DETERMINANTS OF SUSTAINABILITY OF RURAL WATER PROJECTS IN KENYA: A CASE STUDY OF THE NETHERLANDS DEVELOPMENT ORGANISATION (SNV) SUPPORTED WATER SCHEMES IN KAJIADO COUNTY

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DETERMINANTS OF SUSTAINABILITY OF RURAL WATER PROJECTS IN KENYA: A CASE STUDY OF THE NETHERLANDS DEVELOPMENT ORGANISATION (SNV) SUPPORTED WATER SCHEMES IN KAJIADO COUNTY

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ABSTRACT

The central problem of this study was that despite the government efforts coupled by donor aid to enhance rural water projects sustainability, performance has continued to deteriorate with high project malfunctioning. Causes of the high project failure have not been adequately discussed; hence minimal intervention. To this end, the project purpose was to establish the determinants of rural water projects sustainability in Kenya with a focus on NGO supported projects. The study considered sustainability as the dependent variable and sector policy, post implementation impact evaluation, choice of technology and water committee management skills as the independent variables. A descriptive research design was adopted and stratified sampling utilized. Both qualitative and quantitative data analysis was used to analyze the research data. The study established that there is a strong positive influence on sustainability of rural water sustainability attributable to units of change of all the independent variables. There was a positive correlation of 0.504 between sector policy and sustainability; 0.296 between choice of technology and sustainability; 0.370 between water committee management skills and sustainability and 0.219 post implementation impact evaluation and sustainability. The study recommends further review and study of the sector policy, post implementation impact evaluation, choice of technology and water committee management necessary for achieving sustainability of rural water supplies. Further research on areas requiring post implementation support is also recommended as many rural water facilities begin to experience challenges after the third year of implementation.

***Key Words**: Sustainability, Rural Water Project*

INTRODUCTION

Introduction

According to Harvey and Reed (2004) sustainable is defined as able to continue over a period of time; or causing little or no damage to the environment and therefore able to continue for a long time. The key to sustainability would therefore appear to be to identify what enables a water supply to remain operational over a long period of time. However, it is important that the sustainability of a single hand pump is separated from that of the project or programme under which it was. The community management model remains by far the most widespread for rural water supply in sub-Saharan Africa, and yet has failed to deliver the levels of sustainability that were initially anticipated. As described above, experience suggests that there may often be better alternatives to community management and the authors aim to encourage pilot studies that test new and innovative models. It is accepted, however, that community management is currently the most common model implemented and is likely to remain so for the short-term future at least installed (Harvey & Reed, 2004).

Background

The role of the communities in the operation, maintenance and management of rural water supplies was first described in Sessional Paper No. 1 of 1999 on National Policy for Water Resources Management and Development. The paper defined the involvement of communities in project development in all stages including planning, implementation and operation and maintenance in light of the changing economic conditions and increasing burden to government. The paper further recommended institutional steps to be taken to facilitate the role of the communities in the operation and maintenance of rural water supplies. Increasing the participation of the communities in project development was intended to create a sense of ownership of the projects by communities. In line with the recommendations of the Sessional Paper 1999, operation and maintenance of rural water supplies has largely been transferred to

Global Perspective

Sustainability of community based and managed rural water supplies remains a challenge around the world. In India for instance, spite of concerted efforts to transfer ownership of rural water supplies to beneficiary communities and increasing participation of the communities in the operation and maintenance of these facilities, more than a third of all rural water supplies fail within three years of development. (WELL, 1998).

Since the late 1970s, successive UK governments have placed significant emphasis on improving the operational effectiveness, efficiency and cost of delivery of UK public services which in the past has been an issue of concern. Specifically, the more business-like approach to rural water projects administration, which has led to reforms and performance improvement hence value for money (Ashley, 1996).

In Bangladesh, community participation impacted greatly on improving sustainability of rural water supplies. (Ashley, 1996).

Kenyan Perspective

Kenya has the largest, most diversified and innovative economy in East Africa. Its human capacity, entrepreneurial energy and available capital gives it huge potential to create jobs and reduce poverty among Kenyans and other

East Africans, and set trends for other African countries. It is also fragile, with significant risks that this economic potential is not realized if the political stability that nearly collapsed in 2008 cannot be maintained, and vulnerable to climate change.

Donor help with new approaches to service delivery and governance will be needed if millions of poor Kenyans currently excluded from progress are to benefit. Kenya Joint Assistance Strategy (2007-2012)

SNV in Kenya, Netherlands Development Organization.

According to the SNV practice brief (2013), SNV has been working to improve the functionality of water points and systems by addressing a combination of technical, managerial, economic and social issues. Based on its field experiences in Africa, SNV has developed an approach centered on five components. SNV's approach recognizes that making and keeping water points and supplies functional is a collaborative effort involving all stakeholders: implementers, regulators, operators and users.

SNV's approach works by helping to professionalize the delivery of rural water supply through the capacity development of water supply operators and implementer, benchmarking and performance monitoring of implementers and post-construction service providers, supporting improved provincial/district multi-stakeholder planning, targeting and monitoring to improve investment choices and strengthen local ownership, providing post-construction support through the development and implementation of institutional support mechanisms, specifying roles and responsibilities, sharing lessons learned at the national level through participation in learning platforms and government-led sector development groups. Applying this approach has enabled non-functioning water supplies in rural Africa to once again serve people with water in a relatively short time (SNV, 2013).

Statement of the Problem

According to the Ministry of Water and Irrigation (2012) report, the Ministry has been implementing the water sector reforms since the enactment of the Water Act 2002 to improve sector efficiency and overall performance but more importantly created new decentralized institutional framework to among others accelerate water service provision.

As a result, the sector's approved development budget rose seven fold in the last eight years from Ksh 4.2 Billion in 2004/2005 FY to Ksh 30.8 Billion in the 2011/2012 FY (Min. of Water and Irrigation, 2012). This points to an increase in expenditure on water projects in Kenya.

According to IRC (2011) despite relative success in the provision of new rural water infrastructure in the last two to three decades, studies in many countries show between 30 to 40 per cent of facilities either do not function or are operating below capacity. In Kenya, about 25 to 30 per cent of the recently completed community managed rural water supply facilities 6 will become dysfunctional in the first three years following completion.

According to CIDA (2000) Increased investment in rural water supply development in the last decade by both Government and development partners has not resulted in the desired levels of service anticipated. Access to safe water is a basic human need necessary for both the wellbeing and social economic development of populations living in rural Kenya. In spite of efforts to increase access, many rural water

supplies completed have either stopped operating or are not operating optimally. This has resulted in loss of service to populations living in the rural areas of Kenya. Many of the dysfunctional water sources are operated and managed by community based organizations such as Community Water and Sanitation (WASH) Committees, Water User Associations or Women groups (CIDA, 2000).
This forms the basis of this study.

Objectives of the Study

Broad Objective

To investigate the determinants of sustainability of rural water projects in Kenya.

Specific Objectives

i. To find out the effect of sector policy on sustainability of rural water projects in Kenya
ii. To assess the influence of post implementation impact evaluation on sustainability of rural water projects Kenya
iii. To establish the effect of choice of technology on sustainability of rural water projects in Kenya
iv. To ascertain the influence of water committee management skills on the sustainability of rural water projects in Kenya.

Research Questions

i. What is the effect of sector policy on sustainability of rural water projects in Kenya?
ii. In what way does post implementation impact evaluation influence sustainability of rural water projects in Kenya?
iii. What is the effect of choice of technology on sustainability of rural water projects in Kenya?
iv. How do water committee management skills influence sustainability of rural water projects in Kenya?

Justification of Study

This study is in line with the requirements of the new Constitution of Kenya (2010) with regard to consideration of water as public land and the right to water by all. Therefore aligning itself to Constitution of Kenya (2010), WASH aspires to be a key pillar firmly interconnected through a network of management, execution, control, monitoring and closure with this kind of goal there is need for review of performance in the planning of projects. Specifically, the study will benefit the following;

Policy Makers: The government, the International Community and other interested stakeholders will utilize the knowledge gained from this in assisting to develop programmes that will address challenges WASH Project Success.

SNV & WASH Project Managers: Both existing and potential officers will benefit from the findings of this study since they will use it to understand the dynamics and mitigation of planning challenges.

Researchers and Scholars: The study will make empirical contribution to the field of planning and particularly project planning in the Humanitarian sector.

Scope of the Study

The research was conducted in Kajiado County where the respondents of the study were the SNV Supported water Project Sponsors and WASH Users, Sustainability Modelling teams within Kajiado, since they are the ones charged

with the responsibility of carrying out day to day operations of the rural WASH sustainability modeling project and frequently interface with project modeling and the effect on implementation and sustainability. Based on the number of Sponsors in each of the 5 representative stages, namely; Site selection and baseline, Solution modeling, Dissemination, Piloting and Innovation. A number of project Sponsors was randomly selected to constitute 150 Sponsors that formed the population study. The study examined five independent variables and one dependent variable namely Sector Wide Policy, Regulation, Technology, Monitoring and evaluation, Management and Sustainability.

Limitations

i. Due to the unique characteristics of Kajiado County in terms of accessibility and exposure, unique and dynamic trends in project execution; in terms of economic, social and political atmosphere, the findings of this research are not generalized.

ii. Sustainability is a multifaceted variable and therefore this research did not study all the dimensions of Sustainability.

iii. Information was not collected from all the WASH organizations operating in the area, due to logistical limitations.

LITERATURE REVIEW

Introduction

The chapter reviewed empirical and theoretical literature on performance in the water sector. The chapter took a look at other countries that have experienced success and those that have not experienced success. It sought to highlight challenges hindering sustainability as perceived by the scholars. The literature was reviewed from three dimensions; first relevant theories were reviewed, secondly past/empirical studies on the determinants of sustainability.

The Chapter concludes with summary findings and any gaps to be filled by the study, in addition to a brief description of the interrelationships between the variables.

Theoretical review

This section examined relevant theories to the study variables.

The Classical Organizational Theory of Management

The Classical Organizational Theory School of management theory is the work of Max Weber's bureaucratic theory. He believed that civilization was changing to seek technically optimal results at the expense of emotional or humanistic content (Wideman, 2002). Weber then developed a set of principles for an "ideal" bureaucracy as follows: fixed and official jurisdictional areas, a firmly ordered hierarchy of super and subordination, management based on written records, thorough and expert training, official activity taking priority over other activities and that management of a given organization follows stable, knowable rules. The bureaucracy was envisioned as a large machine for attaining its goals in the most efficient manner possible. However, Weber was cautious of bureaucracy when he observed that the more fully realized, the more bureaucracy "depersonalizes" itself. (Wideman, 2002).

This theory opines that bureaucracy is more harm than good on status quo in the sense that it stifles premeditated actions. However, in the worst case scenario, it is good to accept that bureaucracy is sometimes good as it allows procedure. This is essential as it enables the sector policy to trickle down to rural water projects, ensuring oversight and in the long run sustainability of the projects.

Henri Fayol's administrative theory

The Henri Fayol's administrative theory mainly focuses on the personal duties of management at a much more granular level. In other words, his work is more directed at the management layer. Fayol believed that management had five principle roles: to forecast and plan, to organize, to command, to co-ordinate, and to control. Forecasting and planning was the act of anticipating the future and acting accordingly. Organization was the development of the institution's resources, both material and human. Commanding was keeping the institution's actions and processes running. Co-ordination was the alignment and harmonization of the group's efforts. Finally, control meant that the above activities were performed in accordance with appropriate rules and procedures. Fayol developed fourteen principles of administration to go along with management's five primary roles. These principles are: specialization/division of labor, authority with responsibility, discipline, unity of command, unity of direction, subordination of individual interest to the general interest, remuneration of staff, centralization, and scalar chain/line of authority, order, and equity, stability of tenure, initiative, and esprit de corps. Fayol clearly believed personal effort and team dynamics were part of an "ideal" organization. Fayol's five principle roles (Plan, Organize, Command, Co-ordinate, and Control) of management are still actively practiced today.

The concept of giving appropriate authority with responsibility is also widely commented on and is well practiced. Unfortunately, his principles of "unity of command" and "unity of direction" are consistently violated in "matrix management", the structure of choice for many of today's companies.

This is critical to rural water projects which largely depend on donor support for maintenance and even initial investment of the projects. It is critical in modeling a clear outline of the project success by monitoring and controlling the activities. Therefore, scheduled post implementation evaluations are necessary and must be aligned with Fayol's five principle roles (Plan, Organize, Command, Co-ordinate, and Control).

Elton Mayo's Theory of Management

The origin of behavioralism is the human relations movement that was a result of the Hawthorne Works Experiment carried out at the Western Electric Company, in the United States of America that started in the early 1920s (1927-32). Elton Mayo and his associates' experiments disproved Taylor's beliefs that science dictated that the highest productivity was found in 'the one best way' and that way could be obtained by controlled experiment. The Hawthorne studies attempted to determine the effects of lighting on worker productivity. When these experiments showed no clear correlation between light level and productivity the experiments then started looking at other factors. These factors that were considered when Mayo was working with a group of women included rest breaks, no rest breaks, no free meals, more hours in the work-day/work-

week or fewer hours in the workday/work-week. With each of these changes, productivity went up. When the women were put back to their original hours and conditions, they set a productivity record. These experiments proved five things. First, work satisfaction and hence performance is basically not economic – depends more on working conditions and attitudes - communications, positive management response and encouragement, working environment. Second, it rejected Taylorism and its emphasis on employee self-interest and the claimed over-riding incentive of monetary rewards. Third, large-scale experiments involving over 20,000 employees showed highly positive responses to, for example, improvements in working environments (e.g., improved lighting, new welfare/rest facilities), and expressions of thanks and encouragement as opposed to coercion from managers and supervisors. Fourth, the influence of the peer group is very high – hence, the importance of informal groups within the workplace. Finally, it denounced the choices of technology in rural water projects dictate several processes such as acceptability, affordability and in the long run maintenance and sustainability.

This theory clearly strengthens the fact that technology and technological applications only cannot lead to increased productivity, performance and in this case sustainability. However, Technology plays a vital role in the performance of any project. This means that rural water projects must utilize adaptable technologies that can enhance sustainability.

Regulation Theory

This theory is a loose-knit body of empirically oriented, political-economic theory that originated in France in the 1970s, as part of the general effort then being made to overcome the limitations of Marxism's economic reductionism. According to what is sometimes referred to as the Parisian School, the concepts necessary to overcome this reductionism are the following: 'regime of accumulation', which refers to the organization of consumption as well as that of production; 'mode of growth', which relates the regime of accumulation to the international division of labour; and 'mode of regulation', which refers to the national and international, institutional, and ideological framework which facilitates the reproduction of particular regimes of accumulation and modes of growth. The best-known claim made by the regulationists is that the use of these concepts enables one to distinguish two successive modes of regulation in the history of twentieth-century capitalism—fordism and post-fordism.

Regulation of key water projects in rural areas has been ineffective with several cartels taking control operation without restrictions. This impacts negatively on the users of the projects and the community at large.

Conceptual Framework

A conceptual framework is a pictorial representation where , descriptive categories are systematically placed in a broad structure of explicit propositions, statements of relationships between two or more empirical properties to be accepted or rejected (Stone & Archibald , 1993). It comprises of independent and dependent variables .An Independent variable or the exploratory variable is the presumed cause of changes in the dependent variable. The dependent variable is the one the researcher wishes to explain. It is also called the criterion or predictor variable
(Scoy , 2002).

For simple relationship all the variables are considered extraneous and are ignored. In actual study situations however such a simple one-on-one relationship needs to be conditional or revised to take other variables into account. Often one uses another type exploratory variable of value .The prepositions included within the framework summary provide explanations and predictions for empirical observation. This study adopted a conceptual framework of strategic importance to identify some underlying forces behind different aspects of the key concepts of performance .In particular it investigated the significance of performance in the security sector. The study based on the conceptual framework sought to show the relationship between the different constructs that are of paramount importance for the objectives of this study.

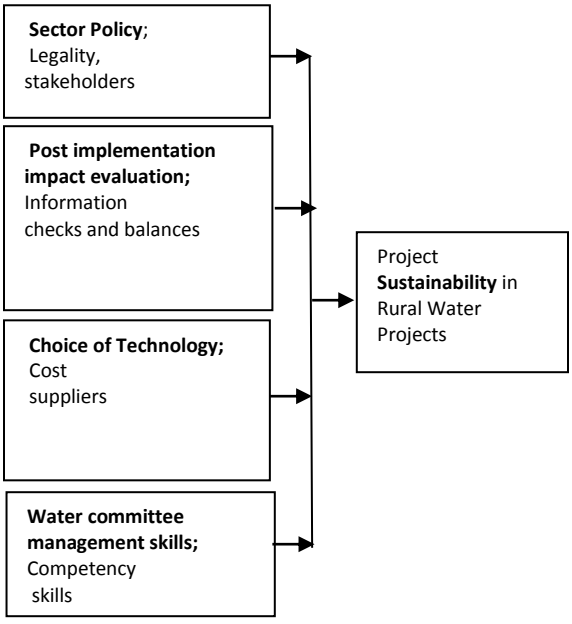

Figure 2.1: The conceptual Framework

Sector Policy

Poverty Reduction Strategy Papers (PRSPs) describe a country's macroeconomic, structural and social policies and programmes to promote growth and reduce poverty, as well as associated external financing needs. Many African governments have now developed, or are developing, PRSPs through a participatory process involving civil society and development partners, including the World Bank and the IMF. The emphasis placed on water and sanitation in these strategy papers varies enormously, from entire chapters devoted to the subject, to passing references alone.

The World Bank (2004) aims to assist policy-makers and sector departments to design PRSP water and sanitation strategies that actively address the needs of the poor. When national governments become reliant on financial support from external donors for virtually all investment in the water sector they may become locked into the dependency syndrome. This places a Government in a difficult position since they require financial support, yet inevitably lose some autonomy as a result of this. Government Sponsors may be unwilling to say 'no' to, or disagree with, policy initiatives of major donors for fear of losing precious external funding. If policy is to be truly developed by governments they must develop the capacity to say 'no' and to seek ways in which to generate internal revenue for water supply provision. This is likely to lead to the promotion of low-cost solutions which can be sustained, rather than ongoing dependency on high investment solutions and the need for repeated rehabilitation.

The Sector-Wide Approach (SWAP) is a mechanism whereby governments and development partners agree on a strategy to achieve improvement in sector performance and more effective use of resources through programmes rather than projects. Various definitions of SWAP have been put forward,

reflecting a range of views as to what is actually meant by this term. CIDA (2000) suggests the following definition:

'The sector-wide approach defines a method of working between Government and donors. The defining characteristics are that all significant funding for the sector supports a single policy and expenditure programme, under Government leadership, adopting common approaches across the sector, and progressing towards relying on Government procedures to disburse and account for all funds.'

SWAPs have already been developed and implemented by the Ministry of Water and Natural resources in Kenya and at the heart of the strategy is central budget support, whereby donors give funds directly to central government which allocates funds for sector activities to local government. This is sometimes referred to as a 'basket fund' approach. While there is no fixed formula for their development, SWAPs should always follow a highly consultative process to ensure that all stakeholders participate in the development of the approach.

One of the key features of SWAP is to improve the sustainability of services (DWD, 2002a). The shift from facility-driven 'projects' with a finite lifespan to service-based 'programmes' has significant potential to achieve this aim. The overall drive for greater efficiency and effectiveness should also contribute to service sustainability, as should greater co-ordination and consistency among implementing agencies. However, if these benefits are to be realized in rural water projects, it is essential that government bodies are accountable, that activities and outputs are adequately monitored, and that roles and responsibilities are clearly defined

Post implementation Impact evaluation

Monitoring, evaluation and review are the mortar that holds the building blocks for sustainability together and ensure the integration of the different sustainability factors. Monitoring is an ongoing process that should cover all levels of operation (from national governments to communities) and all aspects of rural water supply programmes (e.g. policy, institutions, finances, technology and O&M (Lockwood & Smits, 2011).

Lockwood and Smits (2011) further notes that in general, monitoring is integral to evaluation. During an evaluation, information from previous monitoring processes is used to understand the ways in which the project or programme developed and stimulated change. Monitoring focuses on the measurement of the following aspects of an intervention; On quantity and quality of the implemented activities (outputs: What do we do? How do we manage our activities?), On processes inherent to a project or programme (outcomes: What were the effects /changes that occurred as a result of your intervention?), On processes external to an intervention (impact: Which broader, long-term effects were triggered by the implemented activities in combination with other environmental factors?),

The evaluation process is an analysis or interpretation of the collected data which delves deeper into the relationships between the results of the project / programme, the effects produced by the project t/ programme and the overall impact of the project/programme. This process is very important to rural water sustainability and it enables the return on investment to be assessed.

The antecedents of impact evaluation not being addressed lead to lack of data to analyze the outputs and achievements desired. Just like any other kind of project, rural water projects require rigorous evaluation to determine propriety, adequacy, discernibility and utility.

Choice of Technology

Many studies and reports have documented the influence or effect of choice of technology on sustainability of community managed rural water supplies (Lewis, 2005) Sector professionals have used a number of terms to describe affordable, simple technologies that could easily be adapted to local conditions and maintained by communities; among them- appropriate technology, progressive technology, alternative technology, Village level Operation and Maintenance (VLOM) technology, Intermediate technology, Village technology, Low -Cost technology, Self-help technology and even technology with a human face (Laufer, 2007).

Laufer (2007) suggested the use of "sustainable technology at the community level" and argued that projects must incorporate selection of appropriate technology and integrate Operation and Maintenance (O&M) into project development right from the start. An analyses of the performance of water systems in a variety of countries found that performance was markedly better in communities where households were able to make informed choices about the type of system and the level of service they required (Laufer, 2007).Among technical factors suggested to contribute to sustainability of services are technology selection, complexity of the technology, the technical capacity of the system to respond to the demand and provide the desired service level, the technical skills required to operate and maintain the system, the availability, accessibility and the cost of spare parts and the overall cost of O&M. System design and the complexity of the technology involved will clearly have a bearing on the relative weighting of these factors. In the case of hand pumps for example, standardization of pump types, spare parts, support to the private sector for local repairs and institutional arrangements on the part of government in support of community management were all seen as vitally important factors in the sustainability of projects in Africa according to recent research by WEDC (Harvey *& Reed*, 2002).Sustainability of facilities provided is enhanced by involving the private sector in the direct provision of services to communities and emphasizing sound financial management and adequate cost recovery by community-based organizations. All of the above evolve with a legal and institutional framework. At national level there must be clear policies and strategies that support sustainability (Ogus, 2004). Support activities such as technical assistance, training, monitoring and setting up effective financing systems are all likely to influence effectiveness of O&M.

One main criticism of existing technology adoption research was that "the search for a universal approach may be inappropriate given the fundamental differences that exist across innovations.

Settlement pattern of a community also influences the choice of water supply technology and O&M. For example, a hand pump would serve only a limited number of people in a settlement structure where households are located on individual farms. Ground water characteristics also influence

choice of technology. For example, the choice between a hand pump based system and a diesel powered system will be influenced by the size and depth of the ground water and demand or population to be served. An approach that has been ignored yet could give positive results is the prioritization of resource utilization. Allocation of resources is not sufficient. But being accompanied by transparency and accountability, there could be better use of the limited resources to meet the ever increasing procurement needs.

Water committee management skills

According to IRC (2011) The matching or fit between a PM and project extends not only to the technical or domain skills as enumerated above, but also to other general attributes, such as prior exposure to the methodology experience. In addition, as more strategic functions are enabled and outsourced, the PM is also expected to demonstrate a deep knowledge of the business objectives of the system being provided Carter & Sapp, 1990. We conceptualize hard skills as task familiarity, that is, we assess the hard skills needed by the project relative to what the PM brings on board.

While hard skills are essential in PMs, soft skills are especially important for PMs because of the nature of their role not only within the project team requiring intangible management skills but also in the organizational and client relationship structure. Carter and Sapp (1990) follow extant literature to argue that interpersonal and management skills are critical for the IT professionals, more so because of the boundary spanning role that these professionals must assume. In the outsourcing world, the PMs have to interact with many stakeholders. They have to not only manage internal project teams, their peers and superiors, but also interact with clients, using skills that are essentially non-technical in nature, and which may not be easily imitable. These include but are not limited to organizational knowledge, tacit knowledge in handling people within the organizational structure, leadership and management skills, and customer handling skills

As an example, a PM who is an expert in object oriented technology may not be able to successfully lead a project in say, mainframe technology. Similarly, domain experience may also be equally necessary in the PM. Prior literature has shown that task familiarity helps in improving performance (e.g., Campbell, 1988; Goodman and Leyden, 1991).

This study shows skills have a positive impact on sustainability and overall performance of rural water projects. However, it is also argued that low skilled staff are more likely to leave policing, question orders, become bored, expect promotions more frequently and request reassignment more frequently (Carter & Sapp, 1990). Various work groups are not homogenous; the implication of this is that factors are not generalisable.

The heterogeneity in the awareness factors will therefore possess different needs that influence the level of performance.

Sustainability of Rural water supplies

A report prepared for Global Programs, Field Support and Research identified several factors affecting sustainability of community managed water supplies (Hodgkin et al, 1994):Institutional factors comprising national, regional, community organizations and private sector entities), and Development processes which included sign, participation, operation and maintenance and M&E. Technological

factors such as Suitability, acceptability, responsiveness, servicing needs, standards and costs. Contextual factors and forces which include factors beyond the control of institutions involved to change. They include environmental, demographic (population size, growth and distribution as well as health indicators such as infant mortality and morbidity from water borne diseases), socio-cultural, political, economic- (rate of inflation, employment opportunities, income generation) and technological- (skills available in the 13 community, availability of equipment and spare parts and training opportunities relevant to the technology used). Other factors include project organization and processes including administrative and budgeting entities. This pertains to capacity of local and regional institutions to continue development processes that have been initiated and apply skills that have been taught. There are also donor related sustainability issues including control, collaboration, standardization, coordination, flexibility and commitment- (long term). A study into rural water supply sustainability in Niassa Province in Mozambique found that among all communities visited, finance was compromising rural water supplysustainability as most did not have any savings or collected monthly contributions for operation and maintenance (Jansz, 2011). The study further found that while Water Committees understood their responsibilities, there were variations in how these responsibilities were practiced arising from inconsistencies in capacity and capability. The study found while some Committees raised and repaired some water points due to sufficient technical capacity, others did not because those trained with technical skills had left.

Water and Sanitation Programme-Africa Region (2002) in its Field Note No.13 on rural water supplies in Malawi, Ethiopia and Kenya made some common conclusions for adoption by countries planning community operated programmes. In its assessment of community management and sustainability of rural water supplies in these countries, WSP made the following conclusions on sustainability: Community Management works well in cohesive communities where there is clarity of purpose and sense of ownership, while sustainability requires sound financial management including the authority to set tariffs. Sustainability further depends on paying staff. A few community members cannot be expected to donate a large amount of their time over an extended period in order to maintain a public good. Schemes need Sponsorsnot just for technical tasks, but also management and administrative. WSP also concluded that managerial and governance training is important. Relevant, practical and well-tailored training has major impact on success. Suitable training combined with good management systems can help people with little formal education to operate and maintain complex systems. Community management systems benefit from on-going support. Support may not be continuous but must be available when needed from local departments and NGO partners. A study of community operated and managed water supplies in Yatta Division of Kenya found that there was a strong relationship between sustainability of community water projects and technology, managerial skills of the committee members and community participation (Mwamati, 2007). The study further suggested that there was a significant relationship between government support and legislation and sustainability of community water projects.

Empirical Review

This section deals with past studies / literature related to the constructs under investigation in this study. The discussion majors on the variables under study.

The most widely used definition of sustainability is that by the Brundtland Commission of the Nations on March 20, 1987: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainabilityis the long-term maintenance of responsibility. It has environmental, economic, and social dimensions, and encompasses the concept of stewardship. Sustainability of water supply and sanitation projects has been defined as the maintenance over time of the project benefits (Hodgkin et al, 1994)). Benefits from water supply projects may be expressed in several ways including health benefits indicated by a reduction in child mortality and morbidity from diarrhoeal diseases, or simply the number of people who have access to portable water from the project. According to Hodgkin, as long as resources can be obtained to operate, maintain and replace the systems from whatever source, there are sustainable benefits. Sustainability is also the ability of the project through the efforts of institutions, to maintain a level of benefits to a static or expanding population after donor assistance has ceased (Hodgkin et al, 1994).Sustainability is therefore the responsible management of resource use. Its meaning might include to maintain or to support. In the water sector, sustainability has to do with sustained access to services, sustainable operation and maintenance of water facilities. The key indicators for sustainable community managed rural water supplies include reliability, adequacy, accessibility, water fetching time, establishment of operation and maintenance (O&M) fund, ownership, user committee existence and functioning (Panthi and Bhattarai, 2008).In its sustainability framework, WaterAid identified four key things required for sustainability of community managed rural water supplies as: real need and demand, programme design and implementation, existence of active water user committees and external support to the community management systems (WaterAid, 2011). Also important are accounting and allocating responsibility for the true cost of sustainability to prevent the collapse of existing systems and reversal of progress made in extending rural water coverage (Montgomery, Batram&Elimelech, 2009). 12

A Triple-S scoping study on rural water supplies in Ethiopia found that sustainability of rural water facilities is a major issue and one that is now receiving greater attention (IRC, 2011). The study found that levels of non-functioning facilities are high affecting service delivery for many, while post construction support for community management is extremely low. Yet, Water and Sanitation Programme (WSP)-Africa in its report on "Sustainable Management of Small Water Supply Systems in Africa, Field Note, (2010)" said sustainable rural water supplies are important for the growth of local economic hubs. The report found the growth of rural centres and small towns ranging in population from 2000 to 50,000 people are of considerable strategic importance for economic and social development in Africa, contributing to curbing rural urban migration and the accumulation of the unemployed poor in the slums of large cities. Water Supply and Sanitation projects utilize three forms of capital-natural capital (water), infrastructure capital and skilful management of human and financial capital, each form of which must endure in

order to achieve sustainability (Hodgkin, 1994).. Project sustainability is indicated by the ability to continue to meet objectives defined in terms of benefit levels. Sustainability is therefore the ability of a project to initiate a process by which benefits are maintained.

Summary and Research Gaps

In Kenya, several scholars have conducted research on sustainability in rural water projects but no comprehensive study has been carried out on the factors responsible for lack of sustainability. Moreover, there are no empirical studies that can be traced to explain why there is non-sustainability.

A key weakess identified through the literature was that many sustainability studies only targeted urban water schemes and most of it was done on performance measurement and not sustainability. These studies have not also assessed Kajiado County in particular.

Globally, there were no clear records available on studies to show challenges on sustainability in the water sector particular on rural water projects.

RESEARCH METHODOLOGY

Introduction

This section presents the methodology used for the research and contains issues of research design, target population and sample design. It also has a section on how data was collected and analyzed. It concludes with a section on the expected outputs

Research Design

This study adopted a descriptive research design. A descriptive research design is used when the problem is well defined and the researcher knows something about the problem (Mugenda & Mugenda, 2003). The study used a descriptive survey research design with a cross-sectional approach. A survey involves studying a situation as it is, in an attempt to explain why the situation is the way it is (Kothari, 2007). This design allowed for accounting and adequate descriptions of activities, objects and persons. The design type did not only offer descriptions and explanations, but also identified and predicted relationships in and between the variables of the study (Kothari, 2007).

A Cross-Sectional approach was used to collect both qualitative and quantitative data from the respondents. The approach was relatively fast and inexpensive because it provided self-reported facts about respondents, their feelings, attitudes, opinions and habits (Kothari, 2007). Survey design enabled the researcher to make accurate assessment, inferences and relationships of phenomenon, events and issues (Mugenda & Mugenda, 1999). A descriptive survey design ensured ease in understanding the current status of insight and ideas about the area of study (Zells, 2011).
The design choice was based on the fact that the researcher was interested in the subject of study and had experience in the study area. It is on these parameters that the variables were understood.

Target Population and Locale of the Study

The population of interest was the WASH Users of SNV funded rural water schemes Noondepen, Olturuto, Oldarpoi, Ng'atataek and Department of water all in Kajiado County. Specifically the study will focus on rehabilitated existing shallow wells fitted with hand pumps and boreholes powered by electricity, diesel powered solar generators.

For purposes of this research, the study population of 150 was constituted of SNV Sponsorsengaged during the WASH Modelling process, in the supported projects and the WASH Users in Kajiado County. A sample was then selected from this population with a view to investigate the research questions.

Sampling Frame & Sample Size

For purposes of this study the sampling frame constituted a register with a list of Project Sponsors in the 5 project localities.

In this study, 52 % of project Sponsors was selected from a total population of an estimated 150 project Sponsors and WASH Users. A 52% sample was considered representative because according to Kothari (2007) a representative sample is one that is at least 50% of the population of interest. Therefore, this sample qualifies more that representative of the target population.

Table 3.1: Computation of Sample Size

Locality (Xi)	Population Size (X)	Sample Size (Y) =Y/100*X)
Olturuto	20	15.0
Oldarpoi	20	15.0
Noondepen	20	15.0
Ng'atataek	50	25.0
DWENR Kajiado	40	8.0
Total	150	78

As shown in Table 3.1 above, The 78 respondents helped this study to collect information that was used to answer the study questions. This was considered appropriate for the research purposes (Kliem & Ludin, 2006). The total number of 78 respondents reduced sampling error and gave statistical significance for inferences to be made.

Sampling Technique

This research adopted a stratified random sampling. A stratified random sampling procedure is appropriate when the population of interest is not homogeneous and has been subdivided into mutually exclusive and heterogeneous sub populations called stratums (Mugenda and Mugenda, 2003). However, Selltiz, Weightsaman and Cook as cited by Mugenda and Mugenda (2003) argued that for greater accuracy in the findings, the number in each stratum should be based on the relative variability of the characteristic in the study rather than proportionate to the relative size of the group. From the sample facilities selected, three respondents (two Management Committee members and one household) were selected. The two committee members and households were purposively sampled, as the technique allows researchers to use cases that have the

required information with respect to the objectives of the study (Mugenda and Mugenda, 2003). According to Mugenda and Mugenda (2003), researchers proposing to use purposive sampling technique must specify the criteria for choosing the particular cases, in this case one executive member of the management committee and one committee member comprised members of the elected Water Management Committees (WASH Committee) who operate and maintain the water facilities under study. The other was a household representing households using the facility. The household member who came to collect water from the facility at the time of the survey at the facility was interviewed. These groups had intricate knowledge of how each of the variables affecting the operation of their water facilities and could provide insightful responses.

Pilot Testing

This research pilot tested research questionnaires, According to Orordho (2008), pilot testing reveals vague questions and deficiencies in the questionnaire or the validity, which is the degree to which empirical measures of the concept accurately measure the concept. The questionnaires will be pilot tested to determine their suitability to both the committee members and households. Pilot testing was carried out in two project departments selected randomly from a different block before the actual collection of data for the study.

