

# **INFLUENCE OF INTEGRATED WATER RESOURCES MANAGEMENT APPROACH ON SUSTAINABILITY OF WATER PROJECTS IN LAKE NAIVASHA BASIN**

**Enock Nyakango Okemwa** 

Jomo Kenyatta University of Agriculture & Technology

School of Entrepreneurship, Procurement and Management, Nairobi, Kenya

enokemwa@yahoo.com

**Daniel M. Wanyoike**

Jomo Kenyatta University of Agriculture & Technology

School of Entrepreneurship, Procurement and Management, Nairobi, Kenya

dwanyoike@jkuat.ac.ke; danwanyoike@gmail.com

## **Abstract**

*In order to deliver positive gains to the target communities, long term water project sustainability is desired. This study is focused on the influence of integrated water resources management approach on projects sustainability in the Lake Naivasha basin, Kenya. The study explored the influence of stakeholder participation, women involvement and use of water as an economic goods. A descriptive research design was adopted with a target population of 632 members from 12 Water Resources Associations. A combination of stratified random and purposive sampling techniques were used to select the sample size of 86 respondents. A structured questionnaire was used. Data was analyzed using SPSS 20 for descriptive and inferential analysis. Women empowerment; involvement and leadership enhance sustainability of water projects. A statistically significant positive correlation existed between influence of stakeholder participation, women involvement, using water as an economic good ( $r= 0.531, 0.622$  and  $0.627$ ). The study concluded that sustainability of the water projects is largely dependent on stakeholder participation, women involvement and commitment to using water as an economic good by paying water use fees, maintenance costs and conserving water catchments.*

Keywords: Women Participation; Integrated Water Resource Management; Stakeholder; Community Involvement; Economic Goods

## INTRODUCTION

Water is a crucial, but often overlooked element in sustainable development. If effective, long lasting solutions to water problems are to be found, a new water governance and management blueprint must be put in place. Sherk et al. (2000, p 1) argued that “One of the most pressing issues of the current millennium is the management of the limited freshwater resources of the world” This is a challenge faced by governments, civic society and industry, including the energy sector. Great challenges on water use have been accelerated by catchment area destruction and water shed or habitat encroachment especially wetlands.

Being a fundamental natural resource for sustainable development, water was incorporated in the Millennium Development Goals (MDGs) (UNESCO, 2012a). Moreover, across many areas in the world, water scarcity and deteriorating water quality has led to limited sustainable development. It is estimated that one-fifth of the world’s population lives under conditions of water scarcity (Herring & Ingold, 2012). Water is a complex resource that is closely linked to our food and energy systems. The way these three systems intersect is described as the food-water-energy nexus (Hanlon et al. 2013), and involves a broad set of stakeholders. However, women involvement and empowerment to manage water resources is still slow especially in Africa and other developing countries.

Integrated water resource management (IWRM) is a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000, p. 22). The concept of IWRM as advanced by the UN encourages coordinated sustainable management of water resources among all water users. However, according to Victor (2013), the optimism about IWRM must be tempered by realities about how integration across different industries and political systems might be achieved. Further, IWRM is a repetitive process of managing water resources. It needs coordinated efforts and engaging relevant stakeholders. The World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, in 2002 put IWRM at the top of the international agenda. The IWRM was included as one of the key components for achieving sustainable development.

Since 2002, IWRM has marked a fundamental shift away from the traditional top-down, supply-led solutions to water problems dominated by technology (McDonnell, 2008). But as water use increased, more complex institutions were needed to negotiate and coordinate water allocations among different users (Muller & Lenton, 2009). This where the issue of paying water use fees and maintenance costs is significant in sustaining IWRM. The 2012 United Nations survey revealed that over 50% of African countries are implementing national plans for IWRM while 75% are on course in the implementation of water laws in line with African Water Vision

for 2025. The report shows that 18 of the 40 countries that responded have IWRM plans under implementation compared to 2008 when 5 countries, out of the 16 that responded had IWRM plans (UN Water report, 2012).

In Kenya, the water sector has undergone substantial changes and development in the past 15 years. The National Water Policy of 1999, the Water Act 2002 introduced a clear separation of functions performed by a number of newly formed institutions. Water Resources Management Authority (WRMA), manages water through Water Resource User Associations (WRUAs) at the sub-catchment (basin) level. WRUAs have since become a key stakeholder engagement mechanism in Kenya, with a legally protected role to participate in collaborative water resource management at community level. By June 2014 there were approximately 571 WRUAs in the Country against a total potential of 1868 (WRMA performance report 4).

### **Statement of the Problem**

The global challenges in the context of water resources have been manifested in weather variability. This has resulted in increased variability of rainfall events resulting in extreme conditions of droughts and floods. The main driver of these changes is the growing population with accompanying increasing demand in resources and services (UNDP, 2006; GWP, 2004a). Land use activities have the potential to damage the environment and degrade resources particularly water upon which livelihoods are based (Reid et al.,). In Kenya, depletion and change in forest cover in most parts of the country has exposed soils and bare ground surface to hastened erosion. As a result, the land has become unproductive while the eroded soils are deposited in rivers, storage reservoirs, lakes and wetlands thereby reducing their capacity and by extension the quantity and quality of water available (Republic of Kenya, 2006).

Based on these challenges facing water resources use and management, this study was done to determine if the WRUAs within Lake Naivasha basin through IWRM approach are capable of developing and managing Water resources projects in the basin sustainably. This information is vital in advocating for adoption of the integrated water resources management in development and management of water resources projects. The study therefore sought to establish the contribution of IWRM strategy in managing and development of water resources projects.

### **THEORETICAL LITERATURE**

This study was built on theories that are related to sustainability of community projects. Specifically, it explored Resource Based Theory (RBT), Resource Dependence Theory (RTD) and stakeholder theory to enrich the research objectives. From resource-based view, resources

are important units of analysis to understand a firm's strategy. These resources develop organizational capabilities; advantage and immobility of these resources define an organization's competitive advantage in an industry; sustained competitive advantage reward superior economic and financial performance. The resource-based view (RBV) offers critical and fundamental insights into why firms with valuable, rare, inimitable, and well organized resources may enjoy superior performance (Barney, 1995). In this study, since resources develop organizational capabilities; diversity and immobility of these resources define an organization's competitive advantage in an industry; sustained competitive advantage reward superior economic and financial performance, the researchers sought to establish whether the community based project had enough resources that will offer them sustainability. Further, it sought to unearth factors that influence these community based projects to gain enough resources that help them gain sustainability.

Resource Dependence Theory (RDT) is based upon how the external resources of organizations affect the behavior of the organization. Organizations are dependent on resources that ultimately originate from the environment of organizations; the environment to a considerable extent contains other organizations. The resources one organization needs are thus often in the hand of other organizations. Resources are a basis of power; legally independent organizations can therefore be dependent on each other (Chapman et al. 2011). The composition, influence, knowledge, motivations and actions of stakeholders are 'turbulent', meaning they differ for any given place and for any given time, with groups forming complex and ever-changing nets of relationships which are inherently uncertain.

According to this theory, organization depends on resources for their survival; therefore, for any organization to achieve sustainability, resources are indispensable. For community based projects to achieve sustainability, resources are important. These resources will come in the form of human resource – therefore the need to involve all the stakeholders in the project for sustainability; other resources include land and finances. According to Harvey and Reed (2007) participation of project beneficiaries' is of great essence in that it boosts the sense of ownership among members. In this theory focus is given on the participation of beneficiaries and not that of personnel from the sponsoring agencies in development projects. Community participation is attained through collaborative or joint involvement of project beneficiaries and the implementing agencies (Khwaja, 2004).

## **EMPIRICAL LITERATURE**

One of the pre implementation factors for water projects is demand responsive approach. In this context 'demand' the quantity and quality of water, where community members will choose to

consume at a given price (Gizachew, 2005). If there is willingness in the community to provide valued resources in the exchange for services then these community members value the service. As a result demand for supply of water will facilitate the management of the water supply system and it enhances its sustainability (Gizachew, 2005). Harvey and Reed (2004) identified eight main sustainability factors: policy context, institutional arrangements, financial and economic issues, community and social aspects, technology and natural environment, spare parts supply, maintenance, and monitoring. For each of these factors, issues relating to planning, effective demand, financing, and management are explored along with guidance for addressing sustainability. All these are contained in the IWRM approach where they are condensed into what is commonly known as the Dublin Principles (GWP, 2000)

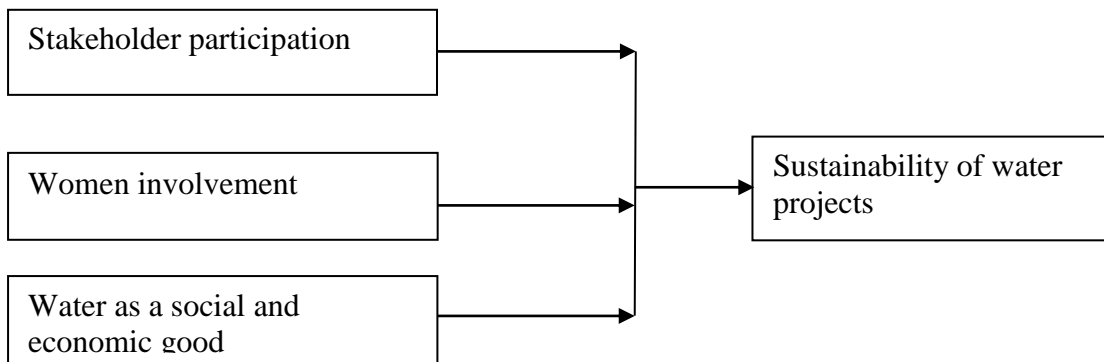
Intended beneficiaries are significant because they can decide to continue or stop the use of the services the project is delivering. Thus genuine stakeholders' participants are critical in promoting project sustainability (Australian Agency for International Development, 2000; Bigdon & Korf, 2000; FAO, nd; Lyons et al, 2001; Oakley, 1991a). Two World Bank studies on participatory projects (Narayan, 1995; Sara & Kartz, 1997) and a study on 17 water supply schemes in the Malawi Rural Piped Scheme Program (Kleemier, 2000) have shown that projects with participatory approaches are more sustainable than projects with little or no participation. Women have a vital role in environmental management and development. According to Principle 20, Rio Declaration, full participation of women is essential to achieve sustainable development. There is also a dual rationale for promoting gender equality for women. The perceptions, interests, needs and priorities of women must be taken into consideration not only as a matter of social justice but because they are necessary to enrich development processes (Osagi, 2001). Women are also affected by the implications of environmental degradation and the negative effects of climate change (Dankelman, 2010).

Water charge is used as an economic tool to support vulnerable groups and influence their water saving and efficient use behaviors by providing incentives to manage demand, cost recovery and readiness of individual users to pay for extra water management services. Recognizing water as an economic good is a key decision-making tool to distribute water among different sectors of the economy and different users within sectors.

### **Conceptual Framework**

In this study the conceptual framework shown in figure 1 is an illustration of possible underlying factors influencing sustainability for Integrated Water Resources management projects. It depicts the relationship between the independent and dependent variables.

Figure 1. Conceptual Framework



### Critique of the Existing Literature Relevant to the Study

In developing countries, Governments and development agencies have invested large sums every year for the implementation of rural water supply projects. However, construction of water projects keep on failing after a short time. Failure rates of these projects should be reduced. A research was done to establish the underlying factors influencing sustainability of community based water projects in Mtito Andei. From the findings, the level of stakeholders' participation in the water projects was low. This affected the sustainability of the water projects. The water projects however transformed health and sanitation practices in the region by reducing conflicts over water resources. There was insufficient technical expertise to manage the project, and human resource for sustainability of the project. Hence, the level of adoption of technology in the management of water project was very low. The study recommends increased stakeholders' participation in the project planning and implementation to enhance the sustainability of the water projects. The study found out that there was vandalism caused by some community members who were not involved in the project fully as it is stated that community participation was low.

As pointed out by Oakley and Marsden (2007), community participation is a major form of stakeholder support. In fact, Admassu et al. (2002) notes that involvement of the communities is crucial for the sustainability of rural water supply systems. Sustainability rate of rural water supply systems increases as a result of communities' owning and managing their schemes, existence of management organization at the village level, protection of the water point, communities cost recovery for operation and maintenance, technology type and availability of their spare parts and recognition of women.

Chappel (2005) indicated that community support and involvement increases project efficiency. He recommended that communities should be involved in all phases of the water projects from selection to post review as this ensures project sustainability. Community

participation together with women involvement and treating water as an economic good; make the factors to consider when running water schemes in an integrated approach which is recommended by Global water partnership (GWP, 2000).

### **Summary**

Sustainability encompasses conventional approaches while adding a long-term perspective. To achieve sustainability, effort must be applied. Some have paid off; other efforts have run into a drain for lack of proper management, resources and commitment of the management and all stakeholders. This points out a clear lapse in effort to attain sustainability in community based project. The current study sought to establish the effect of stakeholders' participation, involvement of women, and water as an economic good on sustainability of IWRM based projects in Kenya

### **Research Gap**

The Integrated Water Resources Management (IWRM) initiative that was launched in 2008 in Copenhagen recommended that countries should set milestones to help translate their IWRM plans into specific actions as well as monitor the impacts of the actions.

In Kenya, most regions have implemented the IWRM approaches to projects development and management. What is remaining is to study whether the new concept of IWRM is working or not. Tafara (2011) carried out a study on the influence of rural community based water projects in Mtito Andei in Kibwezi sub-county. He recommended similar studies in other areas of the country and more so on the role of women in enhancing the sustainability of community based water projects.

### **METHODOLOGY**

The research adopted a descriptive survey design with quantitative approach. Where appropriate, quantitative and qualitative approaches should be combined to maximize the strengths and minimize the limitations of each (Kombo and Tromp, 2006). According to Kothari (2004), descriptive design allows the researcher to describe and record, analyze and report conditions that exist or existed.

The study targeted 632 members from 12 WRUAs covering 3,400 square kilometres. The study applied random sampling. If there is no estimate available of the proportion in the target population assumed to have the characteristics of interest, 50% should be used as recommended by Fisher et al.(1994) as quoted by (Mugenda and Mugenda, 2003) and so 6 WRUAs were selected as a result. Purposive sampling may be used together with both



qualitative and quantitative methods of data collection and statistical analyses such as regression models (Neupane et al., 2002). The sample size from the target population was calculated using the Nassiuma (2000) formula:

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where

n = sample size;

N = population size;

C = coefficient of variation which is 50%

e = error margin which is 0.05.

Substituting these values in the equation, estimated sample size (n) was:

$$n = \frac{632 (0.5)^2}{0.5^2 + (632-1)0.05^2}$$

$$n = 86$$

The six WRUAs officials were purposely selected as they are the ones trained on water matters and the ordinary members were proportionally calculated (Table 1)

Table 1: Sampling Frame

<b>NAME OF WRUA</b>	<b>Total membership A</b>	<b>Executive committee B</b>	<b>Ordinary members C =(A-B)</b>	<b>D =(n<sub>1</sub>= nxp)</b>	<b>Sample size E(B+D)</b>
Wanjohi	80	5	75	17	22
Mkungi Kitiri	65	5	60	13	18
Lower Gilgil	60	5	55	12	17
Middle Malewa	30	5	25	6	11
Lake Naivasha	22	5	17	4	9
Upper Turasha	22	5	17	4	9
<b>TOTAL</b>	<b>279</b>	<b>30</b>	<b>249</b>	<b>56</b>	<b>86</b>

A structured questionnaire was used to collect the data. Interviews were also conducted to give in-depth information which may have been omitted by the questionnaires. The use of questionnaires enabled the respondents to remain anonymous and be honest in their responses (Cooper & Schindler, 2003). The choice of the questionnaire was based on the fact that it was easy to analyze the collected data statistically

A pilot study was conducted on Karati Longonot WRUA and then the necessary adjustments made in order to improve validity. This was done on 10% of the WRUA's population which gave 6 members (Mugenda & Mugenda, 2003, p. 79). The pilot study ensured that the



questions got the intended responses. Furthermore, the questionnaires were subjected to pre-test to detect any deficiencies in them. Necessary adjustments were made to the questionnaire. The data collected was edited, cleaned and coded. This helped eliminate errors and enhance statistical analysis. The data analysis involved both quantitative and qualitative methods using SPSS (version 20) analysis tools. The findings were presented using percentages and frequency distribution tables.

### Pilot Test Results

A pilot study was carried out to test the reliability of the questionnaire. A sample of 10 respondents was picked with a return rate of 100%. The Cronbach's Alpha Test was conducted on all measures for the independent and dependent variables. Cronbach's alpha value of more than 0.7 was obtained. Therefore all the study variables were retained for study as recommended by (Cooper & Schindler, 2003).

Table 2: Cronbach's Test Results

Variable	N	Cronbach's Alpha
Influence of stakeholder participation	5	0.761
Influence of women involvement on sustainability of water projects	5	0.811
Influence of water use as a social and economic good	5	0.752

## EMPIRICAL RESULTS AND DISCUSSION

The researcher administered 86 questionnaires and 70 completely filled and returned giving response rate of 81.4%.

### Demographic Profile of the Respondents

The demographic profile of the respondents was grouped based on their age, gender, level education and results presented in table 3. Data revealed that the number men who participated were higher 54.3% compared to women 45.7%. Majority of the respondents, 51.3% were aged 50-59 years. 61.4% of the respondents had attained both primary and secondary level education while 22.9% and 15.7% had attained mid-level college and university level education respectively. The level of education of the respondents enabled them to comprehend and answer the survey questions (Murphy and Myors (2004).

Table 3: Demographic Characteristic of the Respondents

		Frequency	Percent	Cumulative percent
<b>Gender of Respondent</b>	Male	38	54.3	54.3.0
	Female	32	45.7	100.0
	<b>Total</b>	<b>70</b>	<b>100.0</b>	
<b>Age of the Respondents</b>	18-29years	6	8.6	8.6
	30-39 years	10	14.3	22.9
	40- 49 years	12	17.2	40.1
	50-59 years	36	51.3	91.7
	60&above years	6	8.6	100.0
	<b>Total</b>	<b>70</b>	<b>100.0</b>	
<b>Education Level of Respondent</b>	Primary	11	15.7	15.7
	Secondary	32	45.7	61.4
	Mid-College	16	22.9	84.3
	University	11	15.7	100
	<b>Total</b>	<b>70</b>	<b>100</b>	

On employment (Table 4), 38.6% of the respondents were self-employed, 30% were hired while 15.7 % of the respondents were both self-employed and hired. In the WRUA's, 61.4% of the respondents were ordinary community members.

Table 4: Employment Type and Positions held in the Water Projects

		Frequency	Percent	Cumulative percent
<b>Type of employment</b>	Self	27	38.6	38.6
	Hired	21	30.0	68.6
	Both	11	15.7	84.3
	None	11	15.7	100.0
	<b>Total</b>	<b>70</b>	<b>100</b>	
<b>Position held in WRUA</b>	Chairman	6	8.6	8.6
	Secretary	4	5.7	14.3
	Treasurer	3	4.3	18.6
	Vice chairman	4	5.7	24.3
	Vice secretary	10	14.3	38.6
	Ordinary member	43	61.4	100.0
	<b>Total</b>	<b>70</b>	<b>100.0</b>	
Position held in water project	Chairman	6	8.6	8.6
	Secretary	5	7.1	15.7
	Treasurer	4	5.7	21.4
	Vice chairman	4	5.7	27.1
	Vice secretary	6	8.6	35.7
	Ordinary member	45	64.3	100.0
	<b>Total</b>	<b>70</b>	<b>100</b>	

On the positions held in the water projects 64.3% were ordinary members, while 8.6% were chairmen and 5.7% were treasurers and vice chairmen.

### Stakeholders Participation in Water Projects in Lake Naivasha basin

The study found out that stakeholders' participation was of significant importance in the sustainability of water projects (Table 5). Results of how aspects of stakeholders participation influence sustainability of water projects revealed that of the four aspects of stakeholders participation, sustainability was influenced by project identification to a very great extent as 30% of the respondents indicated, 22.9 % of indicated that project planning and implementation influenced sustainability of projects to a very great extent.

Table 5: Descriptive Analysis of stakeholders Participation in the Water Projects

Statement	N	Very great	Great extent	Moderate	Minimal extent	Not at all	Total
Participation in project identification and assessment	70	30.0%	22.9%	15.7%	21.4%	10.0%	100%
Participation in project planning activities	70	22.9%	15.7%	38.6%	14.2%	8.6%	100%
Participation in the implementation of water projects	70	22.9%	30.0%	31.4%	7.1%	8.6%	100%
Participation in project monitoring and evaluation	70	21.4%	15.7%	31.4%	24.4%	7.1%	100%
Community participation influences (positively or negatively)	70	28.9 %	25.7%	21.4%	14.0%	10.0%	100%

### Influence of Women involvement on Sustainability of Water Projects

The study sought to establish the influence of women involvement on sustainability water projects (Table 6). 22.9% of the respondents said that women participation in water project site selections influenced projects sustainability to a very great extent while 31.4% to a great extent and 22.9% were moderate. These results support Principle 20, Rio Declaration which reaffirmed that full participation of women is essential to achieve sustainable development. This is a dual rationale for promoting gender equality in community development projects. 31.4% of the respondents indicated that local women were empowered to a very great extent and great extent to preserve the water catchment areas for continuous supply. 31.4% were moderate that the local women were empowered to preserve water catchment areas. 61.5% of the

respondents agreed to a very great extent and great extent respectively that the local women were the beneficiaries of the water projects and are participating in their maintenance.

