FACTORS INFLUENCING PERFORMANCE OF WATER RESOURCE USERS ASSOCIATIONS IN THE UPPER EWASO NGIRO NORTH SUB CATCHMENT AREA, LAIKIPIA COUNTY

JOSEPHAT MUSILI MUSYIMA

RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN PROJECT PLANNING AND MANAGEMENT OF THE UNIVERSITY OF NAIROBI

2014

Declaration

This research project report is my original work and has not been submitted or presented for examination in any other University.

Signature: …… Date: ……

JOSEPHAT MUSILI MUSYIMA

REG. NO. L50/84042/2012

This research project report has been submitted for examination with my approval as University supervisor.

Signature: ……. Date: ……

DR. JOASH A. MIGOSI

LECTURER

SOUTH EASTERN KENYA UNIVERSITY

Dedication

This research project report is dedicated to my beloved family, especially my wife, Petronilla Musili, and my children Penina Mwende, Joshua Mutinda, and Daniel Muli, for their unrelenting support, and cheerful encouragement.

Acknowledgements

I would like to acknowledge all the people who have in one way or the other contributed towards my studies and especially in the development of this research project report. I am sincerely grateful to my supervisor, Dr Joash Migosi, for the invaluable support, advice, and guidance throughout my research report writing.

I deeply appreciate all the respondents who participated in the study. I also thank my classmates who provided encouragement and boosted my morale.

Finally, I wish to thank all my colleagues and staff of the University of Nairobi at the Kitui sub Centre for their support in many different ways.

Table of Contents

List of Tables

List of Figures

Abbreviations and Acronyms

ASAL	Arid and Semi-Arid Lands
CMS	Catchment Management Strategy
EIA	Environmental Impact assessments
EMCA	Environment Management and Coordination Act
ENNCA	Ewaso Ngiro North Catchment Area
GoK	Government of Kenya
GWP-TAC	Global Water Partnership-Technical Advisory Committee
INBO	International Network of Basin Organizations
IRBM	Integrated River Basin Management
IRP	International Resource Panel
IWRM	Integrated Water Resource Management
LWF	Laikipia Wildlife Forum
MOU	Memorandum of Understanding
NEMA	National Environmental Management Authority
NWRMS	National Water Resource Management Strategy
RoK	Republic of Kenya
SCMP	Sub-catchment Management Plan
UN	United Nations
WDC	Water Development Cycle
WRMA	Water Resources Management Authority
WRUA	Water Resource Users Associations
WUA	Water Users Associations

Abstract

The main purpose of this study was to investigate the factors that influenced performance of water resource users association in the Upper Ewaso Ngiro North sub-catchment area. The objectives of the study were to determine how water sector regulations; socio-economic household factors; and the technical capacity influenced performance of a WRUA. Data for this study was gathered through a descriptive survey among respondents drawn from the household members of WRUAs in the Upper Ewaso Ngiro catchment, executive Committee members, as well as Water Resource Management Authority officers in Laikipia County. Simple random sampling was utilized in the selection of member respondents in the study, while data was collected through an interview guide and household survey questionnaires. Data collected during the study was analyzed using the Statistical Package for Social Sciences (SPSS). The study found that there is a significant relationship between water regulations on performance of WRUAs in the Upper Ewaso Ngiro WRUAs. It also confirmed that there is a significant relationship between the socio-economic household activities of the water resource users and the performance of Upper Ewaso Ngiro WRUAs. Further, the study also found that there is a significant relationship between the technical capacity of WRUAs and their performance in water resource conservation. The study concluded that water resource users' associations provide an opportunity for the involvement of stakeholders and beneficiaries in joint management of water resources and conflict resolution. The study recommends that in order to promote improved performance of the WRUAs in sustainability of catchment conservation and protection activities, WRUA members should be given continued support by the government, donor agencies and local leadership through institutional support mechanisms, formation of internal policies, legislation, proper monitoring and continued capacity building. It also recommends that there is need to regularly audit the activities and operations of WRUAs so as to strategically enhance their performance and improve their effectiveness.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Water is a critical resource for all forms of life and the socio-economic development of all communities. Access to clean, adequate and affordable water and sanitation remains a challenge in many regions of the world, and any positive or negative influence on its management would have far reaching ramifications across all the different sectors and levels of the economy. This is because water is fundamental to food production, in supporting ecosystem services, during industrial production and energy generation. However, water is an increasingly scarce resource around the world and has been (mis)managed by governments, leading to several social and economic problems, including degradation in its quality and reduction in the level of services it provides. In the case of river basin water resource management, there have been problems stemming from the common pool nature of the resource and the existence of severe externalities from its use by individuals and sectors in various parts of the basin (Kemper, Blomquist and Dinar, 2006).

With central management often lacking appropriate incentive structures and imposing high transaction costs of management, these problems have been exacerbated, leading to recognition of a need for a paradigm shift in river basin water resource management. Dynamics relating to increased demand for water and changes in the nature of supplies call for innovative ways to manage the available water resources more efficiently (Ngigi, 2009).

There is increasing emphasis on improving water management focused on decentralized, local collective action such as through the development of local water user groups, involving government agencies, non-governmental organizations and private firms (Swallow *et al.*, 2006). This approach is increasingly supported by new statutory laws to strengthen legitimacy and enforcement. Most sustainable community level interventions are usually characterized by remarkable communal investment in terms of design, construction, maintenance and operation of facilities through provision of labour, user fees as well as other services in kind (UN, 2005). The guiding principle of agenda 21 adopted in 1992 at the Rio de Janeiro and in 2002 World Summits on Sustainable Development in South Africa also emphasizes the importance of community management of services backed by measures to strengthen local institutions in implementing basic service programmes (Doe & Khan, 2004).

Efforts to conserve and ensure sustainability of water resources in Kenya have seen the advent of many legal and policy changes as well as adoption of new approaches in tandem with international water policy has seen a movement in recent times where state based management is gradually replaced by local Water User Associations (WUAs) and Water Resource Uses' Associations (WRUAs). The roles of a WRUA in Kenya are outlined in the Water Resource Management Rules. This is done through the decentralisation of water resources management to local communities. According to Rondinelli, Nellis and Cheema, (1984), decentralization is the "transfer of planning, decision-making, or administrative authority to the state's field organizations, local administrative units, semi-autonomous and parastatal organizations, local governments or NGOs," while Agrawal and Ostrom (2001) define it as "any act by which the central government cedes rights of decision-making over resources to actors and institutions at lower levels in a politico-administrative and territorial hierarchy."

Decentralization reforms were, on the one hand, a reaction to the over-centralized mixed economies in the developing as well as developed countries in the post-World War II period. Over centralized management of resources was regarded as the source of efficiency shortfalls and budget deficits. The World Bank expected decentralization to promote civic empowerment, diminish corruption, enhance efficiency, and improve public service delivery (Andrews & de Vries, 2007). In developing countries the centre was the planner, financier, and service provider because it had to stimulate economic development (Bennett, 1990), but the World Bank and other international development agencies promoted decentralization primarily as a means to improve service delivery, reduce the burden on central government budget and to demonstrate to citizens that democracy works (McCarthy, 2004).

Whereas the decentralized approach has been promoted on a global scale, the performance of decentralized irrigation institutions, when constituted with a top-down approach, is not clear, according to Meinzen-Dick (2007). Agrawal (2002) states that similar institutional rules can have different outcomes depending on "biophysical, social, economic, and cultural contexts".

The Mt. Kenya water tower is one of the most important ones in the country, and is the source of Ewaso Ngiro North and Tana River systems. The earliest WRUAs in Kenya were formed in the Mt. Kenya area. Kenya's water resources are distributed over six catchment areas among five drainage basins that comprise of the Lake Victoria which has a North catchment and a

South catchment, Rift Valley, Athi, Tana, and Ewaso Ng'iro North (RoK & WRMA, 2009). WRUAs are widely regarded as having the potential of offering a superior institutional arrangement for local resource management and delivering meaningful benefits to users. According to RoK and WRMA (2012), about 400 WRUAs had been formed around the country, with 60 of them operating in the Ewaso Ngiro North Catchment area and among these 17 of them having been incorporated with the assistance of the LWF in the upper Ewaso Ngiro sub catchment area.

In Kenya, the WRUAs as recognized in The Water Act (2002) represent community-based organizations that come together around specified water resources for cooperative management and conflict resolution. The WRUAs approach embraces a sub-catchment water resource management as it promotes a planning, implementation and management strategy in which stakeholders are fully involved.

Water use and development underpins the social and economic fabric of the Kenyan society. Improving the management and protection of water resources so as to ensure that water is available for equitable allocation for all the demands in the country including water for domestic and public use, industry, agriculture, energy, livestock, wildlife, tourism, ecosystems and other water uses is therefore a high priority (WRMA & RoK, 2012).

The main goal of this study was to identify the factors influencing performance of water resource users association in the Upper Ewaso Ngiro North sub-catchment area. Given the fact that institutional structure of the WRUAs are identical throughout the country, this study hypothesized that the conduct of WRUAs in the management of water catchments, power relations within the community, monitoring of users to abide by the rules, and socio-economic factors would impact on the performance of the associations.

1.2 Problem statement

Water resources in Kenya, just as in many other developing countries, are scarce and unequally distributed both geographically and seasonally, which inevitably affects livelihood security. According to the United Nations Environmental Programme (2012), water is fundamental for the ecosystems to remain alive and healthy, as it enables the provision of multiple ecosystem services and support food production. Nevertheless, the growing human population and accelerating development, alongside uncertainties occasioned by climate change have

continued to put the available sources of water under pressure. The problem has been compounded by poor farming practices; illegal, unregulated and over abstraction of available water resources- all of which have negative effects that lead to degradation of water resources and ecosystems. The WRUA strategy was therefore adopted to address the water accessibility and conservation crisis at the catchment level through cooperative participation among water users in the management and conservation of the common water resource. Despite many WRUAs having been established in the ENNCA, and huge investments and resources and investments expended by both government and donors to support the activities of the associations, the challenges arising from water resource conservation, use and access have continued to occur. Incidents such as water conflicts, illegal water abstractions, water pollution and catchment degradation further affect how communities interact, pose difficulties to water regulation agencies and affect the livelihoods of the communities within the catchment areas. While several studies have been undertaken to investigate issues such as public participation in water services delivery, integrated water resources management, and ground water management, this study was focused on performance of WRUAs in fulfilling their mandate as enshrined in the Water Act (2002). It is for this reason that this study sought to investigate factors influencing performance of water resource users associations in the Upper Ewaso Ngiro North sub-catchment area in Laikipia County.

1.3 Purpose of the Study

The study sought to propose relevant and viable solutions that would contribute to better performance of WRUAs in their effort to manage water resources. It was also aimed at developing findings that would inform policy makers, implementing agencies, service providers, and development partners about the determinants of WRUA success within the sub catchment area.

1.4 Objectives of the Study

The study intended to assess the factors influencing performance of WRUAs in the Upper Ewaso Ngiro North Sub-catchment area. The specific objectives were:

i) To establish the influence of water sector regulations on performance of WRUAs in the upper Ewaso Ngiro North sub-catchment area.

ii) To determine the influence of socio-economic household factors on performance of WRUAs in the upper Ewaso Ngiro North sub-catchment area.
iii) To establish the influence of technical capacity on performance of WRUAs in the upper Ewaso Ngiro North sub-catchment area.

1.5 Hypothesis

The study hypothesized that:

i) **H_0:** There is a significant relationship between water regulations and performance of WRUAs in the upper Ewaso Ngiro North sub catchment area.
   H_1: There is no significant relationship between water regulations and performance of WRUAs in the upper Ewaso Ngiro North sub catchment area.
ii) **H_0:** There is a significant relationship between the socio-economic household activities of the water resource users and the performance of WRUAs in the upper Ewaso Ngiro sub catchment area.
   H_1: There is no significant relationship between the socio-economic household activities of the water resource users and the performance of WRUAs in the upper Ewaso Ngiro sub catchment area
iii) **H_0:** There is a significant relationship between the technical capacity of WRUAs and their performance in water resource management in the upper Ewaso Ngiro North sub catchment area.
   H_1: There is no significant relationship between the technical capacity of WRUAs and their performance in water resource management in the upper Ewaso Ngiro North sub catchment area.

1.6 Significance of the Study

Water resources are scarce and unevenly distributed while in some other regions there are increased cases of droughts and conflicts over water. This study was conducted with the aim of analyzing the performance of WRUAs in order to strengthen their role in promoting proper water resource management and utilization in a way that best serves the long term interests of the people of Laikipia County, the ecosystem and the wider population. The study describes the role that Water Resource Users Associations (WRUA) can play to enable the stakeholder communities to have an active role in the management of the river water resources on which their livelihoods depend.

1.7 Delimitations of the study

The study was conducted in the upper Ewaso Ngiro North sub catchment area in Laikipia County. The Upper Ewaso Ngiro North sub catchment area is the upstream section of the greater Ewaso Ngiro River basin. It covers an area of 4,167 square kilometers between latitudes 0º 20' South and 1º 00' North and longitudes 36º 15' East and 38º 00' East.

1.8 Limitations of the study

As the study probed for information on performance of WRUAs, some items may be technical in nature and a matter of propriety, thus the respondents might have given misleading and expedient information. The study anticipated the limitation of response bias, which may result where the subject consciously or subconsciously gave responses that they thought the researcher expected to hear, or to paint a good picture of themselves or the association.

1.9 Assumptions of the study

The study was based on the assumption that the sample selected is representative of the population; it was also assumed that the data collection instruments have validity and would measure the intended constructs. The study was also based on the assumption that the respondents would provide correct and truthful answers to questions during the study.

1.10 Definition of Significant Terms

Performance refers to the output or results of an organization as measured against its intended outputs, goals and objectives.

Riparian habitat refers to the dynamic complex of plant, animal and micro-organism communities, and their non-living environment adjacent to and associated with a watercourse.

Socio-economic factors are the social and economic experiences and realities that influence people's behaviour, attitudes, and lifestyle.

Sub catchment area refers to the area of land whose topography and drainage system directs rainwater into a single watercourse.

Technical capacity refers to the physical and operational ability of a WRUA to meet WDC requirements, including the adequacy of physical infrastructure, technical knowledge and capability of personnel.

Water Resources refers to freshwater in lakes, rivers, and existing as groundwater**.**

Water Resource Management- refers to the planning; decision-making; administration; monitoring and enforcement; incentive and control procedures and processes related to the management of water resources.

Water Resource Users Association refers to an association of water users, riparian land owners, or other stakeholders who have formally and voluntarily associated for the purposes of cooperatively sharing, managing and conserving a common water resource.

Water sector regulations refers to the standards, rules and procedures for the management and use of water resources as stated in the Water Act (2002)

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section presents a review of the relevant concepts from literature on Water Resource Users' Associations. This entails an assessment of issues such as the establishment and operations of WRUAs, relevant water sector regulations, effects of water sector reforms on livelihoods and technical capacity of WRUAs.

2.2 Overview of Water Resource Users' Associations

Stakeholder participation in water resource management at the local sub-catchment level is anchored around the emergence of community based WRUAs; which are voluntary membership associations made up of water users and riparian owners interested in proper management of their water resources. A "user" is one who utilizes water for socio-economic or recreational purposes. Users may also be participants in organizations which represent their interests. While it is recognized that the WRUAs are relatively new institutions, there is an increasingly broader recognition across the world that that WRUAs can channel the desired stakeholder participation in such a way as to help address some of the chronic problems that have constrained water resource management in the past such as low levels of awareness, poor land and water use practices, low levels of compliance with regulations and lack of proper monitoring.

The Water Act (GoK, 2002) requires stakeholder participation in consultations on matters of water resource allocation and to develop the National Water Resource Management Strategy (NWRMS) and Catchment Management Strategy (CMS). In relation to this, Kenya adopted a basin-based approach to water resources management, which is a holistic methodology that provides for regulated use of the water resources for the benefit of communities. WRMA's focus is the river basin, where it oversees the management of the catchments and the stakeholder groups, such as the WRUAs. The Catchment Management Strategies for all the water basins in the country were gazetted in 2009.

The involvement of WRUAs goes beyond just public consultation by seeking to enhance participation of the primary beneficiaries, the water users. The importance of stakeholder participation in IWRM was established at the International Conference on Water and

Environment held in Dublin in1992, and where one of the four principles adopted was that water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels. The importance of stakeholder participation is also justified on the grounds that water users who participate in the formulation and implementation of a sub-management catchment plan are more likely to understand it and comply with it; and also that local water users have indigenous or local knowledge which is important to the development and implementation of Sub-catchment Management Plans. According to Jakeman and Letcher (2003), the last decades have seen increasing efforts to model the complexity of water resource management with the aim to use the model results for improved management. Concern over the critical role played by water resources development and management has led to the adoption of integrated approaches to the development management and use of water resources through focus on tackling the growing challenges related to water resources management, balancing the infrastructural factors, maximizing and sustaining the delivery of a wide range of ecosystem goods and services and maintaining the structure and resilience of the ecosystem. Stakeholder participation in water resource management at the local sub-catchment level resulted in the advent of community based water resource user associations which are by their nature voluntary membership associations made up of water users and riparian owners involved in proper management water resources in their locales. WRUAs are a membership organization, not a service organization, and therefore are empowered through the participation of its membership.

Although stakeholder participation is recognized as important, developing a process in which stakeholders can genuinely participate is no easy task, particularly where stakeholders have grossly divergent socio-economic backgrounds, are dispersed over a large area, have significantly different priorities and visions of the future and have a competitive interest in the water resources which are contained in a complex hydrological system (Berger, Birner, D´ıaz, McCarthy & Wittmer, 2006).This suggests that the complexity of water use within catchments and sub-catchments poses a remarkable challenge in the quest to manage ensure management efficient, equitable and sustainable management of water resources.

The participation of water users also promotes a holistic approach to resource management which is considered to make the most of opportunities in efficient water use, water demand management, sustainable infrastructure and valuing services provided by ecosystems, which would in turn aid in reducing water scarcity and environmental degradation, while on the other

hand promoting the achievement of the Millennium Development Goals (Were, Swallow, & Roy, 2006).

2.3 Water Catchment Areas in Kenya

Kenya's water resources are distributed across six catchment areas among five drainage basins that comprise of the Lake Victoria which has a North catchment and a South catchment, Rift Valley, Athi, Tana, and Ewaso Ng'iro North (RoK & WRMA, 2009).

Figure 1 Kenya's main drainage areas

Source: NEMA (2011)

2.4 Establishment and Operations of WRUAs in Kenya source nema 2011

WRUAs promote community participation and consultation in water resource management through the provision of appropriate strategies around which to mobilize and coordinate the involvement of water users. According to Hooper (2006) the Integrated River Basin Management (IRBM) is "recognized as a tool, perhaps the most appropriate tool, to deliver Integrated Water Resources Management in the basin scale", which therefore implies that

WRUAs are increasingly touted as significant establishments in conservation and ecosystems management. In the recent times, these associations have increasingly been regarded as a central component in the evolution of the framework that defines how water is managed at the river basin or strategic levels (Radosevich and Olson, 1999).

The WRUA is a model for community-based participation in water resource management at the sub-regional level. These associations are established along water courses and provide an opportunity for the involvement of stakeholders and beneficiaries in the corporate management of water resources and resolution of water related conflicts. According to RoK and WRMA (2012), about 400 WRUAs had been formed around the country, with 60 of them operating around the Mt. Kenya region including 27 of which had been incorporated with the assistance of the LWF.

The establishment and operations of WRUAs in Kenya are provided for in the Water Resource Management Rules of 2007. Before WRUAs can operate and have the WRMA's recognition, they must be legally registered entities within the Registrar of Societies or any other form of legal registration. According to Article 10 of the WRMA (2007) rules, a WRUA is to be considered for registration if it is legally registered as an Association under the Societies Act, or as a Trust or Company under their respective Acts) and if has a constitution which is consistent with collaborative management of the water resources of a particular resource and which promotes public participation (inclusive), conflict mitigation, gender main-streaming and environmental sustainability. WRUAs can enter into an MOU with WRMA to further elaborate roles, responsibilities, and working arrangements for collaborative management in areas such as monitoring water resources and abstraction as well as collection of water use charges.

With regard to the institutional interventions, management of water resources has recently tended to adopt the concept of Integrated Water Resources Management, which 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 (The Global Water Partnership, 2000).

The Water Act (2002) requires that stakeholders participate in consultations in developing the NWRMS, CMS and Protected Areas; as well as in public consultations in matters of water resource allocation through formal institutional arrangements such as CAAC and public notification, through the mass media announcements. Collaboration with the WRUAs therefore aims at the enhancement of participation among the principal beneficiaries of water resources. Some of the objectives of a WRUA may therefore include Promotion of controlled and legal water use activities; promotion of good management practices to make efficient and sustainable use of the water resource; promotion of water conservation practices to ensure sufficient water reserves that meet the demands of the environment, the wildlife, the livestock and all the communities who rely on the water resource; working towards reducing conflict in use of the water resource and participating in conflict resolution as well as promoting catchment conservation measures to improve water quantities and quality.

The Dublin Conference held in 1992 emphasized on the need for stakeholder participation in water resource management premised on the understanding that water users who participate in the formulation and implementation of a sub-management catchment plan are more likely to understand it and comply with it; and that local water users have indigenous or local knowledge which is important to the development and implementation of SCMP. A general observation worldwide for both the irrigation and the drinking water and sanitation sectors is that technology-driven innovations rarely succeed unless they conform to users' needs, preferences, and willingness to pay. This is attributed to the fact that without adequate user consultation, essential information on local conditions and local demand for the services is not factored in. It has come to be widely accepted that WRUAs have the potentialities to harness stakeholder participation towards addressing prevalent concerns in water resource management, including low levels of awareness, poor land, and water use practices, low levels of compliance with regulations and lack of proper monitoring mechanisms.

In Kenya, the earliest formal WRUAs were established in the north and western parts of Mt. Kenya area in 1996/97 in response to increasing competition and conflicts over scarce water resources. The roles of a WRUA in Kenya are outlined in the Water Resource Management Rules, and the bases upon which they are formed comprise:

i. That the water resource users, being the principle beneficiaries or direct stakeholders of the water resources, should be integrally involved in the management of the water resources;

ii. Since their livelihood depends on the water resources and is at stake, the water resource users can be mobilized to undertake water resource management activities that serve their best interests (e.g. surveillance on illegal or harmful activities, adoption of best land use practices, catchments management activities, verification of local information, etc);
iii. It is more efficient for the WRUA to mobilize the water users to solve problems at the grassroots level.

According to WRMA and WSTF (2011), developing a process in which stakeholders can genuinely participate is a challenging undertaking especially in cases where stakeholders have grossly divergent socio-economic backgrounds, are dispersed over a large area, have significantly different priorities and visions of the future and have competing interests in the water resources which are contained in a complex hydrological system. The objectives of a WRUA are therefore outlined as including to:

- Promote controlled and legal water use activities;
- Promote good management practices to make efficient and sustainable use of the water resource;
- Promote water conservation practices to ensure sufficient water reserves that meet the demands of the environment, the wildlife, the livestock and all the communities who rely on the water resource;
- To work towards reducing conflict in use of the water resource and participate in solving those that arise;
- Promote catchment conservation measures to improve water quantities and quality.

These objectives are expected to be realised through activities such as exchanging of information and ideas on the water resource use; discussion on potential projects and developments that may affect water usage with a view to obtaining the consent of other WRUA members and the public; resolving conflicts on water use; monitoring water availability and use; as well as lobbying for resources to improve availability, reliability, quality or other aspects of the water resources.

2.5 Participation in Water Resource Management

The participation in river basin management is portrayed as a complex, socio-political process which involves and reconciles various interests across sectors and users in the water catchment and sub-catchments. WRUAs are founded on the philosophy of inclusiveness, where different users on board the associations provide an effective platform for improved resource

management practices, stakeholder negotiation, and conflict prevention or resolution. It also assumes that this approach makes for inclusive stakeholder participation through decentralized processes, equitable resource allocation and utilization, efficient resource use and sustainability. Studies on the efficacy of stakeholder participation have however yielded varying results in different settings where the policy has been implemented.

Water resources management involves various stakeholders with multiple objectives. Stakeholders are considered to comprise all individuals, groups, or organizations that have some interest in the use or the management of water resources, and include water users such as households, farmers, industries and all those government agencies with varied official administrative mandates. With this range of stakeholders therefore, it is necessary to find ways of managing the complexity of participants and their competing demands for water resources (FAO, 2006).

Organizational structures and management are rapidly undergoing transformation as a result of globalization and large-scale industrial changes and environmental disasters. Under such an environment, managers have to make more efficient decisions in performance management (Drucker, 1987). A system of assessing performance is seen as an information system that enables the performance management process to function effectively and efficiently according to Bititci *et al*. (1997).

Organizational excellence, which is defined as "outstanding practice in managing organizations and delivering value for all stakeholders" is closely related to performance assessment. There have been numerous studies seeking to come up with new, reliable approaches of measuring and determining organizational performance. These have resulted from queries on the traditional performance indicators such as profits and return on investment which are deemed as insufficient for decision making, planning and control operations in a dynamic environment **(**Kuscu, Bölüktepe & Demir, 2009). On the other hand, Jusoh *et al*. (2008) criticize traditional performance indicators because of their short-term rather than long term focus and measuring the past rather than future. Thus, performance assessment system sought to reflect and integrate all aspects of organizational performance.

Whereas WRUAs bring together a diversity of users, getting them to participate meaningfully and effectively may pose a challenge. Beyond attending meetings, effective participation

demands significant engagement in the discussions, decision making, and implementation of activities of the WRUAs. Active participation of the users is considered as an important strategy towards solving possible conflicts on water use. Participation should therefore be accessible to a wide range of stakeholders, to make the association representative. Participation in water resource management by users through WRUAS promotes collaboration, collective action organization, and conflict resolution, besides establishing commonly approved rights, roles, and responsibilities over the resource among the stakeholders. For this to occur, some preconditions such as comprehensive stakeholder identification and analysis, meaningful and accountable representation of distinctive members ought to be fulfilled.

Those in support of the policy aver that the involvement of all direct and indirect water resource users in the management of catchments is useful in strengthening the projects and activities of the WRUAs. WRUAs usually incorporate other partners such as NGOs and the authorities, making their membership quite diverse. Such a wide array of participants lends the management of water resources the intended integrated vision. The wide adoption of stakeholder involvement in catchment management has continued to gain increased recognition among policy theorists, and it aligns with the 'development from below' theory which emphasizes the recognition of the significant contribution that those who use and live most closely to the resource can make (Stor & Taylor, 1981). A study by the World Bank (2004) on water resources management in Kenya proposed that in order to deal with extreme hydrological events or poor management, it was necessary to devolve the responsibility for management as far as possible, to regional and local groups, including the private sector.

Were, Roy & Swallow (2006) outlines the general manner in which user participation and dialogue should be conducted, by explaining that extent of public participation in all decision-making processes must be unanimously approved, and that representatives of local elected officials, communities and all users concerned must participate in the formulation of master plans for water development and management, priority action plans and projects with the help of specialists from the administration and specialized consulting firms.

A study on decentralization of water resources management in Zimbabwe however found that effective dialogue and participation does not automatically occur, raising queries on the assumption that this policy is always effective. (Chikozho & Latham, 2005). In Kenya, a study on Improving Water Resources Development and Management by Mogaka, Gichere, Davis &

Hirji (2006) observed that catchment management groups consisting of upstream and downstream stakeholders, assisted by government agency staff, form a fundamental plank to managing many of the causes of degradation, as shown by pilot projects funded in Mt Kenya East project to develop and demonstrate good catchment management practices. Stakeholder participation therefore results in improved understanding among users of those factors and issues applicable to their catchment, thereby contributing to the understanding of the challenges affecting the conservation of a wider scope of the catchment, and wide ranging solutions, as opposed to one where they are only limited to their immediate surroundings.

2.6 Water sector regulations in Kenya

The Water Sector has continued to experience significant reforms within the legislative, policy, and institutional framework all over the world, including in Kenya. The realization that both surface and groundwater resources are being depleted and polluted at unprecedented levels has led to concerted global efforts to come up with a framework for water governance in response to the crisis. The impetus behind these developments has been the need to promote integrated ecosystem management approaches within a wider framework of internationally agreed targets and goals relevant to the water and socio-economic development sectors. A primary theme in the sectoral policy reform is the need for stakeholder participation in water resource management at the catchment and sub-catchment levels through the WRUAs; the extent to which the stakeholder participation can be harnessed to positively contribute to water resource management, as well as the nature, scale and coordination of local and institutional stakeholder participation. Among the Millennium Development Goals, the 7th one addresses the need to halve the proportion of people without sustainable access to safe drinking water and aims at improved access to safe drinking water and basic sanitation.

A conference held in Uganda in 2010 sought to promote the integration of the environmental dimension in national water laws and increase understanding on the benefits of greening up water-related legislation for the whole of the African continent. The conference addressed and assessed a variety of legal and procedural mechanisms, national and international, designed to elevate the status and importance of environmental concerns in the wider context of competition for water resources (UNEP, 2012). Another effort by UNEP was the establishment of the International Resource Panel (IRP) in 2007 with the aim of helping nations to use natural resources sustainably without compromising economic growth and human needs. The objectives of the IRP include providing scientific assessments of policy relevance on the

sustainable use of natural resources as well as to decouple economic growth from resource use and environmental degradation, one of the approaches being through examining ways of achieving improved water productivity, for example in the abstraction, use and reuse of water; defining a measurement framework for achieving efficient, effective and equitable water use. Accordingly, an ecosystem management approach factors in the full range of ecosystems, looking at hydrological basins as a whole, upstream to downstream, while also acknowledging environmental, and social, cultural and economic needs which include maintaining the biodiversity and health of the environment while protecting ecosystems in order for them to continue their vital, multiple tasks of combating climate change and pollution, while providing services to promote health and well-being.

The Constitution of Kenya (2010) enshrines the right of access to clean and safe water in adequate quantities (Art. 43(1) (d)) for everyone as one of the economic and social rights, hence promoting the on-going pollution control measures within the water resources management rules. The draft Water Act (2012) emphasizes separation of regulation in management of water resources which is envisaged to improve efficiency in IWRM processes including pollution control so that the right to clean and safe water can be realized.

The Water Act (2002) is the principal law that governs the management, conservation, use, and control of water resources. The Act stipulates that every water resource is vested in the State, whereby the cabinet secretary has control over all water resources in the country. It separates water resources management and development from water supply activities through a structured decentralized institutional framework comprised of different multi-level institutions, among which decision making is vested in relation to autonomous and regional bodies. At the national level, the ministry is responsible for policy formulation while the Water Resources Management Authority (WRMA), which was established under the Water Act (2002), takes the lead role in the management of all water resources in Kenya by regulating, monitoring, assessing, and allocating the water resources, managing and protecting the water catchments and collaborating with other institutions. At the local level, the WRUAs play the role of overseeing cooperation and conflict resolution by bringing all water users together in their respective catchment areas (WRMA, 2007). Under the new Water Act, three major shifts in water management in Kenya are envisaged in relation to decentralization, participation and sustainability.

The Water Services Trust Fund (WSTF) was established under the Water Act (2002) to assist in financing water services in the underserved parts of Kenya. Subsequently, the WSTF set up financing windows in response to this obligation for rural water supplies, besides initiating other programmes for urban systems with a key focus on peri-urban areas.

Other legal frameworks that support the water act in Kenya are the Environment Management and Coordination Act (1999); the Environment Policy; the Forest Act (2005); The Agriculture Act (CAP 318); The National Land Policy Land Control Act (CAP 406); The Fisheries Act (CAP 378); the Wildlife Act and the Irrigation Act (CAP 347), among others. The Land Act promotes protection and sustainable use of riparian lands while The EMCA requires that Environmental Impact assessments (EIA) should be carried out for any proposed activities that may have an impact on the environment. In addition, The Forest Act (2005) in Kenya promotes sustainable use of forest products and participatory afforestation through Community Forest Associations. The National Environment Management Authority (NEMA) is a state agency responsible for issuing licenses at a fee and charging any persons who discharge effluent and other pollutants into water bodies and affect water quality standards. Figure 2 summarizes the structure, roles, and institutions responsible for the regulation of water resources sector in Kenya.

Other related legal frameworks that support the water acts in Kenya are the Environment Management and Coordination Act (EMCA) of 1999; the Environment Policy; the Forest Act (2005), the Agriculture Act (CAP 318); National Land Policy Land Control Act (CAP 406); The Fisheries Act (CAP 378); the Wildlife Act, the Irrigation Act (CAP 347). For example EMCA demands that Environmental Impact assessment (EIA) should be carried out for proposed interventions that may have an impact on the environment, while the Forest Act (2005) in promotes sustainable use of forest products and participatory afforestation through Community Forest Associations (CFAs) and the Land Act promotes protection and sustainable use of riparian lands.

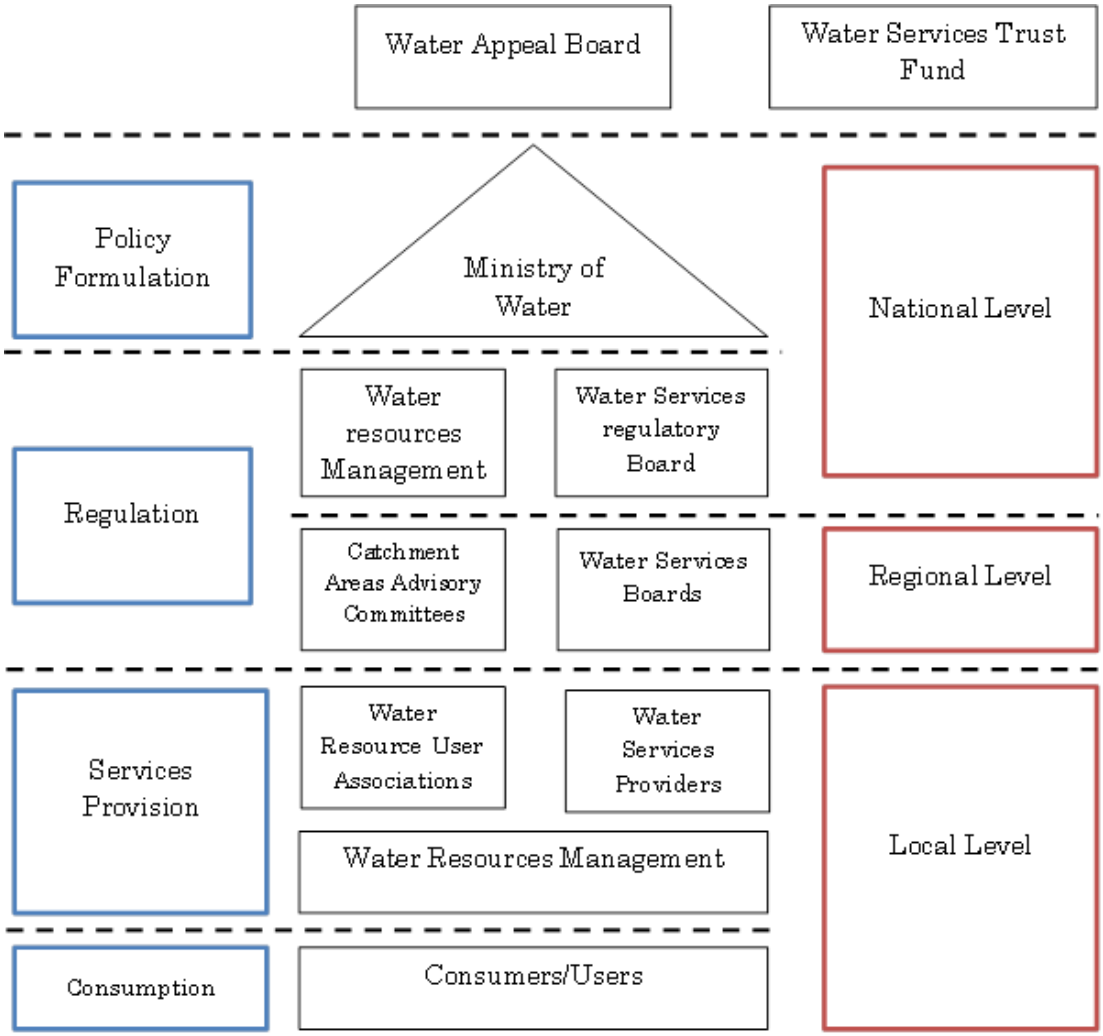

Figure 2 Water resources regulatory framework in Kenya

Source: World Bank (2004)

The Vision 2030 seeks '*to ensure water and improved sanitation availability and access to all by 2030*' through measures such as improving the management of water resources, enhancing storage and harvesting capacity, constructing multipurpose dams as well as water and sanitation facilities to cater for the projected population growth.

How attributions of the WRUAs are redefined usually relate to decision-making responsibility often on matters concerning the catchment. Water resource policies should therefore effectively transfer not only roles, but also the decision-making power and enhance the cross-accountability between the government agencies and users.

2.7 Importance of the water sector reforms on livelihoods

The ecosystems in Kenya comprise of forests, freshwaters, wetlands, coastal and marine, mountains, ASAL areas, and diverse wildlife; within which the biodiversity provides natural capital for economic development and support for the livelihoods of numerous households. Recent policy changes in the management of natural resources in Kenya have availed opportunities for increasing and strengthening community level involvement in the process of planning and management of natural resources. While noting that human activities are the main driver of ecosystem degradation, it is proposed in the draft *National Environmental Policy* (2013) that the government will promote integrated watershed management and alternative livelihood opportunities to enhance community participation in the conservation and management of ecosystems.

The Constitution of Kenya (2010) and the Sessional Paper No. 3 of 2009 on National Land Policy resulted in the reforms of previously existing laws, policies and institutions, seeking to expand the space for communities to participate directly in the management of resources within their localities, which is in turn expected to have a direct effect on their livelihoods. This is indicative of the fact there exists a clear link between water resources management and community livelihoods. Unless poverty and population issues are incorporated in water management, attempts to achieve sustainable water resources management may not yield any success (NEMA, 2010). In ASAL areas, which make up 80% of the country, pastoralists rely on natural resources such as land and water; vegetation including pasture, forest and shrubs. The RoK (2009) states that pastoralism is a livestock based economic activity that has survived as a livelihood and land use system despite changes in lifestyles and technological advancements. Such communities therefore value highly the maintenance of their natural resources because these support their livestock and wildlife which are often their main sources of livelihood. A study on *Building Drought Resilience* in Kenya by IUCN (2013) found that the management of water among pastoralists therefore determines access to vegetation, pasture, crops and other pastoral resources, and for this reason WRUAs are an important institution around which the planning and management of natural resources is organized.

One of the objectives of the draft *National Environmental Policy* (2013) is to ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods. However, some of the

main human activities contributing to environmental degradation in Kenya include unsustainable land use practices, poor soil and water management practices, deforestation, overgrazing, and pollution. These inevitably result in degradation of natural resources such as land, water, wildlife, and biodiversity, thereby resulting in threats to livelihoods of a large section of the population.

In the Ewaso Ngiro North Catchment area, the agro-climatic zones largely determine the socio-economic activities among the residents. Within the arid and semi-arid (ASAL) areas of the catchment, pastoralism activities are the dominant form of livelihood, while in the in the highland areas around Mt Kenya, commercial agriculture is predominant, with increasing irrigation in the middle zones. These activities when unchecked may destroy surface cover resulting in increased surface run-off and soil erosion, silting in the rivers, dams, and pans resulting in reduced storage capacity. The increased surface run-off may lead to increased potential flooding and its associated consequences, as well as other effects such as land degradation, deforestation, encroachment into water catchment areas, cultivation in wetlands and over-grazing (IUCN, 2013).

2.8 Technical Capacity of WRUAs

Involvement of the 'civil society' in water management is still an evolving process in which the decentralization process requires institutional set up and support for development. This necessitates creation of awareness and building the capacity of all the stakeholders on the principle of sustainable water resources management. Water resource management and conservation practices encompass a range of factors such as knowledge, behaviour and attitudes towards water as a resource. According to the World Bank (2006), decentralization of water management as outlined in the Water Act (2002) will provide opportunities for sharing power and responsibilities of governance over water development and allocation, and provide water users with a more effective input to decisions. This must however, be matched by capacity building efforts to ensure that the local levels can cope with increasing responsibilities and unequal power structures.

Comprehension by WRUA members of the environmental and conservation concepts, the need for efficient use of water resources and their important role in the sustainable exploitation and protection of water catchments is vital. Knowledge is commonly seen as a necessary

precondition for behavior, which implies that most educational interventions rely on knowledge transfer.

WRUAs draw their membership from diverse stakeholders, and could therefore contribute towards and assisting with building awareness, skills training and transfer, developing community education programmes, increasing the understanding of rights and responsibilities towards water use and conservation and establishing regular channels of communication between authorities and communities. For this to happen, the WRUA members ought to be familiar with the context within which they participate to ensure that their authority and effectiveness commands support and respect from their communities. Part of the reason for this is the fact that interventions in the procedures, organization and management of water resources through the WRUA strategy demands new structures, projects, and relevant know-how. These require prioritization of training and awareness-raising campaigns and access to information that aids decision making and action (Were, E., Roy, J. & Swallow, B. (2006).

The National Environmental Policy (2013) identifies weak enforcement of environmental compliance as attributable to inadequate technical capacities, monitoring infrastructure and inadequate trained staff in enforcement institutions. It therefore proposes that building a cadre of professionals in environment and natural resource management is an investment that requires both short and long term approaches, in which case short term training and targeted courses are important for skills and managerial development, the long term training in specific areas enhances specialization.

WRMA initiated the Water Development Cycle (WDC) whose objectives are outlined as entailing the provision of training materials for WRMA staff and other stakeholders involved in WRUA mobilization and training, provision of clear and practical guidelines and procedures for Sub-Catchment Management plans implementation; capturing priorities and best practices across a range of IWRM, catchment or WRUA related activities; providing a resource for WRUA capacity building and providing a financing framework for Sub Catchment Management Plans. For purposes of realizing these goals, WRMA developed a framework and toolkit that elaborates on the WDC process.

The LWF (2010) indicates in its progress reports that training workshops/meetings were carried out for some WRUAs based on the major gaps identified during field assessment, and the main

areas in which training was provided included financial management, the Water Development Cycle (WDC) process, record keeping, and various aspects of water resource management. Other areas in which training was offered included Water Sector Reforms, financial management, impact of human activities on water quality, environmental conservation and management of water sources. Capacity constraints among WRUA members are likely to affect keen involvement in catchment management, meaningfully participation in dialogue with other stakeholders, understanding and critical analysis of water resource related policies, sharing of their experiences and interests. A study by Gumbo *et al*. (2004) on water demand management found that one of the major limitations is the absence of well-structured education and training programmes suitably targeted to stakeholders in the water management chain.

WRUAs are established and recognized forums that could play a vital role in disseminating water catchment conservation knowledge through community training, but for this to happen, there is need to establish knowledge, skills and attitudinal change training needs as a starting point for developing or improving an on-going series of training programmes suited to the needs of the sub-catchments. WRUAs could be trained through workshops, lectures, and discussions.

2.9 Conceptual framework

According to Miles and Huberman (1994) a conceptual framework can be defined as a visual or written product, one that explains, either graphically or in narrative form, the main things to be studied - the key factors, concepts, or variables and the presumed relationships among them. In this study WRUAs were conceptualized as entities which are characterized by three interactively interrelated concepts i.e., legal framework, prevailing socio- economic conditions, and technical capacity. Any factors that lead to changes in the three components will have impact on the performance of WRUAs. According to the Water Act (2002) and the Water Rules (2007), WRUAs operate within a legal framework established to prescribe the actions for both individual and collective decision-making in the specified roles in participatory water resource development, water allocation, use, water management and conflict mitigation.

For analytical convenience the variables have been grouped into three broad categories; 1) the independent variables such as water sector regulations under the existing legal system, socio - economic development, financial and physical adequacy of institutional infrastructure. 2) The moderating variables such as political interference, insecurity and natural calamities including

floods and droughts; and, 3) the dependent variables which determined performance like legal status, availability of technical capacity and access to equal opportunities.

The variables were assigned specific indicators and a comparison made on how they impacted on the dependent variable as shown in figure 3 below.

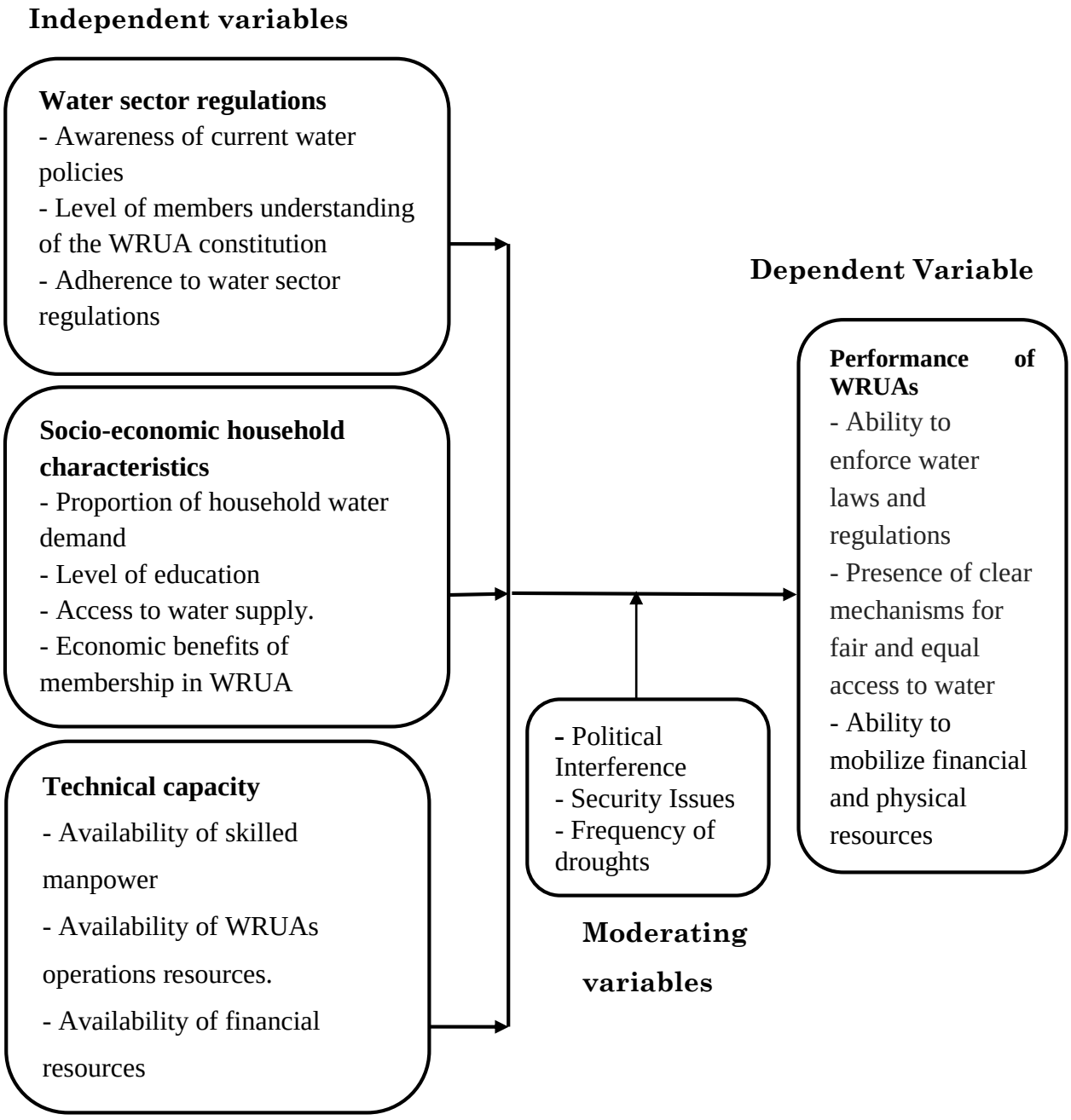

Figure 3 Conceptual Framework

Water sector regulations

The Water Act gives WRUAs responsibility for administering cooperation and conflict resolution by bringing all water users together in their respective areas (WRMA, 2007). The water sector regulations determine the effectiveness of WRUAs in water resource management functions, and impacts on their implementation of policy, improvement of operational efficiency, prevention of conflicts and the stakeholder awareness at the grass roots.

Socio-economic household characteristics

Past studies have shown that there is a linkage between the socio-economic status and natural resource base, including water resources. The upper Ewaso Ngiro sub catchment area supports people with various socio-economic and cultural backgrounds. Access to infrastructural facilities and social services is limited to the majority of the populations in the area. Water security is very poor and conflicts over water tend to arise especially during the dry season. Many people do not have reliable water supplies and rely on untreated water from the rivers and streams. The sub catchment area supports valuable economic activities such as horticulture, ranching, agriculture and livestock rearing. Intense agricultural activity is mainly found in the upper and middle zones of the catchment where annual rainfall is relatively higher and can sustain rain fed subsistence agriculture. Pastoralism and livestock is practiced in the lower zone where rainfall is relatively low. Other socio-economic activities are small scale businesses. A study by the World Bank (2006) observes that sustainable management of water resources is directly related to the prevailing socioeconomic activities. Performance of WRUAs is therefore closely influenced by the socio-economic characteristics of the communities around a specific catchment area.

Technical capacity

The deployment of appropriate and relevant technical expertise is key in developing and sustaining strategic water resource functions within the WRUAs. The suitability of the knowledge, skills and ability of the WRUA members and management committees will provide for a rational, effective and efficient performance in relation to decision making, policy implementation, environmental, financial and institutional management (WRMA, 2007).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

Data for this study was gathered through a descriptive survey conducted in the Upper Ewaso Ngiro North sub-catchment area among respondents drawn from the household members and management of officials of the WRUAs. Both quantitative and qualitative methods were used in the study as this combination offset biases and complemented the different methods. They are also useful in understanding complex social phenomena, allowing for greater plurality of viewpoints and interests, and aid in generating deeper and greater insights (Taylor et al., 2005).

3.2 Research design

According to Orodho, (2003) a research design is the scheme, outline, or plan that is used to generate answers to research problems. This study utilized a descriptive survey research design. The descriptive survey method was preferred because it involved the use of a predetermined set of questions in the form of a questionnaire which not only saves time but are also easier to administer. This research design also provides a good way to examine people's attitudes and opinions. The tools used included the use of structured questionnaires and interview schedules. The questionnaires were self-administered to ensure a high return rate, while interviews were conducted to gather further in-depth information which might have been omitted by the questionnaire. The researcher determined the relationship of the independent variables (prevailing policy and regulation issues; socio-economic household characteristics, and availability of physical and technical capacity) and their influence on performance of WRUAs in water catchment management.

3.3 Target Population

According to Orodho, (2003) small populations can form samples and be studied as distinct cases. The choice of the target population was guided by purpose of the study which was to explore factors that influenced performance of WRUAs in the Upper Ewaso Ngiro North sub-catchment area. The target population for the study comprised the executive management committees and registered members of the 13 WRUAs in the Upper Ewaso Ng’iro North sub-catchment area. This population was selected for the study as they have been exposed to different contextual settings of the WRUAs, in aspects of both management and performance, and was therefore able to reflect on those experiences considered significant to WRUAs. The

total household membership of the Upper Ewaso Ngiro North WRUAs is 1319; while each WRUA has an executive management committee composed of 3 members. Other people targeted for the study included WRMA officials in Laikipia County.

Table 3.1 Target Population

Category	**Target population**	**Percentage %**
Households	1319	96
Executive committee members	39	3
WRMA Officials	3	1
Total	**1361**	**100%**

3.4 Sampling Procedure

Cooper & Schindler (2003) define a sample as a small part of a large population which is considered to be representative of a larger population. Due to the fact that the cluster sampling units (WRUAs) did not have the same number of elements (membership), a random selection process where the probabilities of each cluster being included in the sample is proportional to the size of the cluster was utilized. The main sampling unit of the survey was the WRUA members and the executive committee. Simple random sampling was utilized in the selection of executive committee member respondents in the study. For this purpose, the number of elements in each cluster was listed before systematically sampling the appropriate number of elements from the cumulative totals. WRMA officials were purposively sampled for the study, while each member of the sample population was assigned a number from the table of random numbers and picked at random. All the subjects corresponding to the numbers picked formed the research sample. A sample size of 5 executive committee members was sampled for the interview. This information is summarized in Table 3.2.

Table 3.2 Sample Size

Category	**Sample size**	**Percentage**
Households	49	86
Executive committee	6	10

WRMA Officials	2	4
Total	**57**	**100**

3.5 Data Collection Techniques

According to Cooper and Schindler (2003) survey research can use several methods to collect data such as self - administered questionnaires through mail, telephone, internet or personally administering the questionnaire. In the present study, the data was collected from the respondents through a personally administered structured questionnaire. The respondents were members of the WRUAs in the upper Ewaso Ngiro sub catchment area. The WRUA members that agreed to participate in the survey were interviewed in person by the researcher. The primary advantage of this method are good co-operation from participants, interviewer can probe answers and illiterate participants can be reached (Cooper and Schindler, 2003).

This method allowed the researcher to gain deeper insights into the perception of the WRUA members about their own association and how it was performing its obligated duties. The data was collected from WRUAs in the upper Ewaso Ngiro North sub catchment area in Laikipia County. The data was collected during the period April - May 2014.

3.5.1 Validity

Instrument validity refers to accuracy, meaningfulness and technical soundness of the research instrument (Mugenda and Mugenda, 1999). It is the degree to which a test measurers what it intends to measure. They further contend that the usual procedure in assessing the content validity of a measure is to use a professional or expert in a particular field. To this effect questionnaire or interview guide are said to be valid when they actually measure the intended parameters. To enhance the instrument validity the researcher instruments were appraised by the supervisor to provide expert opinion and evaluate the applicability and appropriateness of the content, clarity and adequacy of the instruments from a research perspective. A pilot test of the instruments was also conducted among 5 randomly selected respondents that were not included in the study to ensure validity in the content of each research instrument.

3.5.2 Reliability

Reliability is a measure of the degree to which a research instrument consistently yields the same results after repeated trials according to Mugenda and Mugenda, (2003). Reliability refers to extend to which instruments yields measurements that are consistent each time if it is administered to same people. The researcher employed a test- retest method in order to test reliability of the research instruments. Research instruments were pre-tested on a sample of 5 respondents from different WRUAs on two occasions within two weeks and the correlation between the two set of scores computed. A Pearson Product Moment co-efficient of 0.64 was obtained. In this study a minimum correlation of 0.5 was considered as a good measure of reliability of the instrument (Cooper and Schindler, 2003)

3.6 Data Collection Procedure

To generate data for this research study, the researcher visited the sampled respondents drawn from the different WRUAs to establish a rapport and seek appointments for interviews, and get a list of the household membership. The researcher then conducted the interviews on the agreed dates, and recorded the proceedings. The questionnaires were distributed to the sampled households with the aid of a research assistant, and the completed questionnaires collected later on an agreed date. This was helpful in increasing the questionnaire return rate and in reducing the chances of delay. Instructions were carefully explained to the respondents during the issuing of the questionnaires and they were also assured that the information given would be treated confidentially and used only for the purpose of the study. The completed questionnaires were checked for completeness and appropriateness of the responses.

3.7 Data Analysis

Data collected during the study was analyzed using the Statistical Package for Social Sciences (SPSS). The items in questionnaires were identified by a variable name and assigned values and value labels for identification of responses during coding. The responses were used to compute descriptive analyses which are presented using tables of frequencies, and statistics such as mean in order to draw interpretations, comparisons, and summaries.

3.8 Operational Definition of Variables

The table below shows the variables in the study, how they were measured and data analysis techniques used.

Table 3.3 Operationalization of variables

Variable	**Type of variables**	**Indicators**	**Measurement**	**Measurement scale**	**Data analysis method**
Water sector regulations	Independent	-Awareness of current water policies -Level of members understanding of the WRUA constitution -Adherence to water sector regulations	Extent of compliance with the national and organizational policies and regulations	Ordinal	-Descriptive statistics -Frequency Distribution - Measures of Central tendency
Socio-economic household characteristics	Independent	-Proportion of household water demand -level of education -Access to water supply. -Economic benefits of membership in WRUA	- Extent to which livelihoods are dependent on water resource - Trends in WRUA membership	Ordinal	Descriptive statistics -Frequency Distribution - Measures of Central tendency
Technical capacity	Independent	-Availability of skilled manpower -Availability of WRUAs operations resources. -Availability of financial resources	-level of awareness and knowledge on water resources conservation	Ordinal	-Descriptive statistics -Frequency distribution

		-Access to capacity building opportunities			
Performance of WRUAs	Dependent	-level of understanding of the water rules -Enforcement of water laws and regulations -Equity to access to water. - Adequacy of financial resources -Ability to mobilize resources	-Adequacy of available resources among WRUAs - Existence of a monitoring and evaluation system.	Ordinal	-Measures of central tendency -Descriptive statistics

3.9 Ethical considerations

The study addressed the ethical issues through the use of an introductory letter (Appendix I) which explained the purpose of the study. It was also used to ensure that the researcher obtained the consent and voluntary participation of the respondents and the right to know the purpose of the study and how the process will be conducted. The respondents' right to confidentiality and anonymity of the responses were ensured whereby the data and information gathered was treated and reported in such a way that it would not be traced to any persons. Further, the works of others quoted or referred to are all acknowledged through use of citation and references. The principle of objectivity will be adhered to during the entire search process including the design, data collection, analysis, and interpretation of data.

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents an analysis and interpretation of data gathered in the study. Analysis was done using descriptive and inferential statistics and findings of the study are presented in form of tables of frequencies and percentages. The data was then interpreted according to the research questions.

4.2 Response Rate of the Study

During the study, a total of 57 respondents were sampled for the study from among household members of WRUAs, executive committee members of the WRUAs and WRMA officials in Ewaso Ngiro North Catchment area. Forty nine (49) households were sampled for the study, together with six (6) executive committee officials and two (2) WRMA officials who were interviewed. The response rate is presented in Table 4.1.

Table 4.1 Response rate of the study

Category	**Frequency**	**Percentage**
Responses	43	75
Non Responses	14	25
Total	57	100

From among all the sampled respondents, responses were received from 43 of them, which gave a response rate of 75%. The reason for the unreturned questionnaires which, represented 25% of the sample size, could be attributed to the respondents' inability to return the questionnaires to the point for collection within the agreed period. However, the response rate was within the acceptable threshold of the return rates, and according to Richardson (2005) an overall response rate of at least 70% is desirable.

4.3 Demographic characteristics of the respondents

The background information of the respondent's is essential for describing the characteristics of the participants in the study. It serves an ethical significance by providing objective generalizations and justifies the fact that real subjects were involved in the study.

4.3.1 Gender profile of the respondents

Table 4.2 Gender profile of the respondents

Sex of the respondents	Frequency	Percent
Male	30	70
Female	13	30
Total	43	100

Table 4.2 shows that a majority of the respondents 30 (70%) were male. Female respondents made up about a third of the respondents in the study, as they comprised 13 (30%) of the participants.

4.3.2 Age of respondents

The respondents were requested to state their ages, and the responses are summarized in Table 4.3.

Table 4.3 Age of Respondents

Age category	Frequency	Percent
21-30	3	7
31-40	9	21
41-50	15	35
51-60	6	14
Above 60	10	23
Total	43	100

According to Table 4.3, the respondents aged between 41 and 50 years old comprised the largest category with 15 respondents, making up 35% of all. Those aged 31-40 and those above

60 years old accounted for 21%. Those aged between 21 and 30 years old were the fewest, at only 3 respondents, or 7% of all. These findings imply that those persons aged between 41-50 years formed majority of opinion leaders in the WRUAs, followed by those aged above 60 years in the ENNCA area.

4.3.3 Education Level of the Respondents

The respondents were asked to provide information on their highest level of education, and the findings are presented in Table 4.4.

Table 4.4 Respondent's highest level of education

Level of education	Frequency	Valid Percent
Primary	6	14
Secondary	22	51
College/University	13	30
No formal education	2	5
Total	43	100

The summary of the respondents' level of education established that a majority of the respondents, 22, comprising 51% of all, had attained secondary school education as their highest level, followed by those with at least a college or university level education who made up 13 of the respondents, or 30%. Those with a primary school level of education made up 14%, with the minority category being those who had no formal education, as these were 2, or 5% of all. These findings imply that many members of the WRUA, as well as the officials are literate and have a significant level of education that could influence their capacity to determine the performance of the WRUAS.

4.3.4 Marital status of the respondents

The study sought for information on the respondents' marital status so as to establish their social status. The findings on these are summarized in Table 4.5.

Table 4.5 Marital status of Respondents

Marital status	Frequency	Percent
Single	4	9
Married	36	84
Divorced	3	7
Total	43	100

According to the data shown in Table 4.5, 36 respondents making up 84%, were married and formed a significant majority. Those who were single comprised 9%, with those who were divorced accounting for 7%. This showed that marriage is highly regarded and this suggests that there is a measure of social stability among the community members in ENNCA.

4.3.5 Occupation of the Respondents

The researcher sought to establish the main occupation of the respondents targeted in the study. The findings are presented in Table 4.6.

Table 4.6 Occupation of the Respondents

Main occupation	Frequency	Percent
Community Health Worker	1	2
Farmer	32	74
Businessman	8	19
Manager	2	5
Total	43	100

Table 4.6 shows that the large majority of the WRUA members in the ENNCA are farmers, as this category had 32 (74%) of all the respondents. Those in business made up 19%, while 2 respondents (5%) were in employment as managers. These findings suggest that those who make up the membership of WRUAs have a stake in the water resource as it is a key factor for their productive activities as farmers.

4.4 Information about WRUA membership

The study investigated different aspects of the household respondents' membership of the WRUA. This sought to establish information such as the respondents' length of membership in the WRUA, the extent to which they participated in the association's activities, their objectives in joining the WRUA as well as whether or not the WRUA had achieved its objectives or not. When did you join the WRUA?

4.4.1 Duration of membership in the WRUA

The study sought to establish for how long the household respondents had been members of the WRUA. This information was useful in determining the extent to which they had an understanding of the performance of the WRUA. The summary of this information is summarized in Table 4.7.

Table 4.7 WRUA Membership

When did you join the WRUA?	Frequency	Percent
1-3 years ago	12	34
4-6 years ago	9	26
7-9 years ago	5	14
10 years ago or more	9	26
Total	35	100

The Table 4.7 shows that while 34% of the respondents had joined the WRUA between 1 and 3 years ago, all the rest, or a combined proportion of 66% of all household respondents had been members for 4 years or more. This suggests that a majority of those participants in the study were conversant with the activities of the WRUA, and could therefore provide reliable information on the goings on in the association.

4.4.2 Participation in the activities of the WRUA

The respondents in the study were asked to state whether or not they participated actively in the activities of the WRUA, as the extent to which they were involved in the matters of the WRUA significantly influences the overall performance of the association.These findings are presented in Table 4.8.

The findings summarized in Table 4.8 show that all the participants, 100%, participated actively in WRUA activities. This implies that they were keen on the day-to-day matters affecting and involving the association, and therefore could influence the extent to which the WRUA achieved its objectives.

Table 4.8 Participation in WRUA activities

Do you actively participate in WRUA activities?	**Frequency**	**Percent**
Yes	35	100
No	0	0
Total	35	100

4.4.3 Roles in the WRUA

Members of WRUAs are expected to play a role in the associations' activities, and the respondents were requested to state some of these, which are summarized in Table 4.9.

Table 4.9 Members' roles in WRUA

Members' roles in WRUA	**Frequency**	**Percent**
Committee membership	9	26
Membership	9	26
Regulating water access	6	17
Executive committee member	2	6
Sensitization	1	3
Tree planting	3	8
Management of WRUA	5	14
Total	35	100

The study found that most of the householders who participated in the study were either committee members or just ordinary members, as these categories accounted for 26% in each case. On the other hand, 6 (17%) of the respondents were involved in regulating water access, while 6% were members of the executive committee. Others were involved in tree planting

(8%) and holding management responsibilities (14%). From these findings, it is seen that members of households were actively involved in WRUA activities, and therefore influence the effectiveness of the WRUA in accomplishing its mandate. None of the respondents who participated in the study indicated that they did not participate actively.

4.4.4 Expectations in joining the WRUA

To establish why the members had joined the WRUA, the researcher asked the respondents to indicate what their expectations were in joining the WRUA. The participants in the study stated various reasons that influenced their choice to join the WRUA, and these are summarized in Table 4.10.

Table 4.10 Expectations in joining WRUA

Expectations in joining WRUA	Frequency	Percent
Better water conservation	10	28
To develop the WRUA	7	20
Benefit from training	3	8
To get enough clean water for all	5	15
Equitable access to water	9	25
To participate in implementation of WRUA activities	1	4
Total	35	100

Among the different expectations expressed by the respondents, the most common one was the expectation for better water conservation, as this was identified by 10 (28%) of the respondents, followed by the expectations for promotion of equitable access to water in the ENNCA area, which was identified by 9 (25%) of the participants in the study. Others stated that they had joined the WRUA with the expectation of participating in developing the WRUA (20%), or in order to get enough clean water for all in the area (15%). Few members of the households in the study had joined just to participate in the implementation of WRUA activities. These findings show that the members of the WRUA have so much confidence in the ability of the

WRUA to enable them have better conservation of water as well as to promote more equitable access to water in the ENNCA area.

4.4.5 Achievement of the expectations

Having indicated what their expectations were in joining the WRUA, the respondents were asked to state whether these expectations had been realized or not. The summary of these findings are presented in Table 4.11.

Table 4.11 Have the expectations been met?

Have the expectations been met?	Frequency	Percent
Yes	26	74
No	6	17
Partially	3	9
Total	35	100.0

The findings show that 26 (74%) of the respondents felt that their expectations in joining the WRUA had been met, with 6 (17%) suggesting that these had not. A smaller proportion of 9% of the respondents stated that these expectations had been partially achieved. This implies that the WRUA has been significantly effective in achieving most of the objectives that it was expected to.

4.5 Water sector regulations

Water sector regulations govern the formation, set out policies, and determine the day to day rules that are used in the management of the WRUA activities. The adherence to these rules and regulations therefore influences the management of the organisations and their effectiveness in the performance of their roles. The respondents were requested to provide information on the impact of these water sector regulations on the WRUA.

4.5.1 Legal status of the WRUA

The study sought to establish the extent to which the legal status of the WRUA influences performance of the WRUA.

Those who strongly agreed that the legal status of the WRUA affects its performance were 17 (49%), while those who agreed comprised of 40%. Few of them disagreed or strongly disagreed, with these options being selected by only 3% in either case. This implies that the legal status can have a significant effect on its operations.

Table 4.12 Legal Status of the WRUA

Legal status of the WRUA	Frequency	Valid Percent
Strongly disagree	1	2.9
Disagree	1	2.9
Undecided	2	5.7
Agree	14	40.0
Strongly agree	17	48.6
Total	35	100.0

4.5.2 Level of members' understanding of the constitution

Each WRUA is expected to have a constitution that sets out its by-laws. The researcher asked the respondents to indicate the extent to which they felt these affected the performance of the WRUA.

Table 4.13 Level of members' understanding of the constitution

Level of members' understanding of the constitution	Frequency	Valid Percent
Strongly disagree	2	6
Disagree	2	6
Undecided	6	17
Agree	10	28
Strongly agree	15	43
Total	35	100

According to the findings summarized in Table 4.13, 43% strongly agreed, and 28% agreed that level of members' understanding of the constitution affected the performance of the

WRUA. 17% were however undecided, while 6% disagreed or strongly disagreed in either case. These findings indicate that the respondents felt that WRUA members' level of understanding of the associations' constitution can hamper or promote the performance quite significantly.

4.5.3 Familiarity with SCMP

Every WRUA is expected to have a Strategic Catchment Management Plan, and the study intended to find out if the familiarity with this has any effect on the performance of the WRUA.

Table 4.14 Familiarity with SCMP

Familiarity with SCMP	Frequency	Percent
Disagree	3	9
Undecided	10	28
Agree	8	23
Strongly agree	14	40
Total	35	100

From the findings in Table 4:14, more than 50% of the respondents agreed or strongly agreed that familiarity with the WRUA's SCMP has an effect on its performance, with those agreeing compose of 23% and those strongly agreeing making up 40%, or the majority. 9% disagreed, while 28% were undecided. From these finding, it is implied that the familiarity with the SCMP can influence the WRUA's performance.

4.5.4 Equity in enforcement of rules

According to Table 4.15, equity in enforcement of rules has a significant effect on the performance of WRUAs, based on the results showing that 46% strongly agreed and 31% agreed. Only 14% disagreed, while 9% were undecided.

Table 4.15 Equity in enforcement of rules

Equity in enforcement of rules	Frequency	Percent
Disagree	5	14
Undecided	3	9
Agree	11	31
Strongly agree	16	46
Total	35	100

4.5.5 Fair representation of membership

Table 4.16 Fair representation of membership

Fair representation of membership	Frequency	Percent
Strongly disagree	2	6
Disagree	2	6
Undecided	6	17
Agree	12	34
Strongly agree	13	37
Total	35	100

A majority of those who participated in the study strongly agreed that fair representation of membership strongly affected the performance of the WRUA, followed by those who agreed. Those who were undecided made up 17%, while those who disagreed or strongly disagreed comprised of 6% in either case. From these findings, it is implied that fair representation of membership can affect the performance of WRUAs.

4.5.6 Adherence to water sector regulations

Table 4.17 shows that while 20% of the respondents were undecided on whether or not adherence to water sector regulations affected the performance of WRUAs, 37% of the respondents strongly agreed or agreed with either case. This implies that these regulations have a significant effect on the performance of the WRUA.

Table 4.17 Adherence to water sector regulations

Adherence to water sector regulations	Frequency	Percent
Strongly disagree	2	6
Undecided	7	20
Agree	13	37
Strongly agree	13	37
Total	35	100

4.6 Socio-economic household factors

The study intended to investigate whether various socio-economic factors at the household level had an effect on the performance of the WRUA, and the respondents were asked various questions related to the extent to which they agreed with these.

4.6.1 Individual level of education

Table 4.18 Individual level of education

Individual level of education	Frequency	Percent
Undecided	4	11
Agree	10	29
Strongly agree	21	60
Total	35	100.0

According to Table 4.18, 60% of the respondents strongly agreed that the individual level of education affected the performance of the WRUA, while 29% agreed and 11% were undecided. These findings imply that the level of education among individual members of the WRUA could have a significant effect on the performance of the association.

4.6.2 Individual/family income

There are variations in the status of individual or family income among members of the WRUA, and the study sought to establish the extent to which these may have an effect on the association's performance.

Table 4.19 Individual/family income

Individual/family income	Frequency	Valid Percent
Strongly disagree	1	3
Disagree	2	6
Undecided	6	17
Agree	13	37
Strongly agree	13	37
Total	35	100.0

Table 4.19 shows that while 3% of the respondents strongly disagreed and 6% disagreed, a higher proportion agreed 13 (37%), while another 37% also strongly agreed. This implies that individual or family income could determine the performance of the WRUA to a great extent.

4.6.3 Number of households in the WRUA

Table 4.20 Number of households in the WRUA

Number of households in the WRUA	Frequency	Percent
Strongly disagree	2	6
Disagree	4	11
Undecided	3	9
Agree	10	28
Strongly agree	16	46
Total	35	100.0

The number of households in a WRUA is seen to affect the performance of the WRUA to a very significant extent, as shown by the findings in Table 4.20, whereby 46% strongly agreed, while 28% agreed. Those who disagreed or strongly disagreed comprised of 11% and 6% respectively.

4.6.4 Level of awareness of benefits of water resource management

Table 4.21 Level of awareness of benefits of water resource management

Level of awareness of benefits of water resource management	Frequency	Percent
Disagree	1	3
Undecided	4	11
Agree	15	43
Strongly agree	15	43
Total	35	100.0

Table 4.21 indicates that a majority of the respondents believe that the Level of awareness of benefits of water resource management is considered to affect the performance of WRUAs in a significant manner; this is because a combined 86% of the respondents stated that they agreed or strongly agreed with this position. Only 3% disagreed.

4.6.5 Household water demand

Table 4.22 Household water demand

Household water demand	Frequency	Valid Percent
Disagree	1	3
Undecided	1	3
Agree	15	43
Strongly agree	18	51
Total	35	100

The respondents were requested to indicate the extent to which they felt household demand for water impacts on the performance of the WRUA, and according to Table 4.22, more than 50% (18) of the respondents stated that they strongly agreed with the proposition. Another 43% (15) of all respondents agreed, while 3% disagreed or were undecided in both cases. This suggests that the amount of water that the households in the catchment areas that were members of the WRUA consider the demand to affect the performance of the WRUA.

4.6.6 Access to water supply

The main reason for the formation of WRUAs is to promote community participation in access to water resources. The study sought to establish the extent to which access to water supply at the socio-economic level affected or did not affect the performance of WRUAs. A summary of the findings is presented in Table 4.23.

According to Table 4.23, 16 (45%) of the respondents were strongly in agreement that access to water supply has an effect on the performance of WRUAs, while 28% indicated that they agreed. On the contrary, those who strongly disagreed or disagreed with this were 6% in either case, as 14% stated that they were undecided on whether or not access to water supply affected the performance. This suggests that the respondents strongly believe that access to water can affect the performance of the WRUA, especially so considering that the resource is a key reason for which the WRUA was established.

Table 4.23 Access to water supply

Access to water supply	Frequency	Percent
Strongly disagree	2	6
Disagree	2	6
Undecided	5	14
Agree	10	28
Strongly agree	16	45
Total	35	100

4.6.7 Proportion of income from agriculture

A majority of the respondents in the household survey reported that their main occupation was farming. They were therefore requested to state the extent to which the proportion of income from agriculture affected the performance of WRUAs. The findings are presented in Table 4.24.

It is shown in Table 4.24 that those who agreed or strongly agreed that the proportion of income from agriculture affected the performance of WRUAs was more than fifty percent, as these were stated by 25% and 43% respectively. 23% of the respondents were undecided, with

another 6% expressing disagreement. From these findings, it is implied that the proportion of income from agriculture could determine the performance of WRUAs as this could motivate them to participate more actively if the benefits from agricultural activities, which mainly rely on water, are rewarding.

Table 4.24 Proportion of income from agriculture

Proportion of income from agriculture	Frequency	Percent
Strongly disagree	1	3
Disagree	2	6
Undecided	8	23
Agree	9	25
Strongly agree	15	43
Total	35	100

4.7 Technical capacity

The study investigated the effect of various technical aspects related to the management of WRUAs, and sought to determine the extent to which the respondents felt these affected the performance of the association. Technical issues such as skilled manpower, technological infrastructure, financial resources participation in training and workshops as well as frequency of educational opportunities were assessed.

4.7.1 Availability of skilled manpower in the WRUA

Table 4.25 Available of skilled manpower in the WRUA

Availability of skilled manpower in the WRUA	Frequency	Percent
Strongly disagree	1	3
Disagree	2	6
Undecided	2	6
Agree	5	14
Strongly agree	25	71
Total	35	100

According to Table 4.25, an overwhelming majority or 25 (71%) of all the respondents strongly agreed that the availability of skilled manpower in the WRUA affects the performance of the WRUA. Those agreed were 14%.while those who disagreed, were undecided or strongly disagreed made up less than 10% in each case. This implies that skilled manpower is an important resource in enhancing the performance of WRUAs in ENNCA.

4.7.2 Availability of technological infrastructure

The study sought to establish the effect of technological infrastructure such as computers, telecommunication network and e-mail on WRUA performance. The findings are summarized in Table 4.26.

Table 4.26 Availability of technological infrastructure

Availability of technological infrastructure	Frequency	Percent
Strongly disagree	1	3
Disagree	6	17
Undecided	1	3
Agree	9	26
Strongly agree	18	51
Total	35	100

According the findings in Table 4.26, the availability of technological infrastructure is perceived to have an effect on the performance of WRUAs. This is because a cumulative proportion of 77% (Agree 26% and strongly agree51%) indicated that these affected the performance of WRUAs. Those who disagreed were made up of 6 (17%) of the respondents, with only 3% disagreeing.

4.7.3 Availability of financial resources

The study sought to establish the extent to which the participants in the study agreed with the influence of availability of financial resources on performance of WRUAs. This is summarized in Table 4.27.

Table 4.27 Availability of financial resources

Availability of financial resources	Frequency	Percent
Strongly disagree	1	3
Disagree	5	14
Undecided	5	14
Agree	5	14
Strongly agree	19	54
Total	35	100

From the findings of the study, 54% strongly agreed that availability of financial resources affected the performance of WRUAs, while 14% each indicated that they agreed, were undecided or disagreed respectively. These results imply that finances had some effect on the performance of WRUAs.

4.7.4 Participation in training workshops and meetings

Table 4.28 Participation in training workshops and meetings

Participation in training workshops and meetings	Frequency	Percent
Undecided	4	12
Agree	12	34
Strongly agree	19	54
Total	35	100

An overwhelming proportion of 31 respondents in total, equivalent to a combined 88% of the respondents agreed or strongly agreed that participation in training workshops affected the performance of WRUAs. 12% were undecided. This suggests that the training workshops and meetings organized for members of WRUAs are considered to be an effective channel for building the capacity of the associations.

4.8 Measures of performance

The study intended to establish the extent to which different factors could measure the performance of the WRUA. These included the adequacy of resources in the WRUA, strict

enforcement of rules to reduce water conflicts, having a monitoring and evaluation system to help increase efficiency and effectiveness, as well as reducing the number of illegal abstractors.

4.8.1 Adequacy of resources in the WRUA

WRUAs require various kinds of resources to facilitate their day-day-activities, including financial, human, material and technological resources. The respondents were asked to indicate whether the adequacy of these could be a measure of the performance of the WRUA. The responses are summarized in Table 4.29.

Table 4.29 Adequacy of resource in the WRUA

Adequate resources in the WRUA	Frequency	Percent
Strongly disagree	1	3
Undecided	3	9
Agree	6	17
Strongly agree	25	71
Total	35	100

From the results, it is shown in Table 4.29 that 71% strongly agreed that the adequacy of resources within the WRUA is a measure of the level of performance of the WRUA, while 17% indicated that they agreed with this statement. Those who were undecided about this were 9%, while those who expressed a strong disagreement made up 3%. These findings suggest that the amount of resources available to a WRUA is a significant measure of the performance of the association.

4.8.2 Strict enforcement of rules

The WRUA is charged with the responsibility of enforcing rules and regulations that govern the management of the water resources within their catchment areas. The study sought to establish whether the respondents agreed with the proposition that strict enforcement of rules measures the performance of the WRUA. The findings are presented in Table 4.30.

Table 4.30 Strict enforcement of rules

Strict enforcement of rules	Frequency	Percent
Undecided	1	3
Agree	11	31
Strongly agree	23	66
Total	35	100

The findings summarized in Table 4.30 reveal that 23 (66%) of the respondents strongly agree that strict enforcement of rules relating to water resources are a measure of performance, while 31% agreed with this, and 3% disagreed. This implies that most members of the WRUA consider the strict enforcement of rules is a significant measure of performance for the association.

4.8.3 Having a monitoring and evaluation system

The study sought to establish what the respondents' opinions with regard to the association having a monitoring and evaluation system were. This is summarized in Table 4.30.

Table 4.31 Having a monitoring and evaluation system

Having a monitoring and evaluation system	Frequency	Percent
Agree	12	34
Strongly agree	23	66
Total	35	100

The study found that all the respondents either agreed or strongly agreed that having a monitoring and evaluation system was an important measure of the performance of WRUAs. From Table 4.31, it is shown that 23 or 66% of the participants in the study were strongly in agreement that having a monitoring and evaluation system is an indicator of performance, while 34% expressed agreement.

4.8.4 Reduced number of illegal abstractors

Table 4.32 Reduced numbers of abstractors

Reduced number of abstractors	Frequency	Percent
Strongly disagree	1	3
Disagree	1	3
Undecided	3	9
Agree	10	28
Strongly agree	20	57
Total	35	100

One of the main reasons for which WRUAs are set up is to regulate water abstraction in an economical and sustainable way. The respondents were requested to state the extent to which they agreed with the reduction in the number of illegal abstractors as a measure of performance in WRUAs.

From Table 4.32, it is evident that 57% of the respondents regarded the reduced number of illegal of illegal abstractors as a measure of performance, compared to only 3% who strongly disagreed. Those who stated that they agreed were 10 (28%), and those who were undecided were 9%. These findings show that the reduced number of illegal abstractors is considered by a significant proportion of the respondents to measure the performance of WRUAs.

4.9 Hypothesis Testing

In order to establish the relationship between the dependent and independent variables, regression analysis was used.

4.9.1 Water sector regulations and performance of WRUAs

The hypothesis stated that there is a significant relationship between water regulations and performance of WRUAs in the upper Ewaso Ngiro North sub catchment area. The correlation computed for these variables is shown in Table 4.33.

Table 4.33 Water sector regulations and performance of WRUAs

Correlations

			Equity in enforcement of rules	WRUA performance
Spearman's rho	Equity in enforcement of rules	Correlation Coefficient	1.000	.381*
		Sig. (2-tailed)	.	.024
		N	35	35
	WRUA performance	Correlation Coefficient	.381*	1.000
		Sig. (2-tailed)	.024	.
		N	35	35

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

According to Table 4.33, there is a positive coefficient between the enforcement of water sector regulations and performance of WRUAs in reducing the number of illegal abstractors and this indicates that there is a direct relationship. The Spearman's rho coefficient for the relationship between these two variables is .381 at the 0.05 level of significance (2 tailed), and it is positive. This tells us that, just as hypothesized, there is a significant relationship between water sector regulations and performance of WRUAs, even though the relationship is not "perfect" (a coefficient of 1). Given that a variety of factors may influence performance of WRUAs, a coefficient of .381 suggests that the relationship between enforcement of regulations and the WRUA's performance is fairly strong and therefore the null hypothesis is accepted and the alternate one rejected.

4.9.2 Socio-economic household activities and the performance of WRUAs

This hypothesis intended to test if there is a significant relationship between the socio-economic household activities of the water resource users and the performance of WRUAs in the upper Ewaso Ngiro sub catchment area.

Table 4.34 Socio-economic household activities and the performance of WRUAs

Correlations

			Access to water supplies	WRUA performance
Spearman's rho	Access to water supplies	Correlation Coefficient	1.000	.258
		Sig. (2-tailed)	.	.135
		N	35	35
	WRUA performance	Correlation Coefficient	.258	1.000
		Sig. (2-tailed)	.135	.
		N	35	35

According to the data in Table 4.34, the results from the Spearman's rho correlation show a positive coefficient of .258 it is therefore concluded that there is a relationship between socioeconomic household activities such as access to water supplies for households as a result of the WRUAs performance, consequently the null hypothesis is accepted while the alternate one is rejected.

4.9.3 Technical capacity of WRUAs and their performance

This hypothesis was intended to test whether there is a significant relationship between the technical capacity of WRUAs and their performance in water resource management in the upper Ewaso Ngiro North sub-catchment area.

The Spearman's rho coefficient for the relationship between availability of skilled manpower in the WRUA and performance of the WRUA is .236, and it is positive. This suggests that, just as it is predicted in the null hypothesis, as technical capacity of the WRUA increases, the WRUAs level of performance also increases. The coefficient, at .236 is not "perfect" but technical capacity appears to be an important predictor of WRUA performance. A variety of other factors may undoubtedly influence performance but as per the result of the coefficient obtained, the null hypothesis is accepted and the alternate one rejected.

Table 4.35 Technical capacity of WRUAs and their performance

Correlations

			Availability of skilled manpower in the WRUA	Performance of WRUA
Spearman's rho	Availability of skilled manpower in the WRUA	Correlation Coefficient	1.000	.236
		Sig. (2-tailed)	.	.173
		N	35	35
	Performance of WRUA	Correlation Coefficient	.236	1.000
		Sig. (2-tailed)	.173	.
		N	35	35

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the findings of the study; conclusions from the analysis of the data obtained and also make recommendations. The section also proposes some areas that could require further research.

5.2 Summary of findings

The study found that most members of the WRUAs have confidence in the ability of the WRUA to enable them have better conservation of water as well as to promote more equitable access to water. The most common reason identified for joining the WRUAs was the expectation for better water conservation (28% of the respondents), followed by the expectations for promotion of equitable access (25%) of the participants in the study. Others stated that they had joined the WRUA with the expectation of participating in developing the WRUA (20%). 74% of the respondents felt that WRUAs had been significantly effective in achieving most of the objectives that the WRUA was expected to. It was established that the legal status of the WRUA affects its operations, which implies that the legal status can have a significant effect on its performance within the catchment area. Those who strongly agreed or agreed that the legal status of the WRUA affects its performance were 49% and 40% respectively. This has an effect on the level of members' understanding of the regulations governing WRUAs, familiarity with the SCMP, equity in enforcement of rules and the adherence to water sector regulations. This implies that a the management of WRUAs should always fast-track the registration process of the WRUA so that it can attain full legal status as set out in the WRMA rules governing the activities and operations of the WRUAs.

The study also found that socio-economic factors related to the household such as individual level of education; individual or family income; level of awareness of benefits of water resource management, household water demand and the proportion of income from agriculture all significantly influence the performance of the WRUA. 60% of the respondents strongly agreed that, while 29% agreed with this. The study found that there was a strong agreement that the socioeconomic factors affected the performance of the WRUA. This implies that the management needs to set measures in place to address the socioeconomic status of the members so as to promote its performance.

The effect of the technical capacity of the WRUA was assessed based on various technical aspects related to the management of WRUAs to determine whether these affected performance of WRUAs, and to what extent. 71% of the respondents strongly agreed that the availability of skilled manpower in the WRUA affects the performance, with 51% expressing strong agreement that technological infrastructure also had an effect. It was therefore found that there is strong agreement that technical aspects of the WRUA such as skilled manpower, technological infrastructure, financial resources participation in training and workshops as well as frequency of educational opportunities all determined the performance of the WRUAs.

5.3 Discussion of Findings

The discussions of the findings in this study are based on the outputs from the analyses of the data obtained from the study. The study was aimed at establishing the factors that affect the performance of WRUAs.

The study found that there is a significant relationship between water regulations on performance of WRUAs in the upper Ewaso Ngiro WRUA. This follows the regulatory mechanisms set out in the Article 10 of the WRMA (1997) rules, which require that a WRUA is to be considered for registration if it is legally registered as an Association under the Societies Act, or as a Trust or Company under their respective Acts) and if has a constitution which is consistent with collaborative management of the water resources of a particular resource and which promotes public participation (inclusive), conflict mitigation, gender main-streaming and environmental sustainability. This also agrees with the requirements set out by The Global Water Partnership, (2000) that call for an Integrated Water Resources Management, which 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.

There is a significant relationship between the socio-economic household activities of the water resource users and the performance of upper Ewaso Ngiro WRUAs. This corresponds to the position proposed by WRMA and WSTF (2011), that developing a process in which stakeholders can genuinely participate is a challenging undertaking especially in cases where stakeholders have grossly divergent socio-economic backgrounds, are dispersed over a large area, have significantly different priorities and visions of the future and have competing interests in the water resources which are contained in a complex hydrological system.

The study also found that there is a significant relationship between the technical capacity of WRUAs and their performance in water resource conservation. This relates to the findings by Bititci *et al*. (1997), to the effect that a system of assessing performance enables the performance management process to function effectively and efficiently. This also agrees with the observation by Were, Roy, & Swallow (2008) whereby they explain that the extent of public participation in all decision-making processes must be unanimously approved, and that representatives of local elected officials, communities and all users concerned must participate in the formulation of master plans for water development and management, priority action plans and projects with the help of specialists from the administration and specialized consulting firms.

5.4 Conclusions of the Study

WRUAs are important establishments in conservation of water resources and ecosystems management. These associations are a central component in the evolution of the framework that defines how water is managed at the river basin or strategic levels, and their performance is greatly influenced by water sector regulations.

Water resource users' associations provide an opportunity for the involvement of stakeholders and beneficiaries in the corporate management of water resources and resolution of water related conflicts,promotion of water conservation practices as well as in promoting catchment conservation measures to improve water quantities and quality. For them to be successful in this endeavor, it is recognized that there is need to consider the influence of socio-economic household factors on their performance in the catchment area.

The technical capacity of WRUAs affects their performance. This because it is evident that WRUAs have the potentialities to harness stakeholder participation towards addressing prevalent concerns in water resource management, including low levels of awareness, poor land and water use practices, low levels of compliance with regulations, proper monitoring mechanisms and water resource conservation.

5.5 Recommendations of the Study

The role of the WRUA has continued to gain increasing importance at the catchment level. Water resources management is faced by challenges such as scarcity leading to conflicts, which have a direct impact on the livelihoods and socio-economic activities of people living within

different catchment areas. Measures of addressing the water conservation, abstraction, equitable distribution need to be contextualized so as to ensure greater effectiveness of the decentralized strategy of the water resource management through local associations. To this end, the study recommends that:

1. To promote improved performance of the WRUAs in sustainability of catchment conservation and protection activities, communities of WRUA members should be given continued support by the government, donor agencies and local leadership through institutional support mechanisms, formation of internal policies, legislation, proper monitoring and continued capacity building for members and management
2. There is need to regularly audit the activities and operations of WRUAs so as to strategically enhance their performance and improve their effectiveness.
3. It is evident that participation in water resource management by users through WRUAS promotes collaboration, collective action, organization, and water conflict resolution. There is need to enhance these and uphold the role and extent to which members support the WRUAs through subscriptions, participation in meetings and sharing of responsibilities within the sub-catchments.
4. It is recommended that the associations assess their technical capacities to run their operations effectively, and institute the appropriate organizational and SCMP implementation strategies to boost their performance.
5. It is recommended that follow up and needs assessment be undertaken to appraise the WRUA members' knowledge, skills and training needs, and establish a basis for further training or re-training.
6. The study suggests the need for enhanced training among WRUAs which should be relevant to water resources conservation to meet the changing dynamics in environment related issues. In addition the training programmes must be evaluated through participant feedback for the purpose of improvements.

5.6 Suggestions for further Study

The study was intended to establish those factors that affect performance of WRUAs in the Ewaso Ngiro North Catchment. It focused on three main variables in the operations of the WRUA: legal status of the WRUA, Socioeconomic factors and technical capacity. This was by no means exhaustive on all the factors that could be considered to affect the operations of WRUAs in their outlined roles. It is therefore recommended that further research could be done in other related areas such as:

1. To establish the influence of financing mechanisms for WRUAs.
2. To find out the level of members' knowledge on climate change and environmental conservation of WRUAs
3. To investigate the gender composition of the management of WRUAs on their performance.
4. To establish the benefits perceived by WRUA communities in their catchment areas deemed to accrue from their membership of the WRUA.
5. To replicate the study in other water catchments to establish whether the same circumstances in ENNCA pertain in those areas.

REFERENCES

Agrawal, A. (2003). Sustainable Governance of Common-Pool Resources: Context, Methods, and Politics. *Annual Review of Anthropology*, Vol: 32, pp. 243-262.

Agrawal, A., & Ostrom E. (2001). Collective Action, Property Rights and Decentralization in Resource Use in India and Nepal. *Politics and Society* 29 (4):485-514.

Anderson, A J. (2005). *Engaging disadvantaged communities: Lessons from the Inkomati CMA establishment process*. Paper presented at a workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', Johannesburg.

Andrews, C.W., & de Vries, M. S. (2007). High Expectations, Varying Outcomes: Decentralization and Participation in Brazil, Japan, Russia, and Sweden. *International Review of Administrative Sciences* 73 (3):424-51.

Bamberg, S. & Moser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*. 27 (1) 14-25.

Berger, T., Birner, R., D´ıaz, J., McCarthy, N., &Wittmer, H. (2006). *Capturing the complexity of water uses and water users within a multi-agent framework* Springer Science+Business Media B.V.

Bititci, U.S., Carrie, A.S. &McDevitt, L. (1997). Integrated performance measurement systems: a development guide. *International Journal of Operations & Production Management*, Vol.17, No.5, pp. 522-534.

Chikozho, C. & Latham, C. J. K. (2005). *Implications of customary law for implementing integrated water resources management in Zimbabwe: Considerations of Shona customary law as an institutional alternative.* Paper presented at the workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa', Johannesburg, 26–27 January.

Chikozho, C. (2005). Policy and institutional dimensions of integrated river basin management: broadening stakeholder participatory processes in the Inkomati River Basin of South African and the Pangani River Basin of Tanzania. *CASS/PLAAS*

occasional papers series No. 12. http://www.sarpn.org.za/documents/d0001452/P1798-Chikozho_April2005.pdf

Cooper, D. R. & Schindler, P. S. (2003), *Business Research Methods*, 8. edn, McGraw-Hill, New York.

Di Gregorio, M., Hagedorn, K., Kirk, M., Korf, B., McCarthy, N., & Meinzen-Dick., R. (2008). *Property rights, collective action, and poverty: The role of institutions for poverty reduction*. CAPRi Working Paper No. 81. Washington, D.C.: International Food Policy Research Institute.

Doe, S.R., & Khan, M.S. (2004). The boundaries and limits of community management: lessons from the water sector in Ghana. *Community Development Journal Vol 39 No. 4.*

Drucker, P. F. (1987) *Management: The Problems of Success*. Academy of Management Executive.

Food and Agriculture Organization. **(**2006). *Stakeholder-oriented valuation to support water resources management processes Confronting concepts with local practice*. Rome, FAO Publishing Management Service.

Ghazouani, W., Molle, F., & Rap, E. (2012).*Water Users Associations in the NEN Region IFAD interventions and overall dynamics***.** IFAD.

Global Water Partnership (GWP). (2000). *Integrated water resources management*. GWP Technical Advisory Committee. TAC Background Paper No. 4. Stockholm.

GoK (2010a). *A review report of the impact of implementing the constitution on the forestry and wildlife sectors.* Ministry of Forestry and Wildlife (MFW), Nairobi.

GoK (2010b). *The Constitution of the Republic of Kenya*, 2010. Government of Kenya. Nairobi.

GoK. (2002).*The Water Act 2002*. Government of Kenya, Nairobi.

GoK. (2009). *Kenya National Environment Action Plan (2009-2013).* National Environment Management Authority (NEMA), Ministry of Environment and Mineral Resources (MEMR), Government of Kenya (GoK), Nairobi.