Reliability

Reliability is the consistency of a set of measurement items while validity indicates that the instrument is testing what it should (Mugenda & Mugenda, 2003). Reliability is the consistency of your measurement, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects. In short, it is the probability of your measurement. A measure is considered reliable if a person's score on the same test given twice is similar. It is important to remember that reliability is not measured, it is estimated. Reliability does not, however, imply validity because while a scale may be measuring something consistently, it may not necessarily be what it is supposed to be measuring. The study used the most common internal consistency measure known as Cronbach's alpha (α). It indicates the extent to which a set of test items can be treated as measuring a single latent variable (Mugenda & Mugenda, 2003). The recommended value of 0.7 was used as a cut-off of reliabilities.

Validity

Validity is the strength of our conclusions, inferences or propositions. More formally, Kothari (2007) defines it as the best available approximation to the truth (or falsity) of a given inference, proposition or conclusion. Mugenda and Mugenda (2003) defines validity as the accuracy and meaningfulness of inferences, which are based on the research results. It is the degree to which the results obtained from the analysis of the data actually represent the phenomenon under study. Measures that were taken to ensure the instruments yield valid data included expert opinion, pilot study and factor analysis.

Data Collection

The main instrument used to collect primary data for this research was a questionnaire. Tryon (2000) defines a questionnaire as a form containing questions or blank tables which are filled by the interviewers after getting information from respondents or by the respondents themselves. Its purpose in research is to provide a standardized tool for data collection and attaining objectivity in a survey, it also facilitates the work of tabulation and analysis after data classification through coding (Stone & Archibald, 2003).

Two research assistants were recruited to assist in data collection. The Research Assistants recruited from the local area were briefed on the process and procedures for administering, recording data and ethical issues prior to embarking on the research. Data was collected by drop and pick method.

Data Analysis

A qualitative and quantitative data analysis was used to analyze the research data. It followed a systematic process starting with editing of all the data obtained from the field. Every questionnaire was checked to ensure it was complete and correctly filled. This was followed by coding of all data hence analyzed with the aid of the Statistical Package for Social Scientists (SPSS Version 26) computer programme (Kothari, 2007). After data collection, all returned questionnaires were numbered, categorized and data coded. Specific responses to the structured questions were each assigned a number to give it a numerical code. A code book containing all the variables derived from the research objectives and research questions of the study as presented in the questionnaire was developed. Data was analyzed using descriptive statistics including tables, percentages and other measures of central tendency such as the mean, mode and median. Inferential statistics was also done where correlation and regression was done to establish relationship and their magnitude between independent and dependent variables. Cross tabulation was used to analyze some data using a regression model targeting the level of significance of each variable and how it influenced sustainability of rural projects.

Data Processing

The data was then coded to enable the responses to be grouped into various categories. Data collected was a combination of quantitative and qualitative and was analyzed by descriptive analysis such as measure of central tendency and measure of dispersion. The descriptive statistical tools helped in describing the data and determining the extent used. Data analysis was done via SPSS version 26 and Microsoft Excel to generate quantitative reports through tabulations, percentages, and measures of central tendency.

Data Presentation

Tables were used to present responses and facilitate comparison. Mugenda and Mugenda (2003) notes that the use of percentages is important for two reasons; first they simplify data by reducing all the numbers to range between 0 and 100. Second, they translate the data into standard form with a base of 100 for relative comparisons. This enables the generation of quantitative reports through tabulations, percentages, and measure of central tendency.

Microsoft Excel assisted in grouping the data to facilitate comparison. The data was converted into percentages so as to lie between 0 and 1.

The Multi linear Regression Model

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

Where Y=Sustainability

β_0 =Constant

X_1=Sector Policy

X_2= Choice of echnology

X_3=Community Management Committee skills

X_4=Post implementation Impact evaliation

e=Margin of error

β_i ; i=1,.....,4 are the model parameters

DATA ANALYSIS, PRESENTATION OF RESULTS AND DISCUSSION

Introduction

The main objective of this study was to investigate factors influencing sustainability of SNV supported rural based and community managed water supplies in three Kajiado Central, Kajiado County of Kenya. Data was collected using the instruments as described in the previous chapter. This chapter, therefore, is the presentation, interpretation and discussion of the findings from the data collected for the research study. The chapter is divided into: response rate; background of the respondents; sustainability of the water supplies; sector policy; regulation; monitoring and evaluation, technology; management of SNV supported rural based and community managed water supplies; and sustainability of SNV supported rural based and community managed water supplies.

Response Rate

A total of 78 questionnaires were administered. Out of these, 52 were administered to sampled SNV rural committee members and users and 26 to sampled project Sponsors within the study area. The response rate was as shown in Table 4.1.

Table 4.1: Response Rate

Response Rate Group	Designated Sample size	Number Achieved	Response Rate
Project Sponsors	26	26	100%
Committee and users	52	47	90.38%
Total	**78**	**73**	**93.58%**

(Source: Field data 2015)

As shown in table 4.1 above the entire designated Staff sample size of 26 was achieved, representing a 100% response rate for the household respondents. However, 47 out of 52 WASH committee members and users' questionnaires were successfully administered, representing a 90% response rate. Overall, a 94% response rate was achieved.

This response rate was considered credible enough to allow for generalization of the findings to the target population besides the

arriving at the conclusions of the study, as, according to Necamaya (1996), a response return rate of more than 75% is enough for a descriptive study hence 94% was more than enough continue.

Pilot Test Results

Validity

To establish the validity of the data collection instruments, the research instruments were given to 10 management staff in different departments in SNV. The managers were expected to tick if the item in the questionnaires addressed factors affecting sustainability of rural water projects in Kajiado County. The content of the responses given by the managers was checked against the study objectives and rated using a scale of 5(very relevant) to 1 (not very relevant). The Content Validity Index was used to determine the validity by adding up all the items rated using a scale of 3 and 4 by the managers and dividing the total sum by the total number of items in the questionnaires. The coefficient of the data gathered from the pilot study was computed with assistance of Statistical Package for Social Sciences (SPSS). A context of validity coefficient index of above 0.82 was obtained and this implied that the questionnaires were valid research instrument for the study.

Reliability Analysis

To measure the reliability of the data collection instruments an internal consistency technique Cronbach's alpha was computed using SPSS. The data obtained from these respondents was analyzed using SPSS Cronbach's alpha. Cronbach (2003) noted that the more consistent an instrument is, the more reliable the measure and noted that the coefficient ranges from 0 to 1. Cooper and Schindler (2006) accept an alpha of 0.8 and above, while Mugenda and Mugenda (2008) noted an alpha of 0.6 and below to be poor. The measurement scales for reliability were tested using Cronbach's alpha coefficient and for an alpha of 0.7 and above, the instrument was interpreted as reliable (Cronbach, 2003). The results in the table 4.2 below show Cronbach's alpha of well above 0.7 and most of it above 0.8 implying that the instruments were sufficiently reliable for measurement.

Table 4.2 Reliability Results

Constructs	Cronbach's Alpha Values	Comments
Sector Policy	0.812	Accepted
Technology Choice	0.897	Accepted
Post implementation Impact evaluation	0.901	Accepted
Management Committee skills	0.826	Accepted

The study accepted a Cronbach alpha of 0.7 and above. Since most items total correlations were reasonably high, the construct validity of the instrument was considered reasonable (Brown, 2006)

Demographic Data

This section discusses the distribution of the respondent by sex, age, level of education and position held in the committee (for Sponsors and Impact evaluation respondents).

Sex of the Respondents

Table 4.3: Distribution of the Household Respondents by Sex

Sex of Respondent	Frequency	Percentage
Male	12	46.2
Female	14	53.8
Total	**26**	**100.0**

(Source: Field data 2015)

Table 4.3 above indicates that Fifty four percent (53.8%) of the project Sponsor respondents were women while 46.2% were male. The high percentage of women respondents may be attributed to SNV gender inclusion that prioritizes empowerment of women, thus making it possible to be easily reached during Sponsor surveys such as the current study.
This agrees with other authors who attest that this is a significant departure from opinions commonly held about gender roles in rural water management and may reflect the impact of recent advocacy for gender mainstreaming in the sector. Furthermore, this finding may also be significant for enhancing sustainability of water facilities as more women begin to share in the burden of water management (Badiru, 2012).

Distribution of the Respondents by Age

Table 4.4: Age Distribution of the Respondents Age

	Household respondents		Committee/user Respondents	
Frequency	**Percentage**		**Frequency**	**Percentage**
Under 30 years	9	34.6	8	17.0
30-40 years	6	23.1	16	34.0
Over 40 years	11	42.3	23	48.9
Total	**26**	**100.0**	**47**	**100.0**

The distribution of the respondents by their age was as shown in Table 4.4 above. The highest percentage of the Sponsor respondents (42%) as well as the beneficiary respondents (49%) were over 40 years of age. There were more Sponsor respondents aged less than 30 years (35%) than there were the WASH beneficiary (17%) and more of the WASH beneficiary

respondents were aged 30- 40 years (34%) as were the household respondents (23%). The high percentage of beneficiary respondents aged over 40 years may be explained by the voluntary nature of participation in WASH Committees where older people are more likely to volunteer for common community services rather than young people (Badiru, 2012).

Respondents' Level of Education

The beneficiary respondents were asked to indicate their level of education. Education is one of the most important characteristics that might affect a person's attitude and understanding of social phenomena.

Table 4.5: Distribution of WASH Users by Level of Education

Level of Education	Frequency	Percentage
No formal education	4	8.5
Primary level	20	42.6
Secondary	20	42.6
College/University	3	6.4
Total	**47**	**100.0**

Table 4.5 above shows the Equal percentages of the beneficiary respondents at 43% had either Primary level or Secondary level education, while 6% had college/university level education. At least 9% of the beneficiary respondents did not have formal education. It is significant to find that more than 91% of WASH Users had some formal education with 49% of these having secondary and college level education. This is in agreement with Ashley (1996) who attests that level of education has implication for improving future sustainability of facilities as more and more people with higher education retire into these communities and participate in management of common services at the community level.

Distribution of beneficiary Respondents by Position Held in the Committees

The beneficiary respondents were required to indicate the positions they held in their respective committees.

Table 4.6: Distribution of WASH Users Respondents by Position Held

Position Held	Frequency	Percentage
Chairperson	8	17.0
Secretary	13	27.7
Treasurer	5	10.6
Member	21	44.7
Total	**47**	**100.0**

Table 4.6 shows the distribution of the beneficiary respondents by positions held in their respective committees. The distribution of the respondents among the executive

committee and the ordinary members of the management committee was well balanced at 55% for the executive (Chairpersons, Secretaries and treasurers) and the WASH Users respondents interviewed (44.7%), Specifically, the ratios of the executive by position held comprised 27.7%, 17% and 10.6% who were secretaries, chairpersons and treasures to the WASH committees respectively.

According to Mugenda (2002) a distribution of more than 50% is representative of the population sampled. This therefore means that this distribution is acceptable.

Study Variables

Sustainability of the Water supplies

Preceding the determination of the factors influencing the sustainability of the SNV supported rural based and community managed water supplies, the study sought to establish the operational status of the sampled projects. This section, therefore, presents and discusses the findings from the respondents' opinions on the operations of the water supplies.

Age of the Water supply facilities

The beneficiary respondents were asked to indicate when their respective water supplies facilities were developed.

Table 4.7: Age of Water Supplies

Facilities Frequency		Percentage
Under 3 years	26	55.3
3-4 years	15	31.9
4-5 years	2	4.3
5-6 years	2	4.3
Over 6 years	1	2.1
Don't Know	1	2.1
Total	**47**	**100.0**

Table 4.7 above shows that more than half of the beneficiary respondents (55.3%) indicated that their respective water supplies facilities had only been operational for less than three years, 32% reported that the facilities had been in operation for 3-4 years, 4% in each case for between 4-5 and 5-6 years and 2% for over six years. At least 2% of the respondents could not remember the age of their facilities.

Findings agree with those of other scholars. IRC (2011) notes that most donor funded rural water projects do not last beyond four years after implementation. These findings clearly point to a clear non sustainability indice.

Functional Sustainability of the Water Supplies Facilities

The respondents were asked to indicate whether their water supplies facilities were functional.

Table 4.8: Functionality of the Water supplies

Facilities Functional	Frequency	Percentage
Yes	42	89.4
No	4	8.5
No Response	1	2.1
Total	**47**	**100.0**

From their responses in Table 4.8 above Majority of the beneficiary respondents (89%) reported that their water supplies facilities were functional compared to 9% who reported otherwise. 2% did not respond to this question. Of those who reported that their water supplies facilities were not functional, 75% indicated that the situation had only prevailed for between 2-5 days (less than a week) while 25% indicated that the facilities had not been functional for a week. The main reason given by the respondents for the failure of the facilities to function was break down of the equipment. This is supported by Barnes (2003) who sates that breakdown of equipment is the main cause of non-functionality of relatively new projects.

Extent of Sustainability of the Water Supplies

All the respondents, both Sponsors and beneficiary respondents were required to indicate whether they thought the water supply facilities were sustainable. Whereas all the Sponsor respondents responded in the affirmative, 96% of the beneficiary respondents had a similar observation, with only 4% of the beneficiary respondents indicating that the water supplies were not sustainable. When asked to indicate the extent to which the water supplies were sustainable, their responses were as shown in Table 4.9.

Table 4.9: Sustainability of the Water Supplies

Extent of Sustainability	Sponsor Respondents		Beneficiary	
	Frequency	**Percentage**	**Frequency**	**Percentage**
To a very great extent	14	53.8	16	34.0
To a great extent	7	26.9	20	42.6
Sometimes good, sometimes bad	-	-	7	14.9
To a very low extent	5	19.2	-	-
To a low extent	-	-	1	2.1
No response	-	-	3	6.4
Total	**26**	**100.0**	**47**	**100.0**

The findings in table 4.9 above indicate that whereas more than half (54%) of the Sponsor respondents and 34% of beneficiary members thought that the water supplies facilities were sustainable to a very great extent, another 27% and 43% of Sponsor and beneficiary respondents respectively thought that they were sustainable to a great extent. A significant 19% of the Sponsor respondents indicated that the facilities were sustainable to a very low extent.

Burke (2003) emphasizes sustainability has to be a multi stakeholder subject. These findings strongly point to the fact that not all

stakeholders are having the same position on the subject.

Sector Policy and sustainability of rural water supplies

The first objective of the study was to investigate how sector policy influences sustainability of SNV supported rural based and community managed water supplies in the study area. This section presents and discusses the findings and analyzes the interaction between the respondents' opinions on sector policy and sustainability of the water supplies.

Sector policy

Sponsor respondents were required to indicate whether the national and county water policies had influenced in the planning of their respective water projects. On the other hand, the beneficiary respondents were asked to indicate the extent to which they thought the sector policies had influenced in the planning and implementation of their projects. All the Sponsor respondents confirmed that the policies had influenced. The beneficiary respondents' responses on the extent of policy influence were as shown in Table 4.10.

Table 4.10: Influence of sector policy on sustainability

Sector policy influence	Frequency	Percentage
Influenced	1	2.1
To a low extent	5	10.6
To some extent	18	38.3
To a great extent	20	42.6
To a very great extent	3	6.4
Total	**47**	**100.0**

The findings in table 4.10 above show that the highest percentage of the beneficiary respondents (43%) thought that the sector policies had influenced in the planning and implementation of their water projects to a great extent compared to 38% who thought that the sector policies had influenced to some extent, 11% who thought that sector policies influenced was a low extent and 6% who indicated that the sector policies had influenced to a very great extent. On the other hand, the Sponsor respondents' opinion on the extent sector policies had influenced ranged from "To a great extent" (27%) to "To a very great extent" (73%).

These findings agree with Eisner (1997 who notes that sector policies have and immense influence in the planning and implementation water projects.

Importance of Sector Policy

Beneficiary respondents were asked to indicate whether sector policy was important for sustainability of their water projects. Majority of the respondents at 94% responded affirmatively while 4% and 2% either gave a negative response or withheld their response to the question respectively. When asked to indicate the extent to which such influence was important, the respondents' views were as shown in Table 4.11.

Table 4.11: Importance of sector policy influence

Importance of sector policy influence	Frequency	Percentage
To a great extent	23	48.9
To some extent	10	21.3
No Response	4	8.5
To a low extent	3	6.4
To a very great extent	7	14.9
Total	**47**	**100.0**

The findings in table 4.11 indicate that 49% of the beneficiary respondents considered sector influence as important to a great extent, 21% to some extent15% to a very great extent and only 6% considered such sector influence as important to a low extent. Generally, a combined 64% of the respondents opined that sector influence was important at least to a great extent. This implies that the community is well aware of the need for the rural water projects to be actively influenced by sector wide approaches, an imperative for sustainability of community development projects whose ultimate goal is to improve the living standards of the community (Eisner, 1997)

Who in the community should participate in sector policy incorporation?

The respondents were asked to indicate the persons in the community that should be involved or participate in sector policy incorporation of community water projects. The findings were as presented in Table 4.12.

Table 4.12: Participation Groups in sector policy incorporation

Participation Persons	Frequency	Percentage
Water User Association	15	31.9
Women Groups	34	72.3
Licensed Water Service Provider	3	6.4
Community leaders	35	74.5
Others	9	19.1

Table 4.12 shows that half of the respondents reported that women were the decision-makers on water in the community, while 15% indicated that it was men who made such decisions. However, 35% of the respondents reported that both men and women were involved in decision- making on water. The findings suggest changes in attitudes and gender based role assignments at the household and in the community with respect to the role men play in the management of household water. Dinsmore (1993) emphasizes that increased decision making role by men in household water management has significant implications for the future sustainability of rural water supplies particularly in the study area where women traditionally played greater roles. These findings therefore agree with other authors.

Sector Policy and sustainability of the rural water supplies

The respondents' responses on the extent of sector policy and extent of sustainability of the rural water supplies facilities were cross-tabulated to determine the influence of community participation on the sustainability of the water supplies. The beneficiary's findings were as shown in Table 4.13.

Table 4.13: Community participation and sustainability of the water supplies

	Extent of Sustainability					
Extent of Community Participation;	**No Response**	**To a low extent**	**Sometimes good, sometimes bad**	**To a great extent**	**To a very great extent**	**Total**
Not involved	-	-	-	(1)	-	**(1)**
	-	-	-	100.0%	-	**100.0%**
To a low extent	(2)	-	(2)	-	(1)	**(5)**
	40.0%	-	40.0%	-	20.0%	**100.0%**
To some extent	(1)	(1)	(3)	(10)	(3)	**(18)**
	5.6%	5.6%	16.7%	55.6%	16.7%	**100.0%**
To a great extent	-	-	(2)	(8)	(10)	**(20)**
	-	-	10.0%	40.0%	50.0%	**100.0%**
To a very great extent	-	-	-	(1)	(2)	**(3)**
	-	-	-	33.3%	66.7%	**100.0%**
Averages	**(3)**	**(1)**	**(7)**	**(20)**	**(16)**	**(47)**
	6.4%	**2.1%**	**14.9%**	**42.6%**	**34.0%**	**100.0%**

The figures in parentheses () represent frequencies

The findings in table 4.13. Indicate that all the Beneficiary respondents who thought that the sector policy had influenced "To a great extent" also indicated that the water supplies projects were sustainable either to a "great extent" (33%) or "To a very great extent" 67%. On the other hand, a significant 40% of those who thought that the sector policy had influenced only to a low extent rated sustainability of the water supplies as "Sometimes good, sometimes bad", with another 40% of the same group withholding their responses on sustainability of the water supplies. Those who indicated that the sector policy had influenced "To some extent" had response across all levels of sustainability, the highest relating to sustainability "To a great extent" (57%).

These findings were corroborated by the respondents' responses when asked to indicate the extent to which sector policy had influenced sustainability of SNV supported community managed rural water supplies as shown in Table 4.14 below

.

Table 4.14: Influence of Sector Policy on sustainability rural water supplies

Influence of Sector Policy	Frequency	Percentage
Very low	2	4.3
Low	8	17.0
Moderately	12	25.5
High	13	27.7
Very High	12	25.5
Total	**47**	**100.0**

Table 4.14 shows the highest percentage of respondents at 28% indicated that sector policy highly influenced sustainability of rural water supplies. Equal percentages of the respondents (26%) reported high and moderate influences, while 17% and 4% indicated low and very low influences respectively.

Relationship between Sector Policy and sustainability of the water supplies

To determine the relationship between Sector Policy and sustainability of the water supplies, the Likert-type questions were used. A scoring strategy was adopted for sustainability of the water supplies where a score of 5 was adopted for a "very great extent" response, 4 = "great extent", 3 = "sometimes good, sometimes bad, 2 = "low extent" and 1 = "very low extent". A similar scoring strategy was adopted for the extent of Sector Policy where the scores ranged from 5 = "participation to a very great extent" to 1="Not involved". The Pearson's Product Moment Correlation (PPMC) was then conducted to determine the relationship between sustainability of water supplies and Sector Policy and the findings were as shown in Table 4.15.

Table 4.15: Relationship between Sector Policy and Sustainability of Water Supplies

		Sustainability of water Supplies	Sector Policy
Sustainability of water Supplies	Pearson's (r)	1	.504**
	P – value		.000
	Sample size (n)	47	47
Community Participation	Pearson's (r)	.504**	1
	P – value	.000	
Sample size (n)		47	47

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

The PPMC analysis in table 4.15 above revealed that there was a significant positive correlation between sector policy and sustainability of rural water supplies (r=0.504). The correlation was of moderate strength and significant at the 0.05 level, indicating that high levels of sustainability

of the water supplies was associated with greater sector policy influence. Water supply projects that reported greater sector policy influence also reported higher levels of sustainability. The findings are consistent with those of (Odie, 2012).

Although a significant relationship (r=.504, P<0.05) was found, the data also shows sustainability is a sector issue requiring the participation of all stakeholders including governments for putting in place the enabling environment, private sector for a reliable supply chain for improved access to spare parts and service requirements, development partners for capacity building and the community itself for accountability. These roles are interdependent and must work collectively to achieve sustainability. These findings agree with Graham and Matthews (2002), Water supply projects that reported greater sector policy influence also reported higher levels of sustainability.

Choice Technology and sustainability of rural water supplies

The second objective of the study was to determine how choice of technology affects sustainability of SNV supported rural based and community managed water supplies in the study area. This section presents and discusses findings related to the respondents' views on the choice of technology and relates the same to sustainability of the rural water supplies.

Appropriateness of Technology

The beneficiary respondents were asked to indicate whether the technology choices were appropriate for their respective water facilities. Their responses were as shown in Table 4.16

Table 4.16: Appropriateness of Technology Choice

Appropriateness of Technology choice	Frequency	Percentage
Yes	44	93.6
No	3	6.4
Total	**47**	**100.0**

Table 4.16 above shows that majority of the respondents at 94% responded affirmatively on the appropriateness of technology choice for their water facilities. This was supported by an overwhelming 96% of the Sponsors respondents who indicated that they were happy with the technology used for operating their respective water facilities. However, asked whether the technology was the most appropriate, although a majority of the beneficiary respondents at 85% responded positively, a significant 15% indicated that their respective water technology choices were not the most appropriate indicating that at least 9% of the beneficiary respondents, who had indicated that the technology choice was appropriate were of the view that there could still be better technologies than what had been adopted. These findings are consistent with Kliem and Ludin (2006) who state that technology affects a sustainability of rural water projects.

Further analysis on the extent to which the respondents thought that the technology choices were the most appropriate is as shown in Table 4.17 below.

