project facilities has been strengthened					
3.3	There are follow-up training of operation and maintenance					
3.4	The project has champions that create awareness among community beneficiaries on project operation and maintenance					
3.5	Your capacity is developed in resource mobilization for project facility maintenance and replacement					
3.6	The project has developed your capacity in leadership and management of the project					
3.7	Your capacity and skills to engage with others in joint project activities has been strengthened					
3.8	There are project update meetings that you attend					
3.9	Project initiators built capacity for establishing project structures and constitution					
3.10	The project has built capacity of the project management committee in managing the activities of the project					
4.0	**Community Empowerment**	**1**	**2**	**3**	**4**	**5**
4.1	You have a good understanding of the challenges facing the project					
4.2	You and colleagues in the project can provide solutions to most of the challenges facing the project					
4.3	You and colleagues are able to ensure that action is taken on the decisions you make					
4.4	You and colleagues have authority to elect or replace management of project					
4.5	You and colleagues in the project have a good working relationship					
4.6	The project has a management committee that has the ability to coordinate project operations on behalf of the beneficiaries					
4.7	The project has benefits that are appreciated and enjoyed by yourself and other members of the community					
4.8	Project beneficiaries willingly and actively participate in the project activities					
4.9	You and colleagues can readily hold project management accountable for their actions					
4.10	You are confident that you can operate and maintain project facilities over a long period					
5.0	**Conflict Management**	**1**	**2**	**3**	**4**	**5**

5.1	There exist a mechanism to ensure equitable use of the project resources by project beneficiaries					
5.2	Meetings are held where project beneficiaries' priorities and interests are discussed and reconciled					
5.3	Project management account for their actions in the meetings of the project					
5.4	Decisions are taken on project operations in a manner that is acceptable to majority of the project beneficiaries					
5.5	There is commitment by beneficiaries to decisions taken on project operation and maintenance					
5.6	Differences in the project are handled in a manner acceptable to the majority					
5.7	There are forums for articulating beneficiaries views over the project					
5.8	There is a conflict management structure in place for resolving conflicts					
5.9	The conflict management structure is manned by individuals with skills in conflict resolution					
5.10	Conflicts are identified early and resolved before they worsen					
6.0	**Community Ownership**	**1**	**2**	**3**	**4**	**5**
6.1	The project is run largely by the community with minimal influence from the sponsors					
6.2	The community set up a committee that manage the project activities on their behalf					
6.3	The committee has final authority over the decisions they make					
6.4	You and colleagues clearly understand the purpose and benefits of the project to the community					
6.5	The project addresses the community and your key water and sanitation priorities					
6.6	You are committed and participate in the activities of the project willingly					
6.7	You and members of the community provide your own resources to operate and manage the activities of the project					
6.8	You and Project beneficiary community appreciate the benefits of the project					
6.9	The beneficiaries are satisfied with management of the project					
6.10	You and local community identify with the project as your own and take pride in it					
7.0	**Perceived sustainability**	**1**	**2**	**3**	**4**	**5**
7.1	The project is managed by a committee that shows a strong capacity to manage it into the future					
7.2	Project implementation is going on smoothly without frequent					

	and sometimes violent conflicts.					
7.3	The project is generating enough resources for operation and maintenance from internal sources					
7.4	The financial flow for maintenance and replacement of project's infrastructure is steady and can be sustained into the future					
7.5	Members of the community are beneficiary of the project and are willing to contribute resources to support the project in to the future					
7.6	The community has adequate technical skills on operation and maintenance of the project facilities to sustain it in the future					
7.7	There is adequate and ongoing grassroot mobilization in support of the project					
7.8	There are clear strategies for long term maintenance of the project facilities					
7.9	The community has confidence in the management of the project					
7.10	There is a great likelihood that the project will continue to exist long in the future					

APPENDIX III: FOCUS GROUP DISCUSSION GUIDE

Project Implementation Strategies in Water, Sanitation and Hygiene Projects

FGD001: Focus Group Discussion Guide

Target Participants: Project Officials, Ordinary Members and Beneficiaries

	Project Implementation strategies in Water, Sanitation and Hygiene Projects in Peri-urban estates in Kisumu Town and Rural Surroundings FGD001: FGD Guide				
	QUESTIONS	RESPONSES			INSTRUCTIONS
1.0	INTRODUCTIONS				
1.1	Date of FGD				DD/MM/YY
1.2	VENUE				
1.3	AREA	☐ 1. Kanyawegi ☐ 2. Manyata B ☐ 3. BAR A ☐ 4. Korando B ☐ 5. Nyamware S. ☐ 6. Kochieng ☐ 7. N. Alungo ☐ 8. Marera			Tick the most appropriate
1.4	Name of the project				
1.5	No. of Participants	Males	Females	Total	
1.6	Time				
1.7	Name of facilitator				
1.8	OVERVIEW OF THE PROJECT				
1.8.1	When was the project established?				
1.8.2	What does the project concerns itself with?				List all responses
1.8.3	Are you aware of the projects' objectives? *Request some participants to brainstorm on the Objectives: Check against the objectives provided by Secretariat*				
1.8.4	Were you as members involved in the formulation of the objectives? If yes, do you think your participation in the exercise was important?				
1.8.5	What are the activities of the project?				

1.8.6	What is your project's target		List all responses
1.8.7	Are the activities addressing the needs of your target group?		
2.0	COMMUNITY PARTICIPATION		
2.1	How would you gauge the participation of members of the community/ beneficiaries in the project from inception to the present stage? **Take note** Quotes, passionate comments, body language, headnods, physical excitement, eye contact between participants etc		
	Probe Questions		
	2.1.1 Do you feel that you and the local community sufficiently participate in the activities of the project		
	2.1.2.Do you and the local community participate in project activities willingly or influenced by other factors		
	2.1.4 Do you think your level of participation and that of the community is sufficient to enable you all identify with the project as your own?		
	2.1.5 To what extent do you think your level of participation and that of the community will contribute to long existence of the project?		
3.0	COMMUNITY CAPACITY BUILDING		
3.1	How has the project ensured that members of the local community/beneficiaries acquired the relevant skills and expertise necessary to effectively operate and maintain the project activities?		
	Probe questions		
	3.1.1 Do you think the skills and expertise so far acquired is sufficient to enable the communities to effectively operate and maintain the activities of the project?		
	3.1.2 Given the current level of community skills and expertise in project operations and maintenance, to what extent can this influence the existence of the project in the future?		
	3.1.3 What improvements should the project undertake to ensure adequate skill and expertise is available within the community to support project operations now and in the future?		
4.0	COMMUNITY EMPOWERMENT		

4.1	How would you gauge your authority and that of the community beneficiaries in making and implementing decisions that run the project
	Probe Questions
	4.1.1 Do you and members of the project beneficiary community understand and appreciate the objective of the project
	4.1.2 Do you think the community members have the ability to manage the project effectively?
	4.1.3 How are the decisions that affect the project made and what role do you and members of the local community play?
	4.1.4 Who has the final authority over the decisions that are made on the direction the project operation should take?
	4.1.5 Do you think the project is run in the way that the local community appreciate
5.0	CONFLICT MANAGEMENT
5.1	What would you say about the mechanism/system that is in place to detect and resolve conflicts as they arise during project implementation
	Probe Questions
	5.1.1 What would you say about the current level of conflict in the project and the operation and maintenance of project activities?
	5.1.2 What do you feel should be done to improve the way conflicts is managed within the project?
6.0	COMMUNITY OWNERSHIP
6.1	To what extent do you think you and members of the local community members identify with the project as you own?
	Probe Questions
	6.1.1 What would you comment on the attitude of the community towards the project?
	6.1.2 What would you say is the motivation behind community involvement in the project?
	6.1.3 Do you feel this level of motivation is sufficient to enable the local community to support the operation and maintenance of the project to the distant future?
	6.1.4 What do you feel should be done to boost community acceptance and participation in the project?
7.0	PERCEIVED SUSTAINABILITY OF PROJECTS
7.1	Considering the current status of the project, do you think it would still be in existence in the distant future

	Probe Questions	
	7.1.1 How does the project generate resources used for operation and maintenance	
	7.1.2 What in your opinion is the percentage of funds used in operation and maintenance generated internally within the project?	
	7.1.3 How far into the future do you still see the project existing in its current state?	
	7.1.4 What would you suggest should be put in place to improve perceived sustainability of the project?	
	THANK YOU	

APPENDIX IV : Final Qualitative Data Coding Framework

	CATAGORIES	FOCUS GROUP DISCUSSION	THEMES
1	Ownership/lack of it	Rangira water project	"..we see the project as belonging to the committee because they no longer inform or involve us in what they do yet we are also unable to make any changes.."
		Alendu water project	"..the project is controlled by the chairman. No one can oppose him in the committee.."
		Miguye water project	"..project is for the community that is why it is located in public land donated by the community.."
		Rabuor water project	"..it is the community that elected the committee to manage the project.."
		Obambo women group	"..the committee consult us when there is any issue.."
		Koraro spring	"..there is no consultation with community on any issue.."
		Kadongo pan	"..some unknown people used to break the padlocks used to close water taps, and at times the fence to access the water free.."
			".community no longer get the opportunity to elect leadership.."
		Koraro spring	"..we only saw the water people dig trenches and lay pipes then disappeared. They did not complete the work and no one is telling us what is going on.."
		Alendu water project	"..when the committee collapsed, the landlord took over management of the project for some years. We later renegotiated to have it back.."
		Marango water spring	"..this project belong to the government. They are the ones who brought the administrator. He charged water fee and collected the money. But when the pump broke down, he simply disappeared without a word and we now suffer.."
		Obambo WG	"..the community are very supportive. They pay water bills wells. In fact when there was a major breakdown and we lacked the funds, the community organised an harambee.."
		Obambo WG	"..water was a big problem here. This project has really helped us and we wish it exist for long. In fact we shall really appreciate if another donor build us another or expand this one to reach many people.."
		Miguye water project	"..we understand the objectives of the project well and appreciate it.."
		Kadongo water pan	"..we knew the project was to provide us with water. But the committee decided to charge us for the water. We can barely raise the fee. Some of us have resorted to collecting water from the ponds.."

		Alendu water project	"..the committee no longer consult us on any issue. Decisions are just made. But because we need water, we must abide.."
			"..most community members appreciate the project and are happy it was started.."
		Kadongo water pan	"..there is no commitment to project activities. Community is disillusioned by the way the committee is running the project.."
		Ranjira water project	"..there is frequent theft and vandalism of project property. I think these are people not happy with the project, but none as ever been found.."
		Alendu water project	"..the committee is controlled by the chairman. It is now a one man show.."
		Kadongo water pan	"..the committee has been in office for too long and they no longer call community meetings for fear that the community may demand elections.."
		Soko Komanji	".KWAHO came without a drilling machine and asked community to provide labour through hand digging. We elected our committee to run the project and we have our project.."
		Miguye water project	"..there is no doubt the project belong to us. That is why it was given the community name. The problem is, however, that project benefits still trickle down to only a few individuals located in close proximity to the project site and that is why a larger part of this community may still feel neglected.."
2	Participation	Obambo water project	"..in general meetings that happen every two years we elect committee members. But, in our other project meetings we review project performance and demand for accountability."
		Miguye Water project	"..the committee are responsible for managing the project on our behalf. If they fail we elect new people.."
			"..we get information about the project from the leaders. Since we also live here, we still get a lot of information on our own.."
		Gorogoro women group	"..we work closely with the local administration and the water people. The local administration assist when there are conflicts or theft while the water people assist with maintenance or advice on such.."
		Miguye water project	"..when the project was starting, we were mobilised well. They even had promoters from among us. The promoters encouraged us to labour for free. We also collected ballast and stones. Some even provided food. We considered the project our own and worked very hard.."
			"..the Committee consult us when there is an issue. They call meetings

			After the cases of theft, we resolved to guard the project in turn using a timetable. The homesteads near the project site were tasked with that responsibility..”
		Ranjira water project	“..we didn't know what was going on. When the project pump was stolen and project collapsed, we were never even invited to a meeting to discuss about it..”
		Miguye water project	“..our participation is good. We elect our management committee which in turn engage us frequently through project meetings. This way all of us contribute on the direction the project is taking and we are happy with it..”
		Kadongo water pan	“..the committee does not involve us much. For example, some day they woke up and decided that we shall be paying a certain fee for water withdrawn. It was not much but where did they get that. They did not seek our opinion yet they expected us to pay. We have not and because the project is ours anyway, they could not stop us from collecting the water. When they closed the taps, people were breaking the fence and collecting it directly from the open pan. At some point they started breaking the padlocks and the management had to give up the idea..”
3	Empowerment	Rabuor water project	“..there was a loan advanced to us by SANA for constructing the project. The committee ensures it is paid regularly otherwise the interest shoots up..”
		Yenga water springs	“..this project was run by an administrator. As community we could only watch from a distance. When it initially broke down, it took too long to be repaired and we suffered for months. It was broken down again and we are really suffering yet we can do nothing..”
		Miguye water project	“..we can say we are empowered because we have the full authority over what happens in this project. We make our decision and the committee implements. When they are not sure of anything, the organize a community meeting where decisions are made..”
		Ranjira water project	“..the committee in many occasions take decisions on their own and have no way of stopping it..”
		Alendu water project	“..the way the project is run has pissed off everyone. People no longer come to meetings even when organised..”
		Miguye water project	“..the committee organise community meetings where we discuss project progress. When there are challenges we try to find solutions..”
		Rabour water project	‘..the community has authority. We replace non performing officials during annual meetings. In case of a serious mistake, a special can be convened where the community take necessary measures..”
		Obambo water project	“..the community is happy with the project and many attend the meetings called by the committee.

		Obambo water project	There are times when the community demands for meetings- like when some of us wanted water to be pumped to them..”
		Gorogoro women group	“..there is a daily duty roaster for members of the project to sell water to the community..”
		Gorogoro women group	“..all community members take responsibility for the project should one be found to destroy project property, any member can report you to the police or local administration..”
		Obambo water project	“..People are always ready to make an input that can improve the project. This can be seen in the large numbers that attend project meetings whenever they are organized. And people make good contribution..”
		Ranjira water project	“..things are going wrong. The project is failing. But what can we do. Who is there to listen..”
		Alendu Water project	“..the community has no say. Authority over project decisions are vested in one individual.”
		Koraro springs	“..we really need water here. We walk long distances to fetch some. When we find it, the quality is very bad, it is very dirty and used also be domestic animals. We will prefer that the government or an NGO construct for us one, but this time they should allow us to manage it ourselves. That way, we can agree among ourselves how to raise funds to sustain funds..”
4	Conflict Management Skills	Alendu water project	“..the chair and committee are at time biased when resolving differences..”
		Alendu water project	“..we use the local administration when we fail to agree among ourselves..”
		Alendu water project	“..the structures that could address conflict such as the committee are themselves divided.”
		Alendu water project	“..chairman acts like the committee often making decisions without seeking consensus ..”
		Gorogoro women group	“..our constitution has strong provisions on roles and responsibilities of officials and regulations that guide our project. This reduces our differences.”
		Alendu water project	“..water is not distributed equitably. It is pumped to certain areas for long hours..”
		Ranjira water project	“..we have no way of addressing conflicts..”
		Gorogoro women group	“..those with complains can drop them in suggestion box at project site or petition the chairlady..”
		Soko komanji water project	“you see, our committee understand us and are able to bring us to an understanding even when there are major differences. In instances where they fail or where one party is dissatisfied, they recommend or even fix a meeting with the local administration for arbitration and it works well for us..”