Table 6: Descriptive Analysis Influence of Women involvement on the Sustainability of Water Projects

Statement	N	V. great extent	Great extent	Moderate extent	Minimal extent	Not at all	Total
Women participated in water project site selection	70	22.9%	31.4%	22.9%	14.3%	8.5%	100%
Local women are empowered to preserve water catchment areas	70	15.7%	15.7%	31.4%	21.4%	15.7%	100%
Local women are beneficiaries of water project hence participate in maintaining it	70	22.9%	38.6%	22.9%	8.6%	7.0%	100%
Women involvement in water projects lead to sustainability	70	38.6%	24.3%	20.0%	14.3%	2.8%	100%
Involvement of women in water project is crucial to their sustainability	70	54.3%	22.9%	7.1%	8.6%	7.1%	100%

### **Influence of using Water as a Social and Economic good on the Sustainability of Water Projects in Lake Naivasha basin**

The study sought to determine the influence of using water as a social and economic good had in Lake Naivasha basin water projects (Table 7). From the results, 54.3% of the respondents indicated to a very extent that they were willing to contribute money for maintenance and operations of the water projects, 22.9% indicated to moderate extent while 7.1% indicated not at all. 48.6% indicated to very great extent to pay any water use fees agreed upon by the government and the stakeholders. 31.4% indicated to great extent to pay the water usage fees. The respondents also recognized that water has an economic value in all its competing uses. This was supported by 54.3% of the respondents who indicated to a very great extent and 22.9% who indicated to a great extent. The researcher further sought to find out if water was recognized as an economic good capable of creating project sustainability. 57.1% indicated to a very great extent that they recognized water as an economic good leading to water projects sustainability. 75.7% of the respondents indicated to a very great extent and great extent that it's important for water users to pay water use fee. This will make them feel they own the water projects. These findings confirm the contents of the UN water report (2012) that reported that

most countries of the world have made IWRM and water efficiency plans which are important for resources management.

Table 7: Influence of use of water as a social and an economic good on the sustainability of Water Projects in Lake Naivasha basin

Statement	N	Very great extent	Great extent	Moderate	Minimal extent	Not at all	Total
I am willing to make monetary contribution for maintenance of water projects	70	54.3%	7.1%	22.9%	8.6%	7.1%	100%
I agree to pay any water use fee agreed upon by government	70	48.6%	31.4%	7.1%	7.2%	5.7%	100%
Water has an economic value in all its competing uses	70	54.3%	22.9%	15.7%	7.1%	0.0%	100%
Recognizing water as an economic good leads to water project sustainability	70	57.1%	7.1%	20.0%	11.6%	4.2%	100%
It is important for water users to pay water use fees as it makes them own the project	70	45.7 %	30.0%	7.1%	14.3%	2.9%	100%

### Project Sustainability

On water projects sustainability (Table 8), 47.2% indicated to a very great extent that the water projects can remain sustainable only if the financial costs were recovered while 22.9% indicated to moderate extent. Moreover, 15.7% indicated to very great extent, 22.9% great extent and 38.6% moderate extent that the local community was able to preserve the water catchment area for continuous water supply and so the sustainability of the projects. Sherk et al. (2000, p 1) argued that one of the most pressing issues of the current millennium is the management of the limited freshwater resources of the world. On empowerment and involvement of the local community to contribute to sustainability of the water projects, 15.7% indicated a very great extent, 35.7% to a great extent, and 27.1% to a moderate extent while 14.3% indicated minimal extent.

In terms of water pricing as an instrument to achieve financial and project sustainability (Table 8), 22.9% indicated to a very great extent and great extent that it was not an instrument for water allocation. Recognizing water as an economic good is a key decision-making tool to distribute water among different community users. This helps bolster the sustainability of the water resources. Sullivan and Meigh, (2003) said that project sustainability has its limitations and is not confined to social aspects of water management, but it does have a principal focus on

the value of water resources as a critical asset for sustainable livelihoods. It is composed of different indicators, similar to the Human Development Index, based on five key components of resources, access, capacity, use and environment

Majority of the respondents agreed that women leadership influenced the sustainability of the water projects. This was supported by 31.5% who indicated very great extent and 47.2% great extent. In terms of community participation in management of water projects, 45.7% indicated a very great extent that this was an indicator for sustainable management of the projects. This was further supported by 38.6% of the respondents who indicated a great extent. FAO (2004) reported that the notion of scarcity is central and this can refer to aspects of water quantity or quality and can have both temporal and spatial dimensions. This scarcity affects project sustainability through limitations of the physical water resources, the means to access them and by inadequate management of the resource base.

Table 8: Descriptive Analysis of Project Sustainability

Statement	N	Very great extent	Great extent	Moderate extent	Minimal extent	Not at all	Total
Only if financial costs are recovered can a project remain sustainable	70	47.2%	15.7%	22.9%	7.1%	7.1%	100%
Local community is able to preserve the water catchment area for continuous supply	70	15.7%	22.9%	38.6%	15.7%	7.1%	100%
Local community is empowered and involved in project management for sustainability	70	15.7%	35.7%	27.1%	14.3%	11.5%	100%
Water pricing is not an instrument for water allocation but for financial/project sustainability	70	22.9%	22.9%	38.6%	8.6%	7.0%	100%
Local community understands that water is an economic good and willing to contribute for sustenance	70	8.6 %	45.7%	30.0%	8.6%	7.1%	100%
Women leadership influences water project sustainability positively or negatively	70	31.5 %	47.2%	7.1%	7.1%	7.1%	100%
Communities' participation , water management supply is an indicator of sustainability	70	45.7 %	38.6%	7.1%	8.6%	0.0%	100%

## Inferential Analysis

### *Relationship between Stakeholder Participation and Sustainability of Water Projects*

There exists a strong significant positive correlation between influence of stakeholder participation and the sustainability of water projects ( $r= 0.531$ ). Thus, involving stakeholders in

the water projects plays a critical role in enhancing sustainability (Table 9). These findings are consistent with Khang and Moe (2008) who said that empirical evidence shows that effective consultations are far more important in influencing project success.

Table 9: Correlation Analysis between Study Variables

		Influence of Stakeholder participation
Sustainability of water projects	Pearson Correlation	.531**
	Sig. (2-tailed)	.000
	N	70

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

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

### ***Relationship between Women Involvement and Sustainability of Water Projects***

There also exist a strong positive significant relationship between involvement of women and the sustainability of water projects ( $r= 0.622$ ). The Pearson's coefficient is  $P < 0.05$  hence supporting the existence of a significant relationship between the two variables (Table 10). The result indicates that the full involvement of women is essential to achieve sustainable development as emphasized by Principle 20 of Rio Declaration. The findings further supports Osagi (2001) who said that perceptions, interests, needs and priorities of women must be taken into consideration not only as a matter of social justice but because they are necessary to enrich development processes.

Table 10: Correlation Analysis between Women Involvement and Sustainability of Water Projects

		Influence of women involvement
Sustainability of water projects	Pearson Correlation	.622*
	Sig. (2-tailed)	.041
	N	70

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

### ***Relationship between Treating Water as an Economic and Social Good and Sustainability of Water Projects***

The study deduced that there is a very strong significant positive correlation between treating water as an economic and social good and the sustainability of the water projects ( $r=0.627$ ) as shown in Table 11. This means that recognizing water as a social and economic good promotes its sustainability. The findings support available literature which recognizes that water is an



integral part of the ecosystem, a natural resource, and a social and economic good. The quantity and quality of water determines the nature of its utilization (Li, 1997).

Table 11: Correlation Analysis between Treating Water as an Economic and Social Good and Sustainability of Water Projects

		Influence of treating water as an economic and social good
Sustainability of water projects	Pearson Correlation	.627*
	Sig. (2-tailed)	.025
	N	70

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

### Integrated Water Resources Management Stakeholders

The WRUA stakeholders were asked to indicate the challenges they encountered in their various roles. They indicated diverse challenges that included dealing with persons with personal interests, inadequate facilitation, lack of WRUA capacity to handle community's issues, scarcity of resources in terms of finances and logistics leading to conflicts among officials, biasness in resolving conflicts due to diverse interest of the members and failure by management to meet specific. According to Oakley and Marsden (2007) stakeholders' support brings together individuals, families, or communities who assume responsibility for their own welfare and develop a capacity to contribute to their own and the community's development. In the WRUAs, not all community members were aware of the integrated water resource management practices and therefore some did not fully participate in such activities.

On women involvement in WRUAs management and their influence on water projects sustainability, all the stakeholders agreed that women play a central role in the provision, management, and safeguarding of water and therefore can make better managers in integrated water resources management. On using water as a social and economic good as one of the factors influencing water projects sustainability, the stakeholders concurred and said this enables water users to place more value on water resources, otherwise its value will be hardly acknowledged.

### CONCLUSIONS

The local community participation is a key indicator on the sustainability of the water projects as it fosters ownership, commitment and project buy-in. Involvement of women is essential to achieve sustainable development. This will not only promote gender equity but also built the capacity of women as the main water beneficiaries to preserve water resources and their

sources. Treating water as an economic and social good, leads towards continuous water supply ensuring project sustainability. Paying water use fees is very critical in fostering project ownership, commitment and this promotes its sustainability. Overall, sustainability of the water projects within Lake Naivasha basin is dependent on stakeholder participation, women involvement and commitment through paying water use fees, maintenance costs and preserving water catchments.

Available data showed that most of the water projects have involved stakeholders, women and understood that water is both a social and economic good. However, more effort needs to be put in building the capacity of women as the main beneficiaries and involve them more in water management committees. Another rationale of this study was to advance the project management discipline by generating knowledge and lessons learnt through stakeholder participation, project selection, assessment and implementation including review or monitoring and evaluation. Findings revealed that the above mentioned factors had significant relationship with the sustainability of water projects in Lake Naivasha basin. The findings emphasized on training the project stakeholders on project cycle, all aspects pertinent to project identification, planning, implementation and monitoring and evaluation. This will ensure project implementers are well versed with the requirements of a project and therefore reduce time spent in executing project deliverables.

## **RECOMMENDATIONS**

Stakeholder participation, project ownership and commitment through contribution of resources for maintenance and ensuring sustainability; in this case, project participation by the community should be throughout all the project phases. Results of the study showed the presence of a statistically significant relationship between the study variables. This implies that water projects within Lake Naivasha basin can achieve sustainability by paying attention to the study findings among other factors. Findings also showed that while a majority of water projects empowered women to preserve water catchment areas, more capacity building and empowerment should be done. Some WRUA's might be doing very well either by owning the projects or contributing funds for the maintenance of the same while others are lagging behind in terms of implementing projects or involving women or using water as a social and economic goods.

## **FURTHER STUDIES**

This study was limited to 70 respondents from water projects and WRUA's within the Lake Naivasha basin. Future researches should consider replicating this study to other IWRM projects in other counties in Kenya to validate the relationships between the study variables.

Further, the study was also limited in terms of the number of factors that were examined (stakeholder participation, women involvement and water use as a social and economic good) on the sustainability of water projects within Lake Naivasha basin. There are other numerous factors that can influence the sustainability of water projects including climate change patterns, government policies and support, community conflicts over land use versus conservation initiatives, project funding and technology. More in-depth study can be done to find out why some WRUAs are lagging behind in some aspects dealing with IWRM programmes implementation.