Table 4.17: Extent of Appropriateness of Technology

Extent of Appropriateness of Technology	Frequency	Percentage
No Response	9	19.1
To a low extent	1	2.1
To some extent	13	27.7
To a great extent	17	36.2
To a very great extent	7	14.9
Total	**47**	**100.0**

Table 4.1.8 above indicates the highest percentage of the respondents (36%) indicated that their respective technologies were the most appropriate to "a great extent" while 28% indicated that they were appropriate "to some extent". However, a significant 19% of the respondents did not respond to the question of the extent of appropriateness. These findings are also consistent with Kliem and Ludin's positon.

Community Participation in Technology Choice

The study sought to establish whether the community had been involved in deciding the technologies adopted for their water facilities. To this end, 72% of the Beneficiary respondents confirmed community participation while 26% indicated that the community had not participated. At least 2% of the respondents did not respond to the question. Asked to indicate the extent to which the community had been involved in choosing the technologies, their responses were as shown in Table 4.18.

Table 4.18: Community Participation on Technology Choice

Community Participation in Choice of Technology	Frequency	Percentage
No Response	13	27.7
To a low extent	2	4.3
To some extent	11	23.4
To a great extent	17	36.2
To a very great extent	4	8.5
Total	**47**	**100.0**

The findings in table 4.18 above indicate that 36% of the beneficiary respondents reported that community had participated in choosing the technology "to a great extent", 23% indicated participation "to some extent" while 9% and 4% reported that the community had participated in the choice of the technology either to a "very great extent" or to a "low extent" respectively. The 28% who did not respond represents the group who had indicated that the community did not participate and those who did not respond to the prior question on community participation in technology choice. These findings agree with Kenya Joint Assistance Strategy (2007), which

states that each rural community has a big role to play in the technology utilized.

Choice of technology and sustainability of water supplies

The respondents' responses on the appropriateness of technology choice and extent of sustainability of the water supplies facilities were cross-tabulated to determine the influence of appropriateness of technology choice on the sustainability of the water supplies. WASH Users' findings were as shown in Table 4.19.

Table 4.19: Choice of technology and sustainability of water supplies

Appropriateness of Technology Choice	Extent of Sustainability					
	No Response	To a low extent	Sometimes good, sometimes bad	To a gr at extent	To a very great extent	Total
No Response	-	(1)	-	(1)	(7)	**(9)**
	-	11.1%	-	11.1%	77.8%	**100.0%**
To a low extent	-	-	1	-	-	**(1)**
	-	-	100.0%	-	-	**100.0%**
To some extent	(2)	-	(2)	(9)	-	**(13)**
	15.4%	-	15.4%	69.2%	-	**100.0%**
To a great extent	-	-	(2)	(7)	(8)	**(17)**
	-	-	11.8%	41.2%	47.1%	**100.0%**
To a very great extent	(1)	-	(1)	(3)	(2)	**(7)**
	14.3%	-	14.3%	42.9%	28.6%	**100.0%**
Averages	**(3)**	**(1)**	**(7)**	**(20)**	**(16)**	**(47)**
	6.4%	**2.1%**	**14.9%**	**42.6%**	**34.0%**	**100.0%**

The figures in parentheses () represent frequencies

The findings in table 4.19 above indicated that where the respondents rated the choice of technology highly, the water supply project was equally rated to be more sustainable compared to where choice of technology was lowly rated. For instance, among those who indicated that the choice of technology was the most appropriate for their projects to a very large extent, 43% and 29% respectively also indicated that their water supply facilities were sustainable to a large extent and to a very large extent respectively. This trend was also replicated to the group who rated choice of technology as appropriate to a large extent, where 41% and 47% respectively thought that their water supply facilities were sustainable to a large extent and to a very large extent respectively. On the contrary, majority of those who indicated that the technology choice was the most appropriate only "to some extent"

(69%) rated sustainability as "sometimes good, sometimes bad", reflective the level of uncertainty of project sustainability. Those who did not respond to the question on the extent to which technology choice was the most appropriate also remained skeptical about the sustainability of the water supply facilities. This agrees with other scholars such as Jansz.

The respondents' views on the influence of technology choice on sustainability of SNV supported community managed rural water supplies were as shown in Table 4.20.

Table 4.20: Influence of Technology Choice on Sustainability of Water Supplies

Influence of Technology Choice	Frequency	Percentage
Low	3	6.4
Moderately	18	38.3
High	19	40.4
Very High	7	14.9
Total	**47**	**100.0**

Table 4.20 shows that (40.4%) reported that technology choice influenced sustainability of SNV supported community managed rural water supplies at least to a high extent while 38% thought that such influence was moderate. Cumulatively, at least 94% of the WASH Users indicated that technology choice influenced the sustainability of SNV supported community managed rural water supplies at least to a moderate degree. To confirm this, when asked whether they thought technology influenced sustainability of their project, 94% of the beneficiary respondents responded on the affirmative while 6% denied that technology influenced sustainability of their water supplies projects. Strongly agrees with SNV (2014) which note that rural water sustainability largely depends on choice of technology.

Relationship between Choice of Technology and sustainability of the water supplies

The respondents' responses on the question related to the extent to which they thought the technology chosen was the most appropriate was scored on a 5-point scale, where appropriateness of the technology ranged from "to a very great extent" with 5 points to "not at all" with 1 point. These scores were used to compute the Pearson's Product Moment Correlation (PPMC) between choice of technology and sustainability of the water supplies. The results of correlation analysis were as shown in Table 4.21.

Table 4.21: Relationship between Choice of Technology and sustainability of the water supplies

		Sustainability of water Supplies	Choice of Technology
Sustainability of water Supplies	Pearson's (r)	1	.296*
	P – value		.043
	Sample size (n)	47	47
Choice of Technology	Pearson's (r)	.296*	1
	P – value	.043	
	Sample size (n)	47	47

**. Correlation is significant at the 0.05 level (2-tailed).*

The PPMC analysis in table 2.21 indicated that there was a significant but weak, positive correlation between choice of technology and sustainability of the water supplies (r=0.296). The correlation was significant at the 0.05 level. The more the WASH Users felt that the technology adopted was the most appropriate augmented by community participation in choosing the technology, the more likely that the water supply project would be sustainable (SNV, 2014).

Water committee management skills and sustainability of rural water supplies

The third objective of the study was to examine how skills of Water Committees influence sustainability of SNV supported community based and managed water supplies in the study area. This section presents findings on the management of the water supply facilities, training of the management committees and adequacy of the skills. The later sub-section explores the interaction between the skills of the management committees and sustainability of the water supplies.

Management of Water Supplies

The respondents were asked to indicate the persons managing their water supply facilities. Their responses were as shown in Table 4.22 below.

Table 4.22: Management of the Water Supplies

Management Water Supplies	Frequency	Percentage
No Response	1	2.1
Water Committee	37	78.7
Women Group	9	19.1
Total	**47**	**100.0**

The findings in table 4.22 above indicate that majority of the water supplies were managed by water committees as alluded to by 79% of the respondents. A significant 19% of the respondents indicated that their water supply facilities were managed by women groups, while 2% did not indicate the persons charged with the responsibility of managing their water facilities. This strongly agree with SNV (2014) that most rural water supply projects are managed by communities.

Adequacy of Management Skills

The WASH Users were required to indicate whether they thought they had adequate skills to manage their water facilities. Their responses were as shown in Table 4.23.

Table 4.23: Adequacy of Management Skills

Adequacy of Management Skills	Frequency	Percentage
No Response	1	2.1
Yes	38	80.9
No	8	17.0
Total	**47**	**100.0**

Table 4.23 above shows majority of the WASH Users (81%) indicated that indeed, they had adequate skills to manage their water facilities while 17% thought otherwise. At least 2% did not indicate whether they had or did not have such skills. This is in tandem with Stone and Archibald (2003) who states that most communities will strongly believe that they have the skills necessary to manage the projects. This however, needs to be augmented with a professional oversight.

The extent to which the respondents thought that they had adequate skills was as shown in Table 4.24 below.

Table 4.24: Extent of Adequacy of Management Skills

Extent of Adequacy of Management Skills	Frequency	Percentage
No response	9	19.1
Not at all	1	2.1
To a low extent	7	14.9
To some extent	22	46.8
To a great extent	5	10.6
To a very great extent	3	6.4
Total	**47**	**100.0**

Table 4.24 shows the highest percentage of the WASH Users (47%) thought that they had adequate management skills "to some extent". A cumulative 17% indicated that they had adequate management skills at least to a "great extent" while 15% indicated that they had such skills only to a "low extent". At least 19% did not indicate the extent to which they possessed adequate management skills. However, these findings were contradicted by the household respondents' majority (89%) who felt that the committee had the necessary skills to manage their water facility sustainably. Only 11% of the household respondents thought that the WASH committees did not have the necessary skills to manage their water facility sustainably. This agrees with other scholarly findings.

Training of the Management Committees

The types of training received by the management committee members were as shown in Table 4.25.

Table 4.25: Type of Training received by WASH Committees

Type of training	Frequency	Percentage
Operation & Maintenance	26	55.3
Management	29	61.7
Book Keeping	16	34.0
Others	13	27.7

The findings in table 4.25 above indicate that 62% of the respondents had been trained on management, 55% had also received training on operation and maintenance and 34% on book keeping. 28% of the WASH committee members had received other types of training that mainly included kiosk operation and trouble shooting for first line repairs of the hand pumps. This supports Trémolet and Browning's view that (2002) training is necessary in rural water management.

Skills of Water Management Committees and sustainability water supplies

The beneficiary respondents' rating of the extent of adequacy of skills of water management committee and extent of

sustainability of the water supplies facilities were cross-tabulated to determine the influence of skills of water management committee on the sustainability of the water supplies. The findings were as shown in Table 4.26.

Table 4.26: Skills of Water Management Committees and sustainability water supplies

WASH Committee Management Skills	Extent of Sustainability					Total
	No Response	To a low extent	Sometimes good, sometimes bad	To a great extent	To a very great extent	
No Response	-	-	(2)	(2)	(5)	**(9)**
	-	-	22.2%	22.2%	55.6%	**100.0%**
Not at all	-	-	-	-	(1)	**(1)**
	-	-	-	-	100.0%	**100.0%**
To a low extent	(1)	-	-	(5)	(1)	**(7)**
	14.3%	-	-	71.4%	14.3%	**100.0%**
To some extent	(2)	(1)	(4)	(8)	(7)	**(22)**
	9.1%	4.5%	18.2%	36.4%	31.8%	**100.0%**
To a great extent	-	-	-	(4)	(1)	**(5)**
	-	-	-	80.0%	20.0%	**100.0%**
To a very great extent	-	-	(1)	(1)	(1)	**(3)**
	-	-	33.3%	33.3%	33.3%	**100.0%**
Averages	**(3)**	**(1)**	**(7)**	**(20)**	**(16)**	**(47)**
	6.4%	**2.1%**	**14.9%**	**42.6%**	**34.0%**	**100.0%**

The figures in parentheses () represent frequencies

The percentages in table 2.26 above indicate that among those who indicated that they had adequate management skills to a great extent, 80% equally indicated that the water supplies were sustainable to a great extent while the other 20% thought that sustainability of the water supplies was to a very great extent. 71% of those who indicated that the adequacy of their management skills was to a low extent, thought sustainability of the water supply facilities was to a great extent, and so, were 56% of those who did not indicate the extent to which they had adequate management skills but reported sustainability to a very great extent. WASH committee members who had reported possessing adequate management skills to a very great extent were equally distributed in their responses to sustainability from “sometimes good, sometimes bad”, “to a great extent” and “to a very great extent”. However, the group that alluded to having adequate management skills only “to some

extent" had responses distributed across all the levels of sustainability as shown in the table. The findings suggest that adequacy of skills of management committees while important, does not in itself alone lead to sustainability of rural water supplies. Asked to indicate the extent which skills of committee members affected sustainability of SNV supported community managed rural water supplies, the responses of the WASH committee members were as shown in Table 4.27 below. These findings agree with Trémolet and Browning (2002) who views skills as very necessary.

Table 4.27: Influence of Skills of committee members on sustainability water supplies

Influence of Management Committee Skills	Frequency	Percentage
Very low	1	2.1
Low	3	6.4
Moderately	19	40.4
High	19	40.4
Very High	5	10.6
Total	**47**	**100.0**

As shown in table 4.27 the highest and equal percentages of the WASH committee members (40%) reported that Skills of committee members either highly or moderately influenced the sustainability of SNV supported community managed rural water supplies. At least 11% reported that skills of the management committee influenced sustainability of the projects to very high extent, while 6% and 2% respectively reported low and very low levels of such influence.

Relationship between Skills of Water Management Committees and sustainability water supplies

The respondents' responses to the Likert-like question on adequacy of skills to manage their respective water facilities were scored on a five-point scale, where the score range varied from 5 for adequacy of management skills "to a very great extent" to 1 for adequacy rated as "not at all". The scores were then correlated with the scores for sustainability of the water supplies and the findings were as shown in Table 4.28.

Table 4.28: Relationship between Skills of Water Management Committees and sustainability water supplies

		Sustainability of water Supplies	Skills of Water Management Committees
Sustainability of water Supplies	Pearson's (r)	1	.370*
	P – value		.010
	Sample size (n)	47	47
Skills of Water Management Committees	Pearson's (r)	.370*	1
	P – value	.010	
	Sample size (n)	47	47

**. Correlation is significant at the 0.05 level (2-tailed).*

As shown in table 4. 28 there was a significant positive relationship between skills of water management committees and sustainability water supplies (r=0.37). The correlation was statistically significant at the 0.05 level of significance, indicating that WASH committee members who had higher management skills also reported higher levels of project sustainability. Thus, sustainability of rural water supplies is associated with higher managerial skills of the WASH committees.

Post implementation Impact evaluation and sustainability of rural water supplies

The fourth objective of the study was to determine how post implementation impact evaluation influences sustainability of SNV supported community based and managed water supplies in the study area. This section presents and discusses post-implementation support in terms of the type, the agencies involved and the duration over which such support is provided. The section also explores the influence of the post-implementation support on the sustainability of the water supplies.

Post implementation Impact evaluation

The beneficiary respondents were asked to indicate if there exists any post-implementation impact evaluation from the water supplies implementing agencies/partners. Majority of the respondents at 66% indicated that there existed no post-implementation impact evaluation while 34% responded positively. The types of post-implementation impact evaluation provided were as shown in Table 4.29.

Table 4.29: Type of Post-Implementation impact evaluation

Type of post-implementation impact evaluation	Frequency	Percentage
No response	33	70.2
Community sensitization and organization	2	4.3
Operation and Maintenance training	5	10.6
Monitoring and guidance	7	14.9
Total	**47**	**100.0**

The findings in table 4.29 indicate that 15% of the respondents received monitoring and guidance post-project implementation support, 11% received operation and maintenance training while only 4% were supported in community sensitization and organization after the projects had been implemented. Majority of the 70% who did not respond to the question on the type of training received included the 66% who had indicated that they did not receive any post-implementation support.

These findings agree with Tryon and Associates (2000) who acknowledges that very few projects undertake post implementation evaluation.

Agencies Providing Post-Implementation impact evaluation

The agencies that provided post-implementation impact evaluation as per the WASH Users' responses were as shown in Table 4.30.

Table 4.30: Agencies Giving Post-Implementation Impact evaluation

Agency	Frequency	Percentage
No Response	31	66.0
District Water Office	4	8.5
Regional Water Services Board	9	19.1
NGO partner	3	6.4
Total	**47**	**100.0**

Table 4.30 indicates that the highest percentage of the WASH Users (19%) reported that they got post-implementation impact evaluation from the Regional Water Services Board, 9% from the District Water Office and 6% from the NGO partners. The 66% represented the WASH committee members who had earlier reported that they did not receive any post-implementation support. These findings also agree with Tryon and Associates (2000) who acknowledge that very few projects undertake post implementation evaluation.

Duration of Post-Implementation Impact evaluation

The respondents were asked to indicate the period for which post-implementation impact

evaluation was required. Their responses were as shown in Table 4.31 below.

Table 4.31: Duration of Post-Implementation impact evaluation

Duration of Post-implementation impact evaluation	Frequency	Percentage
No response	3	6.4
A few months after handing over of project	2	4.3
One year after handing over	5	10.6
Two years after handing over	4	8.5
Continuously	33	70.2
Total	**47**	**100.0**

From table 4.31 above, Majority of the WASH Users at 70% indicated that post-implementation impact evaluation was required continuously, 11% wanted post-implementation impact evaluation up to one year after handing over of the project, 9% wanted such impact evaluation across a two-year period after handing over while only 4% wished that such impact evaluation would be provided for a few months after handing over of project.

Post-implementation impact evaluation sustainability of water supplies

The respondents' responses on the provision of post-implementation impact evaluation and extent of sustainability of the rural water supplies were cross-tabulated to determine the influence of post-implementation impact evaluation on the sustainability of the water supplies. The findings were as shown in Table 4.32 below.

Table 4.32: Post-implementation impact evaluation and sustainability of water supplies

Post-Implementation Support	Extent of Sustainability					
	No Response	To a low extent	Sometimes good, sometimes bad	To a great extent	To a very great extent	Total
Yes	(2)	-	(3)	(8)	(3)	**(16)**
	12.5%	-	18.8%	50.0%	18.8%	**100.0%**
No	(1)	(1)	(4)	(12)	(13)	**(31)**
	3.2%	3.2%	12.9%	38.7%	41.9%	**100.0%**
Averages	**(3)**	**(1)**	**(7)**	**(20)**	**(16)**	**(47)**
	6.4%	**2.1%**	**14.9%**	**42.6%**	**34.0%**	**100.0%**

The figures in parentheses () represent frequencies

The findings indicate that half of those who reported that they had received post-implementation impact evaluation indicated that their water supplies facilities were sustainable "to a great extent" while 19% in each case reported that their facilities were either sustainable to "a very great extent" or were "sometimes good, sometimes bad". On the other hand, those who had not received post-implementation impact evaluation reported sustainability across all levels ranging from sustainability "to a low extent" to "a great extent", with a significantly high percentage (13%) indicating that sustainability was "sometimes good, sometimes bad". These findings were supported by the respondents' views on the extent to which post-implementation impact evaluation influenced sustainability of SNV supported community managed rural water supplies as shown in Table 4.33.

Table 4.33: Influence of Post-Implementation impact evaluation on sustainability water supplies

Influence of Post-Implementation impact evaluation	Frequency	Percentage
Very low	3	6.4
Low	8	17.0
Moderately	14	29.8
High	14	29.8
Very High	8	17.0
Total	**47**	**100.0**

Whereas the highest and equal percentages of the WASH committee members reported that post-implementation impact evaluation either highly or moderately influenced sustainability the rural water supplies (30% in each case), other equal percentages (17%) either reported very high or low influence of post-implementation impact evaluation respectively as shown in the table. Only 6% of the respondents thought that the influence of post-implementation impact evaluation was very low.

Relationship between Post-implementation impact evaluation and sustainability of water supplies

A scoring strategy was adopted for the respondents' responses on the length of post-implementation impact evaluation t, where a score of 1 was adopted for support provided for "a few months after handing over of the project", 2 for "one year after handing over", 3= "two years after handing over" and 5 =" continuous post-implementation impact evaluation". These scores were used conduct the Pearson's Product Moment Correlation analysis against the scores for project sustainability and the findings were as shown in Table 4.34.

Table 4.34: Relationship between Post-implementation support period and sustainability of water supplies.

		Sustainability of water supplies	Post-implementation support
Sustainability of water supplies	Pearson's (r)	1	.219
	P – value		.139
	Sample size (n)	47	47
Post-implementation support	Pearson's (r)	.219	1
	P – value	.139	
	Sample size (n)	47	47

The PPMC analysis revealed that there was no significant relationship between the length of post-implementation impact evaluation period and the sustainability of the rural water supplies. This indicates that sustainability of the water supplies was not associated with longer periods of post-implementation impact evaluation t. When a community identifies its needs and adequately participates throughout the project cycle, they take responsibility for the project to ensure long term benefits to the community even without external support. Thus, while some post implementation impact evaluation is desirable, the community may not require long-term post-implementation impact evaluation which explains the insignificant correlation between the length of post-implementation impact evaluation period and

the sustainability of the water supply facilities in the study locations.

From the findings in table 4.35, Sector Policy had a mean score of 4.311, Choice of technology had a mean score of 3.909, Committee management skills had a mean score of 3.942 an Post implementation impact evaluation had a mean score of 3.991

These findings were in line with those of Braxton (2008) who found out that sustainability of many rural water projects is determined by Sector Policy, Choice of technology, Committee management skills and Post implementation.

Inferences reveal that Funds Sector Policy, Choice of technology, Committee management skills and Post implementation to a large extent determines procurement performance.

Table 4.35 Sustainability Factors Mean, Std. Deviation and Variance Results

Sustainability	N	Mean	Std. Deviation	Variance
Sector Policy	73	4.311	.8404	.648
Choice of Technology	73	3.909	.7152	.612
Committee Mgt Skills	73	3.942	.7176	.582
Post imple. Impact eva	73	3.938	.7148	.572
Average	**73**	**4.054**	**0.7379**	**0.6035**

Linear Regression Model determinants of rural water sustainability in SNV supported projects.

The study further carried out regression analysis to establish the statistical significance relationship between the independent variables notably, (X_1) Sector Policy, (X_2) Choice of technology, (X_3) Committee management skills and (X_4) Post implementation impact evaluation and dependent variables (Y) Rural water projects Sustainability. According to Green and Salkind (2003) regression analysis is a statistics process of estimating the relationship between variables. Regression analysis helps in generating equation that describes the statistics relationship between one or more predictor variables and the response variable. The regression analysis results were presented using regression model summary table, Analysis Of Variance (ANOVA) table and beta coefficients table. The model used for the regression analysis was expressed in the general form as given below:

$Y= a + B_{1*}X_1 + B_{2*}X_2 + B_{3*}X_3 + B_{4*}X_{4\,+} + B_{5*}X_{5+}\, e$

From the findings of the study it shows that the regression model coefficient of determination (R2) is 0.859 and R is 0.901 at 0.05 significance level. This is an indication that the four independent variables notably; (X_1) Sector Policy, (X_2) Choice of technology, (X_3) Committee management skills and (X_4) Post implementation impact evaluation were significant in contributing to Rural water projects Sustainability. The coefficient of determination indicates that 92.7% of the

variation on firms procurement performance is influenced by independent variables (X_1) Sector Policy, (X_2) Choice of technology, (X_3) Committee management skills and (X_4) Post implementation impact evaluation. This implies that there exists a strong positive relationship between independent variables and Rural water projects Sustainability. The remaining 7.3% of the variation on Rural water projects Sustainability can be explained by other variables not included in the model. This shows that the model has a good fit since the value is above 75%. This concurred with Graham (2002) that (R2) is always between 0 and 100%: 0% indicates that the model explains none of the variability of the response data around its mean and100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the (R2) the better the model fits the data.

Table 4.36 Regression Model Summary

Model	R	R Square
1	.859	.902

Predictors: (Constant), X1, X2, X3, X4

The study further used one way Analysis of Variance (ANOVA) in order to test the significance of the overall regression model. Green and Salkind (2003) posits that one way Analysis of Variance helps in determining the significant relationship between the research variables. Table 4.36 hence shows the regression and residual (or error) sums of squares. The variance of the residuals (or errors) is the value of the mean square which is 2.280. The predictors X1, X2, X3 and X4 represent the independent variables notably; (X_1) Sector Policy, (X_2) Choice of technology, (X_3) Committee management skills and (X_4) Post implementation impact evaluation as the major factors influencing Rural water projects Sustainability.