Gumbo, B., Van Der Zaag, P., Robinson, P., Jonker. L. & Buckle, H. (2004). Training needs for water demand management. *Phys. Chem. Earth Parts A/B/C 29 (15-18) 1365-1373.*

Hooper, B. P. (2006). *Key Performance Indicators of River Basin Organizations.* http://www.iwr.usace.army.mil/inside/products/pub/iwrreports/2006-VSP-01.pdf

International Union for Conservation of Nature. (2013). *Local rules and customary regulations on natural resource management in Lower Tana catchment, Kenya*. IUCN.

Jakeman, A. J., Letcher, R. A. (2003). *Integrated assessment and modelling: features, principles and examples for catchment management.* Environmental Modell Software. 18:491–501.

Jusoh, R., Ibrahim, D. N & Zainuddin, Y. (2008). The performance consequence of multiple performance measures usage: Evidence from the Malaysian Manufacturers, *Int. J. Prod. Perform. Mgt. 57(2)119-136.*

Kemper, K. Blomquist B. and Dinar A. (2006). *Integrated River basin Management through Decentralisation*. Berlin.

Kolavalli, S., and J.D. Brewer. (1999). Facilitating User Participation in Irrigation Management. *Irrigation and Drainage Systems* (13):249-73.

Kuscu, H., Eren. Bölüktepe, F. E., &Demir, A. O. (2009).Performance assessment for irrigation water management: A case study in the Karacabey irrigation scheme in Turkey. *African Journal of Agricultural Research Vol. 4 (2), pp. 124-132.* http://www.academicjournals.org/AJAR.

Mathipa, K. S., & Le Roux, C. S. (2009). Determining water management training needs through stakeholder consultation: building users' capacity to manage their water demand. *Water SA (Online) vol.35 no.3 Pretoria Apr. 2009.*

McCarthy, J. F. 2004. "Changing to Gray: Decentralization and the Emergence of Volatile Socio-Legal Configurations in Central Kalimantan, Indonesia." World Development 32 (7):1199-223.

Meinzen-Dick, R. (2007) “Beyond panaceas in water institutions” *PNAS*, Vol. 104, No. 39, 15200-15205.

Mugenda, O. M. and Mugenda, A. G. (1999). *Research Methods: Quantitative and Qualitative Approaches*. Nairobi: Acts Press.

National Environment Management Authority. (2011). *Kenya: State of the Environment and Outlook 2010*. NEMA: Nairobi.

Ngigi, S.N. (2009). *Climate Change Adaptation Strategies: Water Resources Management Options for Smallholder Farming Systems in Sub-Saharan Africa.* The MDG Centre for East and Southern Africa, The Earth Institute at Columbia University, New York

Orodho, A.J. (2003). *Essentials of educational and social science research methods*. Nairobi: Masola Publishers.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton, NJ: Princeton University Press.

Radosevich, G.E., & Olson, D. (1999). *Existing and Emerging Basin Arrangements in Asia: Mekong River Commission Case Study.* Third Workshop on River Basin Institution Development June 24, 1999, Washington D.C.: World Bank.

Richardson, J.T.E. (2005). Instruments for obtaining student feedback: a review of the literature. *Assessment & Evaluation in Higher Education* 30, no. 4: 387–415.

Republic of Kenya. (2013) *National Environment Policy. Revised DRAFT* # 13. MENR: Nairobi.

Rondinelli, D. A., Nellis, R. and Shabbir Cheema R. G. (1984). *"Decentralization in Developing Countries: A Review of Recent Experience."* World Bank Staff Working Paper 581, World Bank, Washington, DC.

Stor, W., & Taylor, D. (Eds). (1981). *Development from above or below?* New Delhi: John Willey.

Taylor, B. J. Dempster M. and Donnelly M. (2005).Grading gems: appraising the quality of research for social work and social care. British Journal of Social Work, Advance access, 1-20.

Turner, S. (2000). *The governance of nature conservation in South Africa*. Paper presented at the international symposium on 'Contested Resources: Challenges to Governance of Natural Resources in Southern Africa', University of the Western Cape, Cape Town.

United Nations Environment Programme. (2012). *Fresh water for the future. A synopsis of UNEP activities in water.* UNON publishing services section, Nairobi.

Water Resources Management Authority. (2013). *Ewaso Ngiro North Catchment*. http://www.wrma.or.ke/index.php/wrma-regional-offices/ewaso-nyiro/catchment-status.html Accessed 5 December 2013.

Were, E., Swallow, B., & Roy, J. (2006). *Water, women, and local social organization in the Western Kenya highlands.* CAPRi Working Paper No. 51. Washington, D.C.

World Bank. (2004). *The Republic of Kenya: towards a water-secure Kenya- water resources sector memorandum. Report No. 28398-KE. The World Bank Washington. D.C.*

World Bank. (1997). *User organizations for sustainable water services*. World Bank *Technical Paper No. 354. The World Bank Washington. D.C.*

WRMA & RoK. (2012). *Water resources management strategic plan 2012-2017*, Republic of Kenya; Nairobi.

APPENDICES

Appendix I: Letter of Introduction

18 March 2014.

Josephat Musyima
P.O. Box 764
Nanyuki.

Dear respondent,

RE: COLLECTION OF DATA

I am a student of Master of Arts in Project Planning and Management in the University of Nairobi. As part of the requirement for the award of the degree, I am expected to undertake a research study on 'Factors Influencing Performance of Water Resource Users Association in the Upper Ewaso Ngiro North Sub Catchment Area. I therefore request your assistance in completing the questionnaires hereby attached. The questionnaire will take you about 10 minutes to complete. Kindly answer all the questions truthfully.

The research results will be used for academic purposes only and will be treated with confidentiality. Only a summary of the results will be made public. Your cooperation will be appreciated.

Yours sincerely,

Josephat Musyima.

DATA COLLECTION INSTRUMENTS

Appendix II: Interview Schedule for Executive Committee members and WRMA officials

1. What are your main goals in addressing water resource management?
2. What are your roles in the water management process at the catchment areas?
3. To what extent do the water regulations affect operations of WRUAs?
4. What forms of support (technical, financial, regulatory) does WRMA extend to WRUAs?
5. In which ways do the WRUAs affect the livelihoods of the members?
6. Do you consider WRUA members to have adequate technical knowhow in water resource management?
7. Describe some of the advantages arising from WRUAs engagement in the water resource management process in Laikipia County.
8. How would you describe the performance of UEWRUAs in management of water resources in the county?
9. What steps does your organization take to ensure effective participation/involvement of members in UEWRUAs?
10. What are some of the challenges faced by the UEWRUAs in water resources management processes?
11. What strategies are utilized in solving operational challenges affecting the WRUAs?

Appendix III: WRUA Household Members' Questionnaire

Date of interview……

A. Household Characteristics

1. Sex of respondent

   [] Male [] Female

2. Age category of respondent

   [] 21 – 30 [] 31 – 40 [] 41 – 50 [] 51 – 60 [] Above 60

3. Highest level of education

   [] Primary [] Secondary [] College/University [] No formal education [] Others ……. (Specify)

4. Marital status of respondent
5. [] Single [] Married [] Divorced [] Widow/widower
6. What is your main occupation? ……
7. Household composition

Category	**Number**
Children 0 – 14 years	
Youths 15 – 17 years	
Adult males 18 years or above	
Total Household Members	

B. WRUA Information

8. When did you join the WRUA? ……
9. a) Do you participate actively in the activities of the WRUA in your area?

   [] Yes [] No

   b) If yes, please state some of your roles in the WRUA

   ……

   c) If No, why don't you participate actively?

   ……

10. a) What were your expectations in joining the WRUA?

    ……

    b) Have they been met?

    [] Yes [] No

C. Water sector regulations

To the best of your knowledge indicate the extent to which the following water policy and regulation factors influence performance of WRUAs using a scale of 5-1 where 5= Strongly agree; 4 = Agree; 3 = Undecided; 2= Disagree; 1 = Strongly disagree

Water sector regulation factors	**5**	**4**	**3**	**2**	**1**
Legal status of the WRUA					
Level of members' understanding of the WRUA constitution					
Familiarity with the SCMP					
Equity in enforcement of rules/punishment for illegal water use					
Fair representation of the membership					
Adherence to water sector regulations					

D. Socio-economic household factors

To the best of your knowledge indicate the extent to which the following socio-economic factors influence performance of WRUAs using a scale of 5-1 where:

5= Strongly agree; 4 = Agree; 3 = Undecided; 2 = Disagree; 1= Strongly disagree

Socio-economic factors	**5**	**4**	**3**	**2**	**1**
Individual level of education					
Individual/family incomes					
Number of households in the WRUA					
Level of awareness benefits of water resource management					
Household water demand					
Access to water supply					
Proportion of income from agriculture					
Experience in irrigated farming					

E. Technical capacity

To the best of your knowledge indicate the extent to which the following technical capacity factors influence performance of WRUAs using a scale of 5-1 where 5 = Strongly agree; 4 = Agree; 3 = Undecided; 2 = Disagree; 1 = Strongly disagree

Physical and Technical factors	**5**	**4**	**3**	**2**	**1**
Availability of skilled manpower in the WRUA					
Availability of Technological infrastructure – computers, applications, network, and e-mail					
Availability of Financial resources (public/private, internal/external)					
Participation in training workshops and meetings					
Frequency of training and education opportunities					

F. Measures of performance

To the best of your knowledge indicate the extent to which the following statements measures performance of WRUA using a scale of 5-1 where 5 = Strongly agree; 4 = Agree; 3 = Undecided; 2 = Disagree; 1 = Strongly disagree

Measures of performance	**5**	**4**	**3**	**2**	**1**
Adequate resources in our WRUAs has facilitated better performance.					
Strict enforcement of rules has reduced water related conflicts in our WRUA					
Having a monitoring and evaluation system helps the WRUA to increase efficiency and effectiveness.					
Currently the number of illegal abstractors has reduced					

Thank you for taking part in this study

Appendix IV: Map of the study area

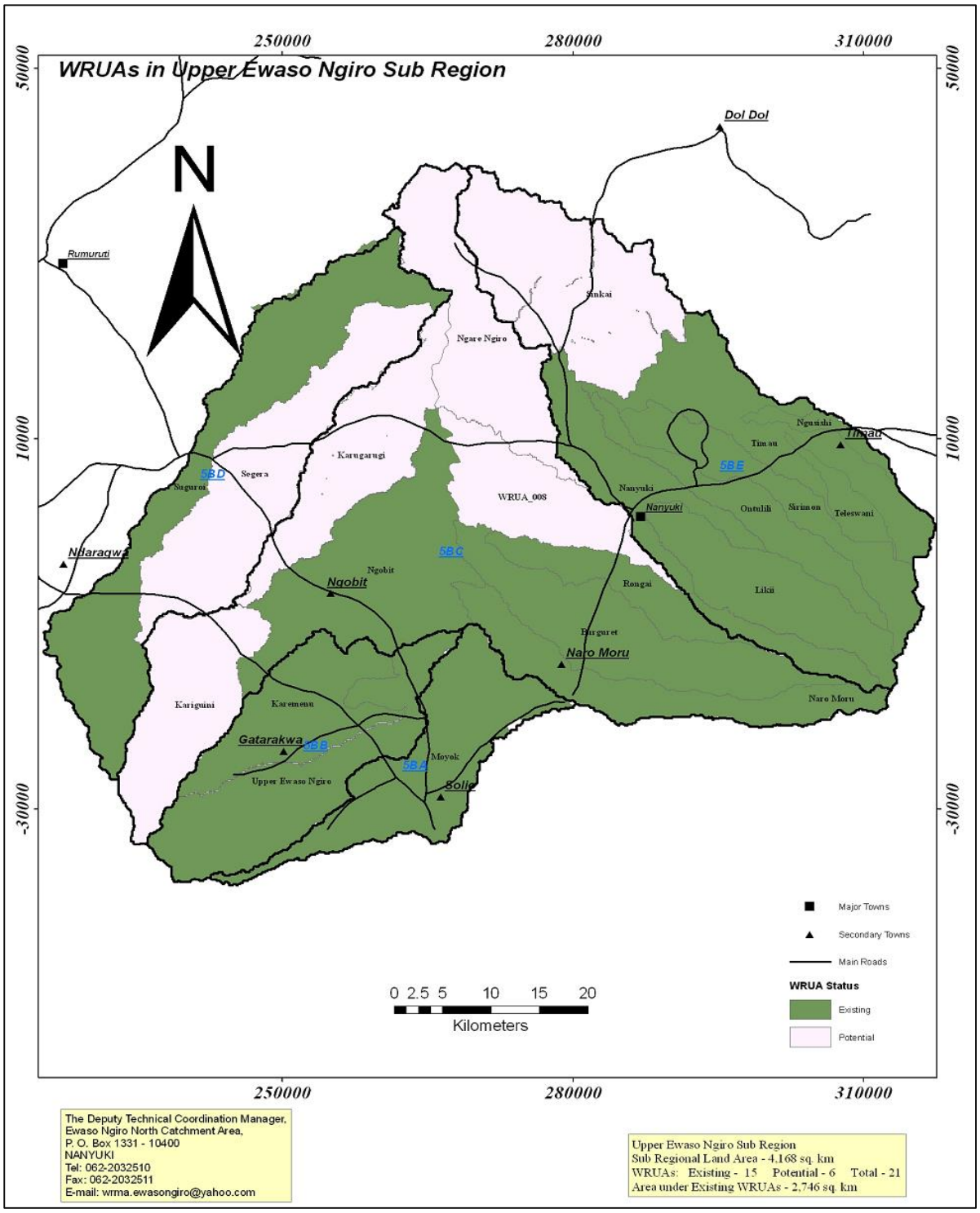

Figure 4. Map of the study area

Source: WRMA (2013).