## REFERENCES

- Admassu, M., Kumie, A. & Fantahun, M. (2002). Sustainability of Drinking Water Supply Projects in Rural of North Gondar, Ethiopia. *Ethiopian Journal of Health Development*, (3):221-229.
- Aquastat, K. (2006). *Food and agriculture Organization of the United Nations, Kenya*. Retrieved from <http://www.fao.org/nr/water/aquastat/Kenya/index.stm>
- Australian Agency for International Development. (2000). *Promoting practical sustainability*. Canberra: Australian Agency for International Development (AusAID)
- Barney, N. (1995). Select the right IS project manager for success. *Personnel Journal*. Vol. 4, pg 78-89.
- Biswas, A. (2004). *From Mar del Plata to Kyoto: A review of global water policy dialogues*.
- Biswas, A. (2004). Integrated Water Resources Management: *A Reassessment*, *Water International*, 29, (2), 248-256.
- Biswas, A. (2004). Integrated Water Resources Management: *A Reassessment*. *Water International*, Vol 29, No. 2, 248-256.
- Biswas, A. (2008). Current directions: integrated water resources management – *A second look*, *Water International*, 33(3), 274-278
- Braithwaite, R., Bianchi, C. and Taylor, S. (1994). Ethnographic approach to community organization and health empowerment. *Health Education Quarterly*. 21(3):407-416)
- Brager, Specht, and Torczyner (2001) *The ecology of place: Planning for environment, economy, and community*. Washington, DC: Island Press .
- Cap-Net. (2003). Integrated Water Resources Management (IWRM) Tutorial. Retrieved 14<sup>th</sup> February, 2015, [http://www.capnet.org/iwrm\\_tutorial/mainmenu.htm](http://www.capnet.org/iwrm_tutorial/mainmenu.htm)
- CAP-NET. (2008): Integrated Water Resource Management for River Basin Organizations. *Training Manual*. Pretoria: Retrieved 14<sup>th</sup> February, 2015, [http://www.capnet.org/iwrm\\_tutorial/mainmenu.htm](http://www.capnet.org/iwrm_tutorial/mainmenu.htm)
- Chappel, M. (2005). *Artand well being*. Sydney, Australia: Australia Council for the Arts.
- Cooper, D. & Schindler, P. (2008). *Business Research Methods*. 10th Edition, Singapore: McGraw-Hill.
- Donaldson, T. & Preston, L. (1995). The Stakeholder Theory of the Corporation: Concepts, evidence, and Implications. *Academy of Management Review*. 20 (1): 65–91.
- Dooge, J. (2003). Water and ethics: Preliminary version. *UNESCO and International Hydrological Programme CD-ROM*. Paris: UNESCO.
- Embid, A. (2003). The transfer from the Ebro basin to the Mediterranean basins as a decision of the 2001 National Hydrological Plan: the main problems posed. *International Journal of Water Resources Development*. 19: 399-411.
- FAO. 2004. *Economic valuation of water resources in agriculture*, by K. Turner, S.

- Georgiou, R. Clark, R. Brouwer & J. Burke. FAO Water Report No. 27. Rome.
- Gay, L. (1981). *Student Guide for Educational Competencies for Analysis and Applications*, USA: Merrill Publishing Company.
- Gizachew, G. (2005). *Innovation: The Attacker's Advantage*, Summit Books, New York, NY.
- Gleick, P. (1993). Water and conflict: *Fresh water resources and international security*, *Int. Security*, 18(1), 79–112,
- Gold Smith. A. & Brinkerhoff. D. (1992). 'Promoting the sustainability of development institutions: A framework for strategy' *World development*. 11(5). Pp.427-446
- Gonzales. J. (1998). *Development sustainability through community participation: Mixed results from the Philippine health sector*. Aldershot: Ash gate
- Grant, D. (1991). Familiarity and group productivity. *Journal of Applied Psychology*, 76(4) 578 586.
- GWP, (2000), *Integrated Water Resources Management - TAC Background Papers No. 4*: Sweden: GWP
- GWP. (2003). *Integrated Water Resources Management Toolbox*, Version 2. Stockholm: Global Water Partnership Secretariat.
- GWP. (2004). *Catalyzing Change: A handbook for developing IWRM and water efficiency strategies*. Stockholm: Global Water Partnership (GWP).
- GWP. (2008). *GWP Toolbox. Integrated Water Resources Management. Strategies*. Stockholm: Global Water Partnership (GWP).
- GWP. (2009). *A Handbook for Integrated Water Resources Management in Basins*. Sweden: (GWP) and International Network of Basin Organizations (INBO).
- Harvey, P. & Reed, R. (2004). *Rural Water Supply in Africa: Building Blocks for Sustainability*: Loughborough University UK: Water, Engineering, and Development Centre (WEDC).
- Harvey, P. & Reed, R. (2007). Community-managed water supplies in Africa: Sustainable or Dispensable? *Community Development Journal*, 42(3), 365.
- Hering, J. and Ingold, K. (2012). Water Management - Water Resources Management: What Should Be Integrated? *Science journal*, 336, 1234-1235 68
- Hoopes, M. and Walker, L. (2003). Global cost benefit analysis of water supply and sanitation interventions. *Journal of Water Health*, 5, 481.
- ICWE. (2004). International Conference on Water and Environment. The Dublin Statement on Water and Sustainable Development. Retrieved 14<sup>th</sup> February, 2015 <http://www.inpim.org/files/Documents/DublinStatmt.pdf>.
- Island, Philippines. A thesis presented in partial fulfillment of the requirement for the degree of Masters of philosophy in development studies, Massey University: New Zealand
- Jonch-Clausen. T. (2004). *"Integrated Water Resources Management (IWRM) and Water Efficiency Plans by 2005"* Stockholm: Global Water Partnership (GWP)
- Kay, A. (2005). Statistics notes: The intracluster correlation coefficient in cluster randomization. *British Medical Journal*, 316, 1455–1460.
- Khwaja, Asim Ijaz (2004). Is Increasing Community Participation Always a Good Thing? *Journal of the European Economic Association*. 16, 55–60.:
- Kombo, K. and Tromp, A. (2006). *Proposal and Thesis Writing: An Introduction*, Nairobi: Pauline Publishers House.
- Kothari, C. (2003). *Research Methodology, Methods and Techniques* New Delhi: New Age International Limited.
- Kothari, C. (2004). *Research Methodology; Methods & Techniques*. New Delhi, India: New Age International Publishers.

- Mazibuko, J., (2007). Enhancing Project Sustainability beyond Donor Support: Analysis of Grassroots Democratization as a Possible Alternative, Thesis, South Africa
- Marsden (2007)). Departmentalization in software development and maintenance. *Communications of the ACM*, 33(6) 658-667.
- Mbata, J. (2006) Estimating Household Willingness for Water Services in Rural economy: the Case of Kanye in Southern Botswana. *Development of Southern Africa*, 23(1), 29-43.
- Mugenda, O. & Mugenda A. (2003). *Research Methods; Quantitative and Qualitative approaches*. Nairobi, Kenya: Acts press.
- Oakley, A. and Marsden, D. (1987). *Approaches to Participation In Rural Development*. Geneva: ILO
- Oakley, A. and Marsden, D. (2007). *Low-Cost Sanitation, a Survey of Practical Experience*. London, UK. Intermediate Technology Publications 93
- Oakley, P. (1991). *Projects with people: The practice of participation in rural development*. Geneva: International organization
- Osagi, G. (2001). "Important concepts underlying gender mainstreaming", factsheet by the Office of the Special Adviser on Gender Issues and the Advancement of Women.
- Pfeffer, A. & Salancik, M. (1978). *The dismal science and the endless frontier: How and why economists think about S & T policy: A guide for further reading*. Available at: <http://ideas.repec.org/p/wpa/wuwpit/0411007.html>.
- Rahaman, M. & Varis, O. (2003). *The ethics of water: some realities and future challenges*. CD Proceedings of 2<sup>nd</sup> Dubrovnik Conference on Sustainable Development of Energy, Water and Environment Systems, 15-20 June 2003, Dubrovnik, Croatia.
- Rahaman, M. and Varis, O. (2005). Integrated water resources management: evolution, prospects and future challenges. *Sustainability: science, Practice & Policy*. 1, (1), Pg.1-8.
- Roseland, M., Connelly, S., Hendrickson, David, L., Chris and Lithgow, M (2005). Towards sustainable communities: Resources for citizens and their governments. (ed.) Gabriola Island, BC: New, Society Publishers.
- Shen, D. & Varis, O. (2000). World water vision: balancing thoughts after The Hague. *Ambio* 29(8): 523-525.\
- Shrek, G., Wouters, P. and Rochford, S. (1998). Water Wars in the Near Future? Reconciling Competing Claims for the World's Diminishing Freshwater Resources – *The Challenge of the Next Millennium*, the CEPMLP on-line Journal, 3, (2), 1-8
- Tafara A. (2011). Factors influencing sustainability of rural community based water projects in Mtiito Andei, Kibwezi sub-county, Kenya. *Unpublished research project, University of Nairobi*.
- Taylor, B. (2009). *Addressing the sustainability crisis: Lessons from research on managing rural water projects*. Dar es Salaam: WaterAid Tanzania.
- Thompson, B. and Kinne, S. (2009). Social change theory: applications to community health. In: Bracht N, *Health promotion at the community level*. Newbury Park (CA):
- Tortajada, C. (2004). *Institutions for IWRM in Latin America*. In Biswas, A.K., Varis.
- Tortajada, C. (Eds.), *Integrated Water Resources Management in South and Southeast Asia*. pp.. New Delhi: Oxford University Press.
- UN Water Report. (2012). Water Resources Management. *Status report on application of Water Resources Management, February 21*.
- UN. (2000). Agenda 21: Earth Summit—The United Nations Programme of Action from Rio. Rio de Janeiro, Brazil: *United Nations Division for Sustainable Development*.
- UNEP. (2012). The UN-Water Status Report on the Application of Integrated Approaches to Water Resources Management. Kenya: UNEP

- UNESCO. (2009). Introduction to the IWRM Guidelines at River Basin Level – World Water Assessment Programme, *Dialogue Paper*. Paris: UNEP
- UNESCO. (2012). *United Nations World Water Assessment Programme – Water for the Millennium Development Goals*, why managing water resources wisely is key to achieving the MDGs. Netherlands: UNESCO.
- United Nations. (1992). Environment and Development, *United Nations Conference on environment and development*, held in June 1992, Agenda 21. p. 174.
- UN-Water report. (2008). IWRM and Water Efficiency Plans. *Status Report on IWRM and Water Efficiency Plans for CSD16 held in March, 2007*.
- Varis, M. & Tortajada, C. (2009). *Integrated Water Resources Management in South and Southeast Asia*. New Delhi: Oxford University Press.
- Victor, P. (1991). 'Indicators of sustainable development: Some lessons from capital theory'. *Ecological economics*. 4, 191-213
- WCED. (1987). *Our Common Future: Report of the World Commission on Environment and Development*. Oxford: Oxford University Press.
- WSSD. (2002). Report of the World Summit on Sustainable Development, A/Conf. 199/20. <http://www.johannesburgsummit.org>. February 21, 2005.
- WWC. (2000). Final Report. Second World Water Forum & Ministerial Conference. Vision to Action. Marseilles: World Water Council.