		Soko komanji water project	"..our officials handle any differences in the project well. They at times convene community meetings when need be. We have not seen cases when differences get out of hand.."
		Kadongo water pan	"..conflicts get out of hand because some people do not have faith in our committee members. When a conflict arise and the committee invite parties for arbitration, before it is resolved you hear one party as reported to the local administration for a parallel arbitration. This only worsen the differences.."
		Kadongo water pan	"..the officials are not open with the way our money is spent.."
		Alendu water project	"..the officials do not allow members to oppose what they say. They brand you anti development.."
		Kadongo water pan	"..conflict levels are very high. The management committee which should be addressing them is ineffective and biased. The local administration has taken advantage and now is interfering with the running of the project. This has created even more division in the project.."
5	Training		
		Rabour water project	"..no one in the community can repair the equipment when they break down. We call in technicians from Kisumu. You see, when training was done, our people were not told how to repair the equipment when damaged.."
		Obambo women group	"..non of us was trained on how to repair the equipment. They just handed over the project and left.."
		Rabour water project	"..the donor handed over project manuals to the committtee. I guess they are kept by the secretary.."
		Ranjira water project	"..when we bring technicians to repair the pump. They charge us and it is not cheap. There was a time we were not able to raise the money and the community really suffered from lack of water.."
		Gorogoro women group	"..there are times when the local administration and water department are called upon for advice.."
		Gorogoro women group	"..the committee was trained on bookkeeping and how to operate the pump.."
		Alendu water project	"..we were asked to elect the management committee to run the project. We were not informed how the committee was to run the project, the rules they were to follow and how the related to us. This created a lot of difficulties in managing the project.."
		Obambo women group	"..there was no training for the committee when the project was handed over to them.."

		Gorogoro women group	"..the donor took the committee and some community member to a number of trainings. They also followed up for some time to see how we were doing. I can say they are running the project well. We are only worried most of them are getting old and there is need to train a new group.."
			"..the donor gave out contact of one of their officers who we could contact whenever there was a problem.."
		Ranjira water project	"..when we replaced the initial committee with a new one, the new people were not trained and they lacked the competency to manage the project. We were just fumbling.."
		Alendu water project	"..there is need for training to be continuous. You see, when the executive are replaced, it creates a skills gap.."
		Rangira Water Project	"..we need training for our officials in conflict management. Some of these officials are themselves divisive and are more inclined to adding salt to an injury whenever issues arose.."
6	Resources	Rabour water project	"..they supply us with water collectively using one meter and charge flat rate fee. This is unfair because you use less water but still pay that amount. This has made some of us default.."
		Gorogoro women group	"…the equipment sometimes break down and spare parts are not available here. We may at time be required to travel to Kisumu or even Nairobi for the parts and this is very expensive.."
		Rabour water projects	"..The project cannot raise enough resources to meet operation and maintenance cost. Electricity bill and repair cost for pipes is very high…"
		Miguye water project	"…Community contributed through a harambee to meet the costs.."
		Rabuor water project	At times electricity bill was so high that we were unable to pay from funds collected….."
			"…Community is often not informed how the resources are used.
		Yenga water springs	"..the administrator brought by the government collected and kept the funds. We do not know how much was being raised and how it was spent…".
			"..A water charge of kshs 2 per 20L jerican is very little…."
			"..Water yield is low and sales made cannot meet costs..".
7	Performance	Kandongo pan	"..Project is poorly managed and may not last for long. The committee is divided and lack passion.."
		Kandongo pan	"..the committee has no cohesion. In fact most members lack the requisite skills to execute their roles.."

	Obambo women group	" ..you know, all this things go together. We need to have a strong management committee. This should be a committee that we have ourselves appointed and we should have the authority to question them or remove any or all of them from office if need be.."
	Obambo women group	"..members of this committee should also have the skills to run the project well and bring people together. Conflicts really create divisions in a project and the committee must have away of handling it in a professional way.."
	Obambo women group	"..they should also be open with our money and allow us to question its use. Only then will we feel close to the project and support it..".
	Rabour	"..we do not get water for long period when electricity is disconnected.."
	Miguye water project	"..project is running smoothly and serving us well. We only wish it could be expanded to reach more people.."
	Obambo women group	"..we are comfortable with the management and that is why we pay water user fee with default. When there is a major problem with the project, we can agree to collect funds among ourselves through harambee as we ones did.."
	Alendu Water project	The project is doing poorly, the community do not care any longer about its progress.
	Kandongo water pan	"..some people destroy project property. Sometimes I feel it is intentional to punish committee members.."
		"..most of us fail to pay water charges. I do not think they are able to meet their costs.."
	Soko Komanji water project	"..Water yield is very poor and it is no longer serving us as we expected. Some of us are turning to sinking own shallow wells.."
	Kadongo Water pan	"..the divisions in the project does not allow any meaningful progress. If not sorted out the project will just collapse.."
	Ranjira water project	"..The project rely completely on funds from water sales which is quite little.."
		"..we used to have a committee but with time it became moribund. No one is in-charge now.."
	Obambo water project	"..the project is running smoothly, with the type of management we have it will exist for a long time.
		The committee is not transparent and they are running down the project.."

APPENDIX V: Splitting Half Using the Iterative Process

Group A		Group B		Difference
Item	Score	Item	Score	(A-B)
3.9	87	3.3	81	6
7.6	90	3.1	88	2
3.5	97	3.1	98	-1
3.7	100	3.4	100	0
5.1	101	2.5	104	-3
7.7	104	3.8	104	0

3.2	105	2.1	107	-2
2.3	108	3.6	107	1
5.7	108	4.9	111	-3
5.3	113	7.8	111	2
5.8	113	2.9	114	-1
2.2	116	2.7	115	1
5.9	116	4.3	118	-2
2.8	120	5.2	119	1
4.2	120	4.1	122	-2
7.9	124	7.3	122	2
4.4	125	5.4	125	0
7.4	128	2.4	128	0
5.6	130	7.1	131	-1
4.6	135	6.7	134	1
5.1	135	5.5	136	-1
6.9	139	6.3	137	2
7.2	139	7.5	142	-3
6.2	147	2.6	145	2
4.7	148	7.1	149	-1
6.1	151	6.5	151	0
6.8	153	4.5	152	1
4.1	157	4.8	155	2
6.4	157	2.1	162	-5
6.6	165	6.1	164	1
Total	3731		3732	-1

APPENDIX VI: Correlation Between Scores of Two Halves Corrected for Full Test Reliability

Group A		Group B	
Item	Score	Item	Score
3.9	87	3.3	81
7.6	90	3.1	88
3.5	97	3.1	98
3.7	100	3.4	100
5.1	101	2.5	104
7	104	3.8	104

3.2	105	2.1	107		
2.3	108	3.6	107		
5.7	108	4.9	111	Correlation coefficient	0.995141
5.3	113	7.8	111	Spearman-Brown correction	0.997564
5.8	113	2.9	114		
2.2	116	2.7	115		
5.9	116	4.3	118		
2.8	120	5.2	119		
4.2	120	4.1	122		
7.9	124	7.3	122		
4.4	125	5.4	125		
7.4	128	2.4	128		
5.6	130	7.1	131		
4.6	135	6.7	134		
5.1	135	5.5	136		
6.9	139	6.3	137		
7.2	139	7.5	142		
6.2	147	2.6	145		
4.7	148	7.1	149		
6.1	151	6.5	151		
6.8	153	4.5	152		
4.1	157	4.8	155		
6.4	157	2.1	162		
6.6	165	6.1	164		

APPENDIX VII: Research Permit

APPENDIX VII: Map of Study Area