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DETERMINANTS OF SUSTAINABILITY OF WATER PROJECTS AT MACHAKOS COUNTY IN KENYA

[1*]Nganga Lillian

Post graduate student, Jomo Kenyatta University of Agriculture and Technology

[2]Dr. Josephine Mutiso

Lecturer, Jomo Kenyatta University of Agriculture and Technology

P. O. Box 62000, 00200 Nairobi, Kenya

Corresponding Author email: ngangalillyane@gmail.com

Abstract

Purpose: The study sought to establish the determinants of sustainability of water projects in Machakos County, Kenya. Specifically, the study sought to establish the effect of project management capacity, government policies, resource support and monitoring on sustainability of water projects in Machakos County Kenya. The study was guided by Project Management Competency Model, Policy Theory, Resource Based View Theory and Program Theory.

Methodology: The target population comprised of 244 water projects in the county implemented by the county government, national government community and non-governmental organizations. The unit of observation was water project managers. A descriptive research design was adopted in the study. The study applied Yamane sampling formula to derive a sample of 151 respondents to be involved in the study. The study used quantitative data that was collected from respondents using 5-point Likert scales questionnaire with closed ended questions. Data was analyzed using Statistical Package for Social Sciences (SPSS). Both descriptive and inferential statistics were used. The study findings were presented through tables and figures.

Results: The study found that the key significant determinants of sustainability of water projects in Machakos County were capacity of the project management, government policies, monitoring and resource support. The study concluded that project management capacity had the greatest determinant of sustainability of water projects in Machakos County, followed by resource support, then monitoring while government policy had the least determinant of sustainability of water projects in Machakos County.

Contribution to policy and practice: The study recommends that the government should advocate for proper planning with involvement of the benefiting community and timely implementation with the required results. This can be done through making of a policy by the ministry demanding for the practice of the same by the involved organizations. The project committee should set up financial structures considering both rising of funds and dissemination of

the same in relation to operating and maintaining of the project. This can be done through learning and training on the same. The study also recommended that water beneficiaries and management should be sensitized to improve their knowledge on conservation and protection of water facilities from mismanagement and destructions. Community members should be involved in the determination of the water sale rates. County governments and the general management of the water projects in Kenya should ensure that the local community members are trained to do minor repairs.

Key Words: *Project Management Capacity, Government Policies, Resource Support, Monitoring and Sustainability of Water Projects*

1.0 INTRODUCTION

Water projects are of crucial importance as they contribute to provision of water necessary for sustenance of human life, ecological systems and for social and economic development. According to Burke (2014), water projects ought to be done in an organized way using available resources to achieve the set objective in terms of time, scope and cost. Completion of a water project and achievement of set goals and objectives is accompanied by sustainability. World Bank (2010) defines sustainability as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs." Similarly, Baumgartner and Ebner (2010) defines project sustainability as the ability to develop growth strategies by organizations that functions unlimitedly and involves maintenance of project's goals, results and products. The key to sustainability of projects is to identify contributing factors that would make a project remain functional and operational for a long period of time. World Bank report (2010) discovered that developing countries experience project sustainability challenges despite incurring huge costs on project implementation. Bilateral aid agencies and notable donors such as Asia Development Bank and World Bank have been raising concerns over the unsustainability of projects they mostly fund in developing countries. According to agencies and donors, their main concern lies on post implementation of projects which includes sustainability as opposed to formulation and implementation of projects as it has shown improvements in recent times. The agencies add that only few projects are sustained and the sustained ones optimally satisfy the intended needs. According to World Bank (2010), the poor state of sustainability of projects in developing countries coupled with huge expenditures deprives the funding agencies the benefits and returns foreseen on the projects. According to GoK (2014), development programs have given water projects a priority aiming at providing clean water accessibility to citizens for consumption and social economic development. Both county and national governments have taken initiatives to ensure availability of water by seeking funds from donors and sponsors to initiate water projects. Communities and non-governmental organizations on the other hand have also initiated programs and projects that aim at availing water to drought stricken areas. The efforts put by governments, donors, non-governmental organizations and communities in implementing water projects tend to be unsuccessful due sustainability failures of the projects (Burke, 2014). Machakos County in particular faces perennial drought and limited water resources while experiencing low levels of rainfall annually. This has triggered the government and Non- governmental organizations to assist the communities living in these regions access safe and reliable water through initiating water

projects. Despite the availability of water projects, the region continues to experience water shortages during dry seasons (Machakos Strategic Plan-MSP, 2013).

1.1 Statement of the problem

The enactment of Water Act 2002 aimed at implementing reforms in water sector that would contribute to efficiency and improvement in provision of water services in both rural and urban areas (ROK, 2012). The Act resulted to an increase in budget in water development projects from KSh. 4.2 Billion in financial year 2004/2013 to KSh. 30.8 Billion in the financial year 2011/2012. This signifies an increase of over seven times on water project expenditure from 2004 to 2012. Additionally, it shows that the government has been putting efforts to ensure there is accessibility of water to citizens for consumption and development purposes. However, despite the existence of water provision infrastructure by governments in both rural and urban areas, studies in different counties shows that between 30% and 40% of water projects initiated by the county governments, national government or nongovernmental organizations operate below capacity. A report released by AusAID (2012) on water project sustainability in Africa revealed that about 70% of all water projects fail in sustainability. Further a report by the Word Bank (2015) shows that sustainability of water project falls below 35% while many of the sustained projects experience more failures than successes more so in developing countries. In Kenya, sustainability of water project falls below 49% and amongst East Africa, it is rated as the poorest in sustainability. Machakos county is one of the counties characterized by low rainfall and limited water resources. Statistics show that 67% of residents in the county lack accessibility of water. The high rate of water shortages has seen the government, donors and nongovernmental organizations initiate water projects in the county. The various water projects initiated however face sustainability problems as only a select few attain the intended sustainability benefits to the beneficiaries.

Determinants of sustainability of water projects have not been researched widely. In Ghana for instance, Okun (2015) established factors contributing to sustainability of water projects such as inadequate financial resources, inexperienced manpower and ineffective engagement in the community during project development process. Additionally, factors such as capacity challenges characterized by inadequate knowledge and skills to run projects affect sustainability of water projects. In Kenya, Imunya (2014) found out that sustainability of projects is determined by monitoring, technology adoption, financial resources and staff training. Similarly, Okoth (2016) revealed that sustainability determinants on projects include finance, stakeholders, leadership structures and mission and goals. Additionally, Mutimba (2013) revealed that government strategies, community participation, top management and donor roles are some of the factors that determine sustainability of donor projects. Even though the reviewed studies highlights factors determining project sustainability, the studies are limited to specific fields such as education, health, environment among other sectors. The studies fail to provide a general analysis of determinants of sustainability of every project in different parts of the country. This study sought to fill the existing knowledge gap by evaluating determinants of water projects sustainability in Machakos County in Kenya.

1.2 Research objectives

i. To assess how project management capacity determines the sustainability of water projects in Machakos County, Kenya.

ii. To assess how government policies determine the sustainability of water projects in Machakos County, Kenya.

iii. To examine how resource support determines the sustainability of water projects in Machakos County, Kenya.

iv. To evaluate how monitoring determines the sustainability of water projects in Machakos County, Kenya.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Project Management Competency Model

The model was established by the work of McClelland and McBer in (1980). The model stipulates that competency in project management and sustainability is a key contributor to achievement of project's set goals and objectives. The model incorporates personality characteristics, skills, knowledge and demonstrable performance attributes which are seen as challenging virtues that a person can develop and acquire through training. According to the model, competency comprises of individual's underlying characteristics that are criterion related and effectively contribute to achievement of success in a project. According to McClelland and McBer (1980), project developers' aims at formulating a project that sustains the intended needs in long run and benefits target beneficiaries for a long time. To achieve the intended benefits, project frontiers needs to have competent attributes that matches the needs of the project. Similarly, the project leaders need to have key knowledge that will ensure smooth running of project after its completion. Additionally, the knowledge is required in maintaining continuous flow of benefits to target beneficiaries. Competency interest in project management and sustainability banks on widely held assumption that if competent people manage and work on projects, their performance will be effective and successful and it will culminate into realization of organization's set goals and objectives (Gerstenfeld, 2011). Competence in project management and sustainability is accepted generally but it ought to encompass skills, behaviors, knowledge and attitudes which are attributes associated with performance (Kandler *et al*, 1014).

The model contributes significantly to the study as it informs of the first study variable which project management capacity. In water projects, individual's left to maintain the projects after the financier phases out need to have competent managerial skills that is key in running the project. Similarly, the financiers need to instill project managerial skills to the beneficiaries that will enhance sustainability achievement of the project.

2.1.2 Policy Theory

The theory was proposed by Colebatch (2002) and it revolves around formulation of policies, their implementation and project evaluation along assigning documents to a particular goal or issue. Further literature review on the theory reveals the important roles played by documents in defining purpose and direction of projects. According to Colebatch (2002), policies that govern formulation and implementation of projects have the ability of providing stakeholders a less complex method of governing a project. The relationship between policy and power (exercised primarily by the governments) is furthered by Smith (2004) where he claimed that formulated policies form a mechanism where social relations are meditated. In his argument, Smith(2004) revealed that

policies aim at organizing relations socially by governing existing and future social practices. Additionally, policies outline positions objectively from where issues, systems and people create a relationship with world. Ball (2015) advanced policy theory and disclosed that emergent discourses identifies stakeholders position, field of action and sets boundaries on the outcomes of the intended policy. This perspective on policy formulation process surpasses the written document, voices heard and the context and combines in giving a particular agenda and stance legitimacy that supports a specific group to act authoritatively while at the same time marginalizing another group. The policy theory contributes to the study as it informs on how policies formulated by governments can positively or negatively contribute to sustainability of water projects.

2.1.3 Resource Based View Theory

The theory was proposed by Barney (1991). The theory suggests that the internal resources held by an organization influences sustenance of competitive advantage of the firm. According to the theory, ownership of non-imitable, rare, non-substitutable and valuable resources contributes to firms' optimal productivity that contributes to competitive advantage. The value characteristic of a resource means that a resource should have the ability of creating a valued strategy that lessens a firm weakness or surpasses that of the competitor (Barney, 1991). Similarly, the returns acquired from the adopted value strategy must be significantly higher than the investment costs associated with the resource (Mahoney & Prahalad, 1992). The rare characteristic of a resource means that its defined price has the ability of reaching the targeted future returns. Similarly, the inimitability of a resource enables a firm to have control over the resource which serves as source of competitive advantage or sustainability. The author stipulates that when a resource highly unknown, it becomes more inimitable. According to Cooner (1992) who supported Barney's theory, there exist different types of resources that a firm can possess and includes tangible, intangible and organizational capabilities. Tangible resources comprise of technological, financial, organizational and physical assets which are easy to identify in a firm. Intangible resources comprise of practices developed by organizations over time and contribute to results improvement. They are difficult to identify and cannot be easily copied by competitors. Organizational capabilities comprise of skills and competencies used to acquire outputs as a result of combining tangible and intangible resources. Availability of resources either knowledge based, potentially value-creating, non-substitutable or imitate ensures sustainability of firms that enhances productivity. The theory contributes to the study as it informs on the need of resource support and availability that enhances achievement of project sustainability. When resources are availed to a project, the target beneficiaries continue to reap benefits from the project for a long period of time.

2.1.4 Program Theory

The theory was proposed by Mark (1990) and its evaluation capacity has grown and developed over the past decade. The theory proposes that a program/project should be well-designed to achieve its intended benefits and outcomes to the target beneficiaries. Similarly, the theory explains the extent to which interventions in project formulation and implementation are understood and their contribution to achievement of program/project's intended long term impacts on beneficiaries. The theory provides a framework that brings together existing aspects of a project /program and clarifies on the prevailing issues that may hinder realization of set objectives. Additionally, the theory provides a basis for identifying existing gaps on the intended benefits of a project and how the gaps can be sealed. Similarly, Donaldson (2012) asserts that program theory

offers an avenue for project evaluation by identifying segments in a project that needs to be emphasized and addressed to realize the intended benefits of a project. Application of program theory in project formulation, implementation and in post-implementation practices offers helpful information that explains solutions to problems bound to hinder projects sustainability and provides alternative means of obtaining intended results and benefits of a project. Additionally, the theory can be used in making expansive decisions that culminates into solutions on problems facing a project. Every project calls for a close and continuous evaluation and monitoring for it to achieve its long term benefits to beneficiaries. Availability of relevant monitoring resources, framework and support contributes to sustainability of projects to the target beneficiaries. The theory is of relevant to the study as it informs on the important roles played by monitoring practices towards sustainability of projects.

2.2 Conceptual framework

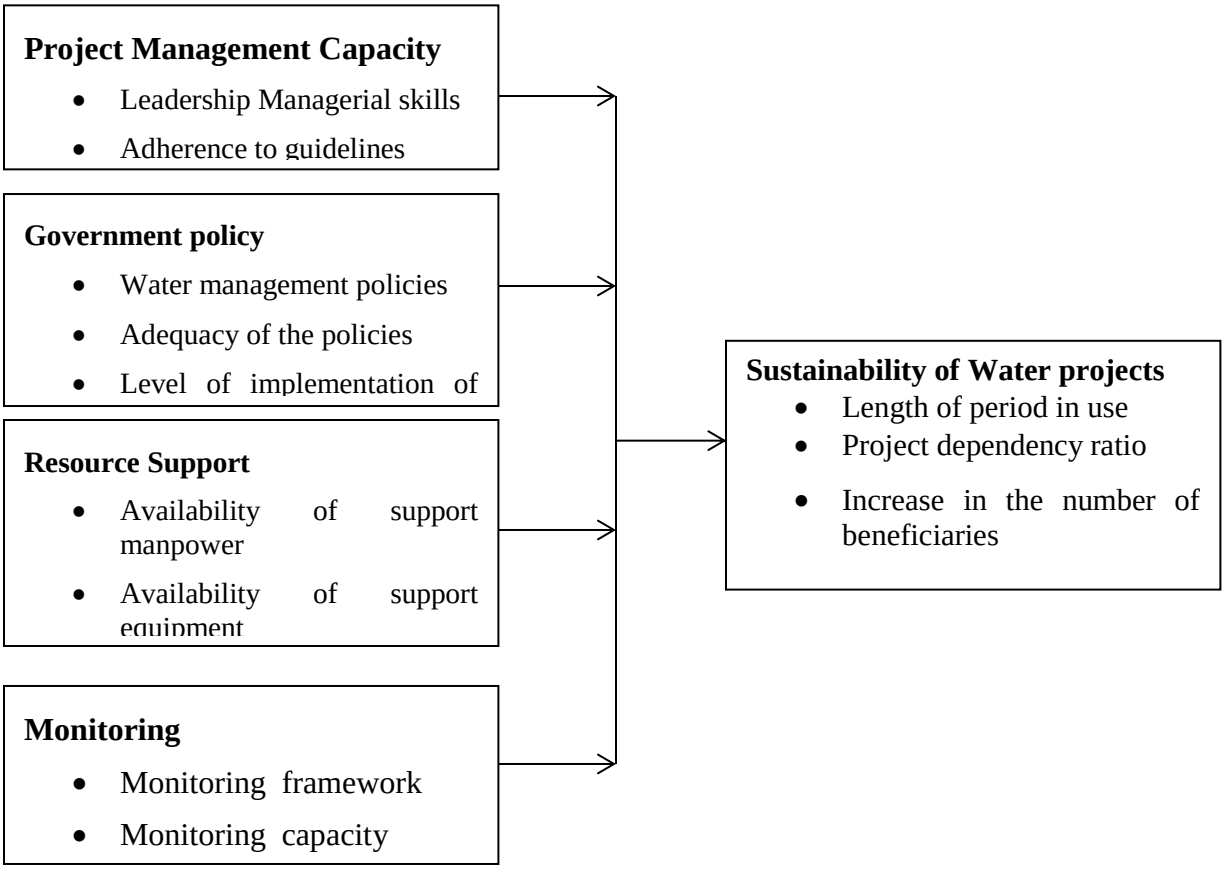

Figure 1: Conceptual Framework

2.3 Project Management Capacity

According to PMBOK (2010), project management capacity is the ability of applying both technical and knowledge skills to ensure that a project achieves its stipulated goals and objectives in both short and long term. Similarly, it is the ability of identifying projects goals, how to achieve

the goals, the resources needed in achieving the goals and the time it will take to achieve the set goals and objectives. Karanja (2014) asserts that project management aims at ensuring completion of a project at stipulated time, project conclusion within the set budget and ensuring that a project achieves its technical and functional performance attributes that ultimately satisfies the needs of the end user. Project management capacity applies to both project financiers and the target beneficiaries. After the completion of a project, its sustainability depends on the laid down management preparedness and availability of management resources on the beneficiary side. The financiers of a project including governments, donors and non-governmental organizations are called upon to avail and instill the required management capacity skills before phasing out. By doing so, they will be paving a way for continuous sustainability of projects to the community. Chou (2013) notes that many projects collapse shortly after the financier phase out due to lack of post management skills required to keep the project running. He adds that lack of preparedness on the side of beneficiaries also contributes to collapsing of projects. According to Gerstenfeld (2011) knowledge and technical management skills are attributes necessary for enhancing sustainability of projects. Technical skills entail practical knowledge required in operating the technical aspect of a project and require training for successful mastery of the skill. Running a water project sustainably requires both technical and non-technical skills. The skills are acquired from frontiers of the project. A water project bears a technical side that calls for continuous maintenance to ensure a project achieves its sustainability objectives. According to Handarto (2015), the overall project management capacity depends highly on the cooperation between individuals in the management team where individual contribution should be directed towards achieving the project's set goals and objectives. A successful project management team requires key technical and non-technical resources that a project needs to achieve it sustainability needs.

2.4 Government Policy

Better governance policies form a prerequisite for project sustainability. According to Kemp *et al* (2013), a good governance policy comprises of participation, openness, accountability, efficiency and sensitivity aspect emanating from the policy giver towards subordinates. Of importance is noting that a good governance lays emphasis on the roles played by institutions in administrative hierarchy as entities that links citizens with government. Kemp *et al* (2013) notes that sustainability governance comprises of key components and features which includes sharing sustainability objectives, policy integration, practical implementation incentives, governance rules and sustainability indicators. According to OECD (2012), project sustainability requires integration of government policies in the course of running a project to ensure it achieves it expected long term benefits to end users. In this regard, OECD notes that to realize project sustainability, there has to be prior planning and approvals from relevant administrative institutions, governing execution rules and formulated target achievement indicators. Additionally, incentives and information for policy implementation that guides execution of project's activities are necessary for achieving sustainability. A report by UN(2013) noted that regulatory frameworks formulated by national governments that aim at overseeing running of water projects are essential in ensuring the projects acquire protection that contributes to sustainability. According to the report, regulatory frameworks act as incentives that eliminate success inhibitors of project sustainability. The government on its side has the responsibility of creating an enabling environment that contributes to sustainability of water projects such as establishing an efficient tax structure that favors

establishment of a project. Areas where county governments have established favorable governance policies on water projects experiences high sustainability levels since the policies favor running of the project.

2.5 Resource Support

Resource support according to Sutton (2014) defines the resources required to successfully run a project after phasing out of financiers. The resources include and not limited to manpower, equipment and financial support that are necessary for ensuring smooth running of a project. Manpower resources comprise of skills and labor required to run the activities of a project. Efficiency, adequacy and availability of human resource support manpower avails helpful skills necessary for smoothly running a project. Support equipment in project sustainability comprises of set of tools required in achieving set objectives. Projects such as water project benefits end users routinely and are expected to operate throughout for maximum sustainability. Occasional breakdowns are inevitable for such projects and availing maintenance equipment enhances correction of breakdowns. For project sustainability to be achieved, the funding organization needs to avail maintenance support comprising of equipment to the end user. In areas where project sustainability fails, Uyoga (2012) established that the end user is left with the responsibility of maintaining the project. Skills and equipment deficiency amongst end user contributes to failing of projects. Orondi (2015) posit that financial resources contribute the highest factor in project sustainability. In financing and running a project, adequate funds are needed for the project to realize its intended benefits. Binder (2014) is on the agreement that financial support that involves soliciting for project maintenance funds contributes to project sustainability. Insufficient sources of funds to support running of a project leads to poor maintenance and has been cited as the main cause of failures of projects sustainability. Support resources play a key role in enhancing sustainability of water projects. For a project to benefit the end user for a long time, support from financiers and end user inputs are crucial. Deficiencies in support availability lead to sustainability failures of water projects.

2.6 Monitoring

According to Mrosek (2015), monitoring practices have been one of the most important tools for achieving economic, environmental and social sustainability globally. At international and national levels, monitoring indicators and sustainability criteria are crucial tools that define, reports and monitors social, economic and ecological trends by tracking progress towards achievement of goals and influencing practices and policies (UN, 2014). At regional levels, Montana (2015) asserts that monitoring is an important tool that assesses regional sustainability practices and assists in planning management. According to PMBoK (2015), monitoring creates an avenue where the management develop abilities of assessing and identifying potential successes and problems bound to affect sustainability of a project. Similarly, M & E provides the basis through which corrective actions and measures aiming at improving the quality of end results are identified and implemented. Spaulding (2014) agrees that M & E is one of the aspects of a project that cannot be underrated as it determines sustainability levels of a project. According to World Bank (2011), one of the reasons for projects sustainability failures is attributed to poor or lack of monitoring and control practices. M & E activities provide financiers of projects with means of identifying past failures experienced in project sustainability and paves a way for improving on the failures. Consequently, financiers acquire resource allocation and planning tactics that are important in

achieving a project's intended goals and objectives. Project formulation, initiation, execution and completion focuses on the final results which explain the continuous growth on monitoring interests. According to Mark *et al*(2015), sustainability and success of a project depends largely on the feedbacks derived from ongoing activities of a project. In past years, financiers funding projects activities have emphasized on the importance of results achievement and efficiency project operations. This has led to emphasis on monitoring practices that ensure a project delivers its long term benefit to end users hence achieving sustainability.

2.7 Sustainability of Water Projects

According to Habtamu (2012), project sustainability is the degree to which a water project functions for a long period of time while benefiting end users. Determinants of water sustainability as stipulated by Gebrehiwot (2015) depends on both pre and post- implementation factors. Factors in pre-implementation stage comprises of demand responsiveness, community involvement, site selection, construction quality, existing population, technology selected and community training. Factors in post–implementation stage comprise of community satisfaction, financial and institutional management, technical support and willingness to support, maintain and sustain the project. Sustainability of water project is a key desire for government, nongovernment and communities at large since a sustained project ensures continuous deliverance of benefits to the target beneficiaries for a long time (Kanyanya, 2014). Planning for sustainable activities calls for engagements of stakeholders and the target beneficiaries to create a better understanding and pave way for implementation of formulated activities. Pauline (2015) noted that the most important factor that contributes to water project sustainability is genuine involvement of target beneficiaries as equal partners and active participants since their experience and concerns intrinsically contribute to success of the project. The level of involvement of intended beneficiaries determines to a great extent establishment of a project, how successful a project consolidates and how it responds in meeting arising needs. According to Pauline (2015), it is of great importance to involve target beneficiaries regarding decisions on project's planning stage, implementation, execution and closure.

3.0 RESEARCH METHODOLOGY

The study adopted a descriptive research design and targeted 244 water projects initiated in the county by the county government, national government community and non-governmental organizations. Yamane (1967) sampling formula was adopted in the study to derive a sample of 151 projects. The unit of observation comprised of managers of the selected water projects. The study used questionnaires with open and close ended questions to collect data captured through a 5-point likert scale. Inferential and descriptive statistics was used to analyse data. Results of the analysis were presented by use of tables and figures. Inferential statistics was used to establish the association between independent variables and dependent variable. The study used the following regression model:

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

Where Y = Sustainability of Water Projects, X_1 = Project Management Capacity, X_2 = Government Policy, X_3 = Resource Support, X_4 = Monitoring, β_0= Regression Constant or

Intercept, $\beta_1, \beta_2, \beta_3$ and β_4= coefficients of various independent variables and Ɛ =error term assumed to be normally distributed with a zero variance.

4.0 RESULTS

The study administered 151 questionnaires where 118 questionnaires were filled and returned. This represented a response rate of 78%. This response rate was within what Creswell (2012) prescribed as a significant response rate for statistical analysis and established at a minimal value of 50%.

4.1 Descriptive statistics

Project Management Capacity

The study sought to assess how project management capacity determines sustainability of water projects in Machakos County, Kenya. The respondents were requested using a Likert scale of 1-5, to tell their level of agreement with statements on project management capacity. Their responses were as shown in Table 1. From the findings, the respondents agreed that water management committees have increased the alignment of development projects with host communities as illustrated by a mean score of 4.415, that water management committee members adequately respond to concerns as illustrated by a mean score of 4.220 and that water management committees have clear and achievable estimates in project schedule as illustrated by a mean score of 4.161. This is in line with Karanja (2014) who asserts that project management aims at ensuring completion of a project at stipulated time, project conclusion within the set budget and ensuring that a project achieves its technical and functional performance attributes. Further, the respondents agreed that leadership skills of water management committees is satisfactory as illustrated by a mean score of 4.066, that water management leadership is provided based on formulated guidelines and policies as illustrated by a mean score of 3.983, that there is an effective water management system in in water projects as illustrated by a mean score of 3.644 and that there is provision of leadership training on management of water projects as illustrated by a mean score of 3.559. Moreover, the respondents agreed that water management committees have experience in management as illustrated by a mean score of 3.542 and that water management committee have sufficient technical expertise to manage water projects 3.534 but disagreed that skills of water management committee are adequate in sustainability of water projects as illustrated by a mean score of 2.042 and that there are measures put in place to mitigate water projects sustainability risks as illustrated by a mean score of 1.966. These findings concur with Chou (2013) that many projects collapse shortly after the financier phase out due to lack of post management skills required to keep the project running. He adds that lack of preparedness on the side of beneficiaries also contributes to collapsing of projects.

Table 1: Agreement with Statements on Project Management Capacity

Statements	Mean	Std. Dev.
Water management committee members adequately respond to concerns	4.220	0.601
There is provision of leadership training on management of water projects	3.559	0.607
Skills of water management committees are adequate in sustainability of water projects	2.042	0.982
There are measures put in place to mitigate water projects sustainability risks	1.966	0.784
Water management leadership is provided based on formulated guidelines and policies	3.983	0.613
There is an effective water management system in the water projects	3.644	0.647
Water management committees have sufficient technical expertise to manage water projects	3.534	0.903
Water management committees have experience in management	3.542	0.636
Water management committees have clear and achievable estimates in project schedule	4.066	0.640
Leadership skills of the water management committees is satisfactory	4.161	0.522
Water management committees have increased the alignment of development projects with host communities.	4.415	0.766

Government Policy

Further the study sought to assess how government policies determine sustainability of water projects in Machakos County, Kenya. The responses given by the respondents were used to come up with the findings. The respondents were also requested using a Likert scale of 1-5, to tell their level of agreement with statements on government policy. Their responses were as shown in Table 2. As per the findings, the respondents agreed that the county government involves all stakeholders in formulating polices on water projects as shown by a mean score of 4.144, that the county government have put measures in place to ensure there is implementation of sustainability policies on water projects as shown by a mean score of 4.000 and that there are adequate water officers to enhance policies and guidelines on water projects as shown by a mean score of 3.983. These findings corresponds to Kemp *et al* (2013) who noted that a good governance policy comprises of participation, openness, accountability, efficiency and sensitivity aspect emanating from the policy giver towards subordinates. Of importance is noting that a good governance lays emphasis on the roles played by institutions in administrative hierarchy as entities that links citizens with government. Moreover, the respondents agreed that the county government provides effective water management policies on water projects as shown by a mean score of 3.831 and that there are penalties set on violation of water polices in the county as shown by a mean score of 3.653. However, the respondents were neutral that the county government have established water management guidelines on water projects as shown by a mean score of 2.780and disagreed that nature of polices and guidelines contributes to sustainability of water projects in the county as shown by a mean score of 2.229. The findings are similar to Kemp *et al* (2013) findings that sustainability governance comprises of key components and features which includes sharing sustainability objectives, policy integration, practical implementation incentives, governance rules and sustainability indicators.

Table 2: Agreement with Statements on Government Policy

Statement	Mean	Std. Dev.
The county government provides effective water management policies on water projects	3.831	0.890
The county government have established water management guidelines on water projects	2.780	0.416
The county government have put measures in place to ensure there is implementation of sustainability policies on water projects	4.000	0.847
The county government involves all stakeholders in formulating polices on water projects	4.144	0.603
There are adequate water officers to enhance policies and guidelines on water projects	3.983	0.762
Nature of polices and guidelines contributes to sustainability of water projects in the county	2.229	0.422
There are penalties set on violation of water polices in the county.	3.653	0.605

Resource Support

The study sought to examine how resource support determines sustainability of water projects in Machakos County, Kenya. The respondents were requested to answer using a Likert scale of 1-5, to tell the level of their agreement with statements on resource support. Their responses were as shown in Table 3. From the findings, the respondents agreed that the county allocates enough funds for maintenance of water project as shown by a mean of 3.975, that there are technical team allocated to water projects to offer technical support as shown by a mean of 3.966, that the county government provides equipment for maintenance of water projects as shown by a mean of 3.771 and that the county government provide resources for routine maintenance of water projects as shown by a mean of 3.720. The respondents also agreed that there is a periodic training on maintenance of water projects by the county government as shown by a mean of 3.585. These findings correlate with Orondi (2015) who posits that financial resources contribute the highest factor in project sustainability. In financing and running a project, adequate funds are needed for the project to realize its intended benefits. However the respondents were neutral that water project maintenance costs is met by the beneficiaries on the projects as shown by a mean of 3.153 but disagreed that completion of water projects is accompanied by training on operating the project as shown by a mean of 2.339 and that the funds allocated for maintenance of water projects is well utilized as shown by a mean of 2.127. The findings are in line with Binder (2014) who is on the agreement that financial support that involves soliciting for project maintenance funds contributes to project sustainability. Insufficient sources of funds to support running of a project leads to poor maintenance and has been cited as the main cause of failures of projects sustainability.

Table 3: Agreement with Statements on Resource Support

Statement	Mean	Std. Dev.
The county allocates enough funds for maintenance of water projects	3.975	0.562
The funds allocated for maintenance of water projects are well utilized	2.127	0.335
There are technical teams allocated to water projects to offer technical support	3.966	0.762
Water project maintenance costs are met by the beneficiaries on the projects	3.153	0.854
The county government provides resources for routine maintenance of water projects	3.720	0.846
The county government provides equipment for maintenance of water projects	3.771	0.919
Completion of water projects is accompanied by training on operating the project	2.339	0.669
There is a periodic training on maintenance of water projects by the county government.	3.585	0.631

Monitoring

Table 4: Agreement with Statements on Monitoring

Statements	Mean	Std. Dev.
There is a monitoring team on water projects	3.686	0.748
Designing monitoring frameworks involves all stakeholders in water projects	3.915	0.635
There is an established post implementation M&E framework on water projects	2.144	0.899
The county government provides financial support in monitoring water projects	4.492	0.725
Water projects are routinely monitored to evaluate their success	3.280	0.905
There is a set budget for executing the monitoring practices	4.220	0.509
Funds allocated are used for M&E activities only	4.017	0.599
Leaders take active part in designing the M&E systems	4.373	0.624
Results from evaluation processes are implemented according to formulated recommendations.	3.636	0.712

The study further sought to evaluate how monitoring determines sustainability of water projects in Machakos County, Kenya. The respondents were again asked using a Likert scale of 1-5, to tell the level of agreement with statements on monitoring. Their responses were as shown in Table 4. As per the findings, the respondents agreed that the county government provides financial support in monitoring water project as illustrated by a mean of 4.492, that leaders take active part in designing the M&E systems as illustrated by a mean of 4.373, that there is a set budget for executing the monitoring practices as illustrated by a mean of 4.220 and that funds allocated are used for M&E activities only as illustrated by a mean of 4.017. The respondents also agreed that designing monitoring frameworks involves all stakeholders in water projects as illustrated by a

mean of 3.915, that there is a monitoring team on water projects as illustrated by a mean of 3.686 and that results from evaluation processes are implemented according to formulated recommendations as illustrated by a mean of 3.636. The findings are consistent with Mrosek (2015) who argues that monitoring practices have been one of the most important tools for achieving economic, environmental and social sustainability globally. However, the respondents were neutral that water projects are routinely monitored to evaluate their success as illustrated by a mean of 3.280 and disagreed that there is an established post implementation M&E framework on water projects as illustrated by a mean of 2.144. This is in line with PMBoK (2015) that monitoring creates an avenue where the management develop abilities of assessing and identifying potential successes and problems bound to affect sustainability of a project.

Sustainability of Water Projects in Machakos County

The respondents were requested to indicate the average length of use of water projects in the county after projects completion. Their replies were as shown in Table 5. From the above results, majority of the respondents indicated that the use of water projects in the county after project completion has been for 3 to 4 years as shown by 43.2%, for 1 to 2 years as shown by 27.1%, for more than 5 years as shown by 24.6% and for a period of less than 1 year as shown by 5.1%. This implies that most of the water projects in the county have been sustained after completion.

Table 5: Length of Use of Water Project in the County after Project Completion

Length of use	Frequency	Percent
Less than one year	6	5.1
Between 1-2 years	32	27.1
Between 3-4 years	51	43.2
Above 5 years	29	24.6
Total	**118**	**100**

Further, the respondents were asked to indicate changes in the number of beneficiaries of water projects in the county for the past 5 years. The results were as shown in Figure 4.1. The findings shows that the number of beneficiaries have been increasing since 2014. As per the respondents this is as a result of increasing population in the county coupled with immigration to the county being one of the fast developing counties in Kenya. Other cited that devolution has played major role in the increase in number of beneficiaries with county residents now able to access the water projects initiated by the county government.

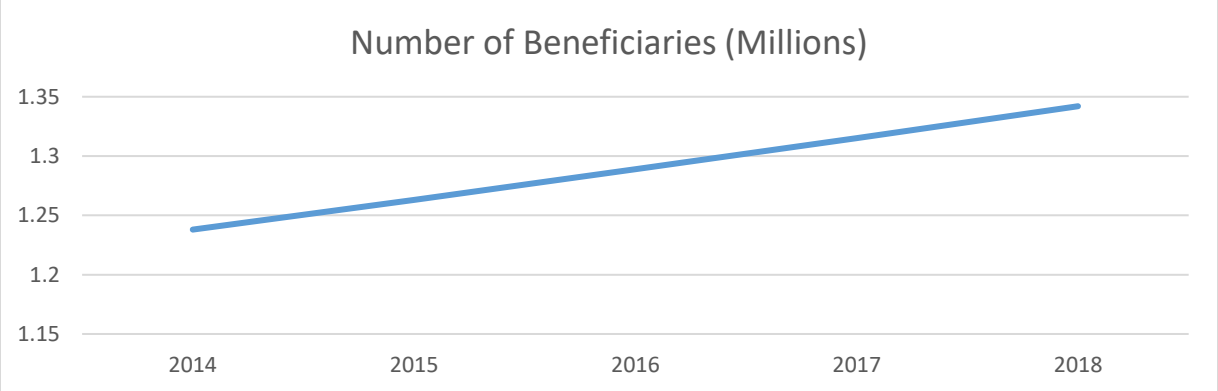

Figure 2: Number of Beneficiaries (Millions)

Further respondents were requested to indicate the variations in the water project dependency ratio in the last five years. Their replies were as shown in Figure 4.2. From the findings, the respondents indicated that the water projects dependency ratio in the last five years has been increasing since 2014. This is as a result of population increase in Machakos County.

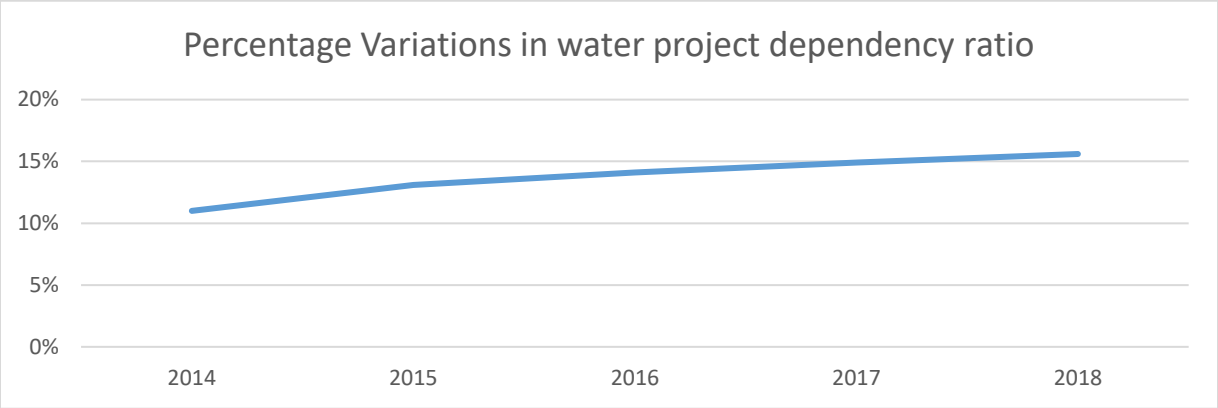

Figure 3: Percentage of Variations in the Water Project Dependency Ratio

Regression Analysis

Regression analysis shows how the dependent variable is influenced with independent variables. The study sought to determine the influence of stakeholder activities on sustainability of water projects in Machakos County. Table 6 is a model fit which seeks to establish how fit the model equation fits the data. The R^2 was used to establish the predictive power of the study model and it was found to be 0.741 implying that 74.1% of the variations on sustainability of water projects in Machakos County is explained by project management, government policy, resource support as well as monitoring leaving 25.9% percent unexplained. Therefore, further studies should be done to establish the other determinants of sustainability of water projects in Machakos County.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.861	0.741	0.732	0.755

The probability value of 0.000 in the ANOVA indicates that the regression relationship was highly significant in predicting how project management , government policy, resource support as well as monitoring influenced sustainability of water projects in Machakos County. The F calculated at 5 percent level of significance was 80.746 since F calculated is greater than the F critical (value = 5.6581), this shows that the overall model was significant.

Table 7: ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	189.117	4	47.279	80.746	3.17E-32
	Residual	66.165	113	0.586		
	Total	255.282	117			

The regression equation above has established that taking all factors into account (project management capacity, government policy, resource support and monitoring) constant at zero, the influence of stakeholder activities on sustainability of water projects in Machakos County was 0.731. Further, the findings shows that a unit increases in the monitoring would lead to a 0.712 increase on the influence of stakeholder activities on sustainability of water projects in Machakos County. The variable was significant since calculated t (3.207) was greater that table value of t (1.658). This corresponds to Mrosek (2015) who argues that monitoring practices have been one of the most important tools for achieving economic, environmental and social sustainability globally. The findings presented also show that taking all other independent variables at zero, a unit increase in financing activities would lead to a 0.867 increases on the influence of stakeholder activities on sustainability of water projects in Machakos County. The variable was significant since calculated t (2.843) was greater that table value of t (1.658). This concurs with Karanja (2014) who asserts that project management aims at ensuring completion of a project at stipulated time, project conclusion within the set budget and ensuring that a project achieves its technical and functional performance attributes that ultimately satisfies the needs of the end user.

The study also found that a unit increase in government policy would lead to a 0.703 increase the influence of stakeholder activities on sustainability of water projects in Machakos County. The variable was significant since calculated t (2.449) was greater that table value of t (1.658). This was similar to Kemp *et al* (2013) who noted that a good governance policy comprises of participation, openness, accountability, efficiency and sensitivity aspect emanating from the policy giver towards subordinates. Further the study found that a unit increase in the scores of resource support would lead to a 0.732 increase on the influence of stakeholder activities on sustainability of water projects in Machakos County. The variable was significant since calculated t (5.674) was greater that table value of t (1.658). This was in line with Orondi (2015) who posits that financial resources contribute the highest factor in project sustainability. Overall, project management capacity had the greatest determinant of sustainability of water projects in Machakos County, followed by resource support, then monitoring while government policy had the least determinant of sustainability of water projects in Machakos County. All the variables were significant (t>1.658).

The optimal regression model becomes:

Sustainability of Water Projects in Machakos County = 0.731+ 0.867 (Project management capacity) + 0.703 (Government policy) + 0.732(Resource support) + 0.712 (Monitoring)

Table 8: Coefficients of Determination

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.731	0.239		3.059	0.003
Project management capacity	0.867	0.305	0.368	2.843	0.006
Government policy	0.703	0.287	0.386	2.449	0.017
Resource support	0.732	0.129	0.832	5.674	0.011
Monitoring	0.712	0.222	0.462	3.207	0.002

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study concluded that project management capacity determines sustainability of water projects in Machakos County significantly. This was attributed to the fact the water management committees have increased the alignment of development projects with host communities and adequately respond to concerns with clear and achievable estimates in project schedule. It was also clear that water management committees leadership skills is satisfactory where its leadership is provided based on formulated guidelines and policies. This has led to effective water management system in water projects. Further, it was deduced that water management committees have experience in management coupled with sufficient technical expertise to manage water projects. Further, the study concluded that government policies are a significant determinant of sustainability of water projects in Machakos County. This is as a result of the fact that county government involves all stakeholders in formulating polices on water projects and have put measures in place to ensure there is implementation of sustainability policies on water projects. Moreover, there are adequate water officers to enhance county provided water policies and guidelines on water projects. There are penalties set on violation of water polices in the county. The study concluded that resource support determines sustainability of water projects in Machakos County significantly. It was revealed that county allocates enough funds for maintenance of water project as well as allocation of a technical team allocated for water projects to offer technical support. The county government also provides equipment for maintenance of water projects and resources for routine maintenance of water projects. The study also deduced that there is a periodic training on maintenance of water projects by the county government and water project maintenance costs is met by the beneficiaries on the projects. The study further concluded that monitoring determines the sustainability of water projects in Machakos County significantly. The county government provides financial support in monitoring water project where leaders actively participate in designing the M&E systems. Further, a budget is set for implementation of monitoring practices where funds are allocated for M&E activities. The study deduced monitoring frameworks designing involves all stakeholders in water projects where results from evaluation processes are implemented according to formulated recommendations.

5.2 Recommendations

The researcher recommends that the government should advocate for proper planning with involvement of the benefiting community and timely implementation with the required results. This can be done through making of a policy by the ministry demanding for the practice of the same by the involved organizations. The project team should consider and implement community management through ensuring that all the projects they undertake are locally managed. This can be done through encouraging meetings on the site and educating the beneficiaries on the management. The project team should also ensure awareness of all stakeholders on the project intentions all the time. This can be done through addresses made in chief Barazas, church gatherings and other gatherings in the area. The project committees should set up financial structures considering both rising of funds and dissemination of the same in relation to operating and maintaining of the project. This can be done through learning and training on the same. The study recommended that periodic maintenance supports e.g. replacement of worn out parts for the boreholes, disilitation of water pans and dams should be done promptly in order to improve the functionality of water projects. The study also recommended that water beneficiaries and management should be sensitized to improve their knowledge on conservation and protection of water facilities from mismanagement and destructions. Also, the project implementers and donors should give adequate guidance and training to water operators and beneficiaries on how to operate and maintain water facilities before handing over to them. The study recommends that county governments in Kenya should put in place proper governance as this increases the sustainability. There is need for proper maintenance of donor projects as this shall enhance sustainability. County governments and the general management of water projects in Kenya should ensure continuous upgrading and training of the technical skills as this enhances sustainability. Water quality testing should be put in place on a regular basis. The study further recommends that all county governments and the general management of water projects should ensure maximum community participation and support for this increases project efficiency. Community members should be involved in the determination of the water sale rates. The study recommends that community members should willingly conserve the project area. County governments and the general management of water projects in Kenya should also involve community members in raising suggestions and opinions to better the project. County governments and the general management of the water projects in Kenya should ensure that the local community members are trained to do minor repairs. Management of water projects and the county governments in general should also involve community members during conception, design, implementation, operation and maintenance of the projects.

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