Table 4.37 presents the results of ANOVA test which reveal that all the independent variables notably; (X_1) Sector Policy, (X_2) Choice of technology, (X_3) Committee management skills and (X_4) Post implementation impact evaluation have a significance influence on Rural water projects Sustainability. Since the P value is actual 0.00 which is less than 5% level of significance. Table 4.37 also indicates that the high value of F (84.353) with significant level of 0.00 is large enough to conclude that all the independent variables significantly influence Rural water projects Sustainability.

Table 4.37 Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	P-Value.
1	Regression	8.332	2	3.280	83.433	.000
	Residual	2.000	57	.027		
	Total	10.332	59			

a. Predictors: (Constant), X1, X2, X3, X4

b. Dependent Variable: Y

Table 4.38 presents the results of the test of beta coefficients which indicates that the significant relationship between independent variables notably; (X_1) Sector Policy, (X_2) Choice of technology, (X_3) Committee management skills and (X_4) Post implementation impact evaluation and dependent variables Y= influence Rural water projects Sustainability. As presented in table 4.38, (X_1) Sector Policy coefficient of 0.799 was found to be positive at significant level of 0.004 and this indicates that Sector Policy has a positive influence on Rural water projects Sustainability. , (X_2) Choice of technology coefficient of 0.655 was found to be positive at significant level of 0.002 and this indicates that choice of technology has a positive influence on Rural water projects Sustainability. , (X_3) Committee management skills coefficient of 0.701 was found to be positive at significant level of 0.003 and this indicates that Committee management skills has a positive influence on Rural water projects Sustainability., (X_4) Post implementation impact evaluation coefficient of 0.811 was found to be positive at significant level of 0.001 and this indicates that Procurement policy and legal framework has a positive influence on Rural water projects Sustainability. This clearly demonstrates that all the independent variables significantly influenced Rural water projects Sustainability but the relative importance of each independent variable was different. However, since the significance values were less than 0.005, all the coefficients were significant an thus the regression equation was;

$Y= 217 + 898X_1 + 544X_2 + 644X_3 + 787X_4 + X_{5+} e$

Table 4.38 Coefficients

	B- Coefficients	**Std. Error**	**Sig F**
(Constant)	0.221	.211	.005
X1	0.799	.184	.004
X4	0.655	.184	.002
X3	0.701	.170	.003
X2	0.811	.168	.001

Dependent Variable Y

These findings echoed findings by Eyaa and Oluka (2011) who found out that procurement performance of pharmaceuticals in many developing nations is greatly influenced by the level of Governance Structure, Technology, Top management support and Procurement policy

and legal framework. The study therefore concluded that through improvement of Governance Structure, Technology, Top management support and Procurement policy and legal framework procurement performance would be increased.

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The study sought to answer four questions relating to how each independent variable influences the dependent variable of sustainability of community managed and operated rural water supplies in Kenya. The study was conducted on SNV supported projects in Olturuto, Noondepen, Oldarpoi and Ng'atataek Locations in Kajiado Central Sub County, Kajiado County, Kenya respectively. This chapter presents a summary of the findings, conclusions and recommendations. The chapter further summarizes the contribution to the existing body of knowledge and gives suggestions for areas of further research arising from the gaps identified.

Summary of the findings / answers to research

Of the 78 questionnaires administered (52 for sampled WASH Users and 26 on project staff) during the study, 47 of the 52 WASH Users questionnaires were returned representing a 90% return rate, while 100% of the project Sponsors questionnaires were returned. Overall, a 94% response rate was achieved. Fifty four percent (54%) of the household respondents were women while 46% were male. The highest percentage of the project Sponsors respondents (42%) as well as the beneficiary respondents (49%) were over 40 years of age. There were more project Sponsors respondents aged less than 30 years (35%) than there were the beneficiary respondents (17%) and more of the beneficiary respondents were aged 30- 40 years (34%) as compared to the project Sponsors respondents (23%). An equal number of the beneficiary respondents had primary or secondary level education at 43%, while 6% had college/university level education. At least 9% of the beneficiary respondents did not have formal education. More than 91% of beneficiary members had some formal education with 49% of these having secondary and college level education. 60

Of the WASH Users respondents (55%) indicated that their respective water supplies facilities had been operational for less than three years, 32% reported that the facilities had been in operation for 3-4 years, 4% in each case for between 4-5 and 5-6 years and 2% for over six years. At least 2% of the respondents could not remember the age of their facilities. On the extent of sustainability of the facilities, all the project Sponsors respondents responded in the affirmative, while 96% of the WASH Users respondents had a similar observation, with only 4% of the WASH Users respondents indicating that the water supplies were not sustainable.

Sector Policy and Sustainability

The study found that sector policy was important to sustainability of rural water supply projects as agreed by majority of the respondents surveyed who agreed that sector policy was important for sustainability at least to a great extent. There was a significant positive correlation between sector policy and sustainability of water supplies. The correlation was of moderate strength and, indicating that high levels of sustainability of the water

supplies was associated with greater sector policy influence.

Choice of Technology and sustainability

Most of the respondents agreed that technology choice influenced the sustainability of SNV supported community managed rural water supplies at least to a moderate degree. The findings indicate that where the respondents rated the choice of technology highly, the water supply project was equality rated to be more sustainable compared to where choice of technology was lowly rated. A Pearson's Product Moment Correlation analysis indicated that there was a significant but weak, positive correlation between choice of technology and sustainability of the water supplies. The more the WASH Users felt that the technology adopted was the most appropriate augmented by community participation in choosing the technology, the more likely that the water supply project would be sustainable.

Water Committees Management Skills and Sustainability

On the influence of skills of water management committees on sustainability, majority of the respondents agreed that the skills of water management committees influence sustainability of rural water supplies either moderate or highly. With respect to the adequacy of skills of the water management committees, the study found that only about half of the respondents thought that they had adequate management skills. The correlation was statistically significant at the 0.05 level of significance, indicating that WASH committee members who had higher management skills also reported higher levels of project sustainability. Thus, sustainability of rural water supplies is associated with higher managerial skills of the WASH committees.

Post Implementation Impact Evaluation and Sustainability

More than half of the respondents agreed that post implementation is important to some extent. A Pearson's Product Correlation analysis revealed that there was no significant relationship between the length of post-implementation implementation impact evaluation period and the sustainability of rural water supplies project. This indicates that sustainability of the water supplies was not associated with longer periods of post-implementation implementation impact evaluation.

Conclusion

Sector Policy

The study found Sector policy was important for achieving sustainability of rural water supply projects in the study area. The study further found the participation of women groups and community leaders is desirable for achieving sustainability. More importantly, both men and women were found to be involved in decision-making on water at the household. This finding suggests changing attitudes on gender based role assignments at the household where decisions on water at the household were traditionally associated with women and girls. The increased participation of men in household water management has significant implications for enhancing future sustainability of rural water supplies. More importantly the study shows sustainability is a sector issue requiring interdependent actions of many stakeholders at all levels including national and

regional governments, the private sector, development partners and the community itself. Communities on their own cannot be expected to achieve long term sustainability of rural water supplies without an enabling environment. The sector must take deliberate steps to address itself to sustainability as a sector issue and put in place policy frameworks needed to achieve it.

Choice of Technology

The findings indicate that where the selected technology is the preferred choice, the water supply project was equally rated to be more sustainable compared to where choice of technology was not the preferred choice or community did not adequately participate in the selection of technology. Project planners must therefore allow for wider consultation and participation in decisions relating to choice of technology for rural water supplies. The weak link between technology and sustainability found is explained by the fact that technology choice is influenced by water source characteristics, settlement pattern of the users, demand, access to spare parts, cost of operation and ability of the consumers to pay for the services. Thus choice of a technology however appropriate in itself alone does not render a project sustainable in the long run for such factors as the source characteristics which have strong influence on selection of technology options are beyond the project and WASH Users control. Technology is therefore only appropriate to the extent other mitigating parameters are also present.

Water management committee Skills

Sustainability of rural water supplies is associated with high levels of managerial skills of the WASH committees. The high number of members of water management committee members with basic and college level education has increased capacity of water committees to develop and utilize management, operation and maintenance skills required for enhancing sustainability. Those committees who indicated that they had adequate management skills, also felt that their water supplies were sustainable to a great extent. Committees with higher levels of education and skills network better with their consumers increasing participation of WASH Users and partner agencies. In addition, such committees can use and make decisions on shared information including use of information technology. Project planners should set new criteria for election of management committees including minimum education levels. The study shows evidence of increasing participation of men in the collection and management of household water, sharing the burden with women and girls traditionally associated with collection and management of household water. This may be a reflection of changing attitudes and redefinition of long held traditional values arising from increased gender mainstreaming in project planning and implementation in recent years. Project planners should build on this trend by strengthening gender mainstreaming programming approaches as it has important implications for enhancing future sustainability of rural water supplies.

Post-implementation impact evaluation

The study found there was no significant relationship between the length of post-implementation impact evaluation and the sustainability of rural water supplies. This indicates that sustainability of the water supplies was not associated with longer periods of post-implementation impact evaluation;

majority of the water committee members indicated that post-implementation support was required continuously. Training on O&M and management and monitoring were some of the areas respondents identified as requiring post implementation impact evaluation. Most facilities did not receive any s impact evaluation from external actors after project handover.

Recommendations

Increasing sector policy in project design and implementation is associated with sustainability of rural water supplies in Kenya. Increased community participation increases sense of ownership of projects among the community members. Programme and project designers must make provision for sector policy right from the start of the project. This includes making funding available for the community processes including social mobilization, organization and training of the communities.

Sector Policy

Sustainability is a sector issue that requires the collective efforts of all stakeholders to achieve. The sector must put in place the enabling environment including policy and legal frameworks for accountability necessary for achieving sustainability.

Choice of Technology

Selecting appropriate technology is a primary concern of every project manager, for without technology safe sources cannot be exploited. Project designers must take into account all parameters mitigating selection of technology including source characteristics, demand and adequacy of source and cost of operation and maintenance before making choices. Such factors as affordability, access to spare parts and quality of water are also important factors that influence long term sustainability of facilities. Planners must involve target communities in comprehensive analysis of the above parameters so that WASH Users can appreciate their responsibilities clearly from the beginning. Skilled water management committees are fundamental to achieving sustainable rural water supplies.

Water management committee Skills

Managing water supplies involves complex operations, processes and decisions in addition to coordination challenges with multiple stakeholders. Skills of water committees must therefore be continuously increased including setting minimum education and skills levels for effective participation in water committees. Incentivizing water committees should also be considered as a strategy for attracting and retaining people with skills as volunteerism in the long run is unsustainable. Such incentives may include participation in learning exchange visits, regional or national level recognition awards for community service, gifts such as bicycles/motor cycles after a certain period of successful service at the facility and repeat trainings.

Of post-implementation impact evaluation

Post implementation impact evaluation is not strongly associated with sustainability of rural water supplies although some level of support is desirable. Many rural water supplies managed by communities do not collect enough revenue to meet their operation and maintenance costs and future replacement of facilities/capital equipment. Nor do these facilities receive subsidies from government like

their urban company operated systems. Setting tariffs to cover operation, maintenance and future replacements costs will make water unaffordable by these communities. The alternative will continue to undermine long self-reliance of communities and sustainability of rural water supplies. The sector must address itself to this reality and define what level of sustainable services may be expected from unsubsidized rural water supplies. A sector analysis and policy direction on standardizing and regulating tariffs chargeable at rural water supplies is urgently required to enhance accountabilities of service providers and define desirable service levels for people living in rural areas of Kenya.

Suggestions for further studies

The study recommends further review and study of the policy and legal framework necessary for achieving sustainability of rural water supplies. The regulatory framework for an enabling environment for the creation of accountability among water management committees is currently absent. Further research on areas requiring post implementation support is also recommended as many rural water facilities begin to experience challenges after the third year of implementation.

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