

**FACTORS INFLUENCING PERFORMANCE OF WATER
RESOURCE USERS' ASSOCIATIONS ON CONSERVATION OF
WATER CATCHMENT AREAS IN KIBWEZI, KENYA.**

BY

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DECLARATION

This Research Project Report is my original work and has not been presented for award of a degree at any University or any institution of higher learning.

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DEDICATION

This research work is dedicated to my wife Ann Mutile Mwangi, my daughter Renee Mwatha Ndeti, my son Randy Mwangi Ndeti, my mum Ms. Jophinecah Mbiti and our larger family.

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TABLE OF CONTENT

	Page
DECLARATION	ii
DEDICATION.....	iii
ACKNOWLEDGMENT	iv
TABLE OF CONTENT	v
LIST OF TABLES	ix
LIST OF FIGURES	x
ABBREVIATIONS AND ACRONYMS	xi
ABSTRACT	xiii
CHAPTER ONE: INTRODUCTION	1
1.1 Background of the study	1
1.2 Statement of the Problem.....	7
1.3 Purpose of the study.....	9
1.4 Objectives of the study.....	9
1.5 Research questions.....	9
1.6 Significance of the study	9
1.7 Basic assumptions of the study.....	10
1.8 Limitations of the study	10
1.9 Delimitations of the study	10
1.10 Definition of significant terms used in the study.....	11
1.11 Organization of the study.....	11
CHAPTER TWO: LITERATURE REVIEW.....	13
2.1 Introduction	13
2.2 Training of WRUAs in Conservation of Water Catchment Areas	15
2.3 The WRUA Financing Mechanisms in Conservation of Water Catchment Areas	16

2.4	Merging of Small WRUAs in Conservation of Water Catchment Areas	22
2.5	Knowledge on Environment in conservation of Water Catchment Areas	23
2.6	Conceptual Framework	26
2.7	Summary and Research Gaps	26
CHAPTER THREE: RESEARCH METHODOLOGY		27
3.1	Introduction	27
3.2	Research Design	27
3.3	Target Population.....	27
3.4	Sampling Procedure and Sample size	28
3.4.1	Sample size	28
3.4.2	Sampling procedure.....	29
3.5	Research Instruments	29
3.6	Reliability of the Research Instrument	29
3.6.1	Pilot Testing	30
3.7	Validity of the Instrument	30
3.8	Data Collection Procedures	30
3.9	Data Analysis Techniques.....	30
3.10	Ethical Considerations	31
3.11	Operational Definition of Variables	32
CHAPTER FOUR: DATA ANALYSIS, PRESENTATION AND INTERPRETATION....		34
4.1	Introduction.....	34
4.2	Response Rate of the Study	34
4.3	Background of the Respondents.....	34
4.3.1	Gender Profile of the Respondents	35
4.3.2	Age of the respondents.....	35

4.3.3 Occupation of the respondents	36
4.3.4 Education Levels of the Respondents	36
4.3.5 Marital Status of the Respondents	37
4.3.6 The Respondent’s WRUA Background Information.....	37
4.4 Influence of Adequate WRUA Training on Conservation of Water Catchment Areas.	39
4.4.1 Respondents’ Training on Water Resources Conservation.....	39
4.4.2 Trainers of WRUAs on WRC.....	39
4.4.3 Relevance of WRUA Training Programmes.....	40
4.4.4 Competency of WRUA Trainers	41
4.4.5 Improvement of WRUA Training Delivery	41
4.5 Influence of WRUA Funding Mechanisms on Conservation of Water Catchment Areas. ...	42
4.5.1 Source of Funding for the WRUA Activities	42
4.5.2 Adequacy of Funding to WRUA Activities	43
4.5.3 Supplementary Funding Available to WRUAs	43
4.5.4 Consistency of WRUA Funding Cycle with Sub-Catchment Development Cycle.....	43
4.5.5 Reasons for Funding Cycle Inconsistencies.....	44
4.5.6 Viable solutions to Funding Inconsistencies	45
4.6 Influence of Merging Small WRUAs in Conservation of Water Catchment Areas.	45
4.6.1 Experiences of WRUA Merging	45
4.6.2 Effects of WRUA Merging	46
4.6.3 Opinion on Benefits of Merging Small WRUAs.....	47
4.6.4 Specific Benefits of Merging Small WRUAs	47
4.7 Influence of Knowledge on Environment on Conservation of Water Catchment Areas.	48
4.7.1 Respondents’ Level of Knowledge on Environment	48
4.7.2 Environmental Concerns Identical with Respondents’ WRUAs.....	49

4.7.4 Adequacy of Proposed Initiatives Relative to the Identified Environmental Concerns	.50
4.7.5 Solutions that Sustainably Address Environmental Concerns Identified	51
CHAPTER FIVE: SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS	53
5.1 Introduction	53
5.2 Summary of findings	53
5.3 Discussion of Findings	54
5.4 Conclusions of the Study	55
5.5 Recommendations of the Study	55
5.6 Suggestions for further Studies	56
REFERENCES	58
APPENDICES	61
Appendix I: Letter of Transmittal on Data Collection Instruments	61
Appendix II: Water Resource Users' Associations Questionnaire	62
Appendix III: Table for Determining Sample Size from a Given Population	68
Appendix IV: WRUAs in Athi Catchment Area	69
Appendix V: Table showing merging of WRUAs in Kibwezi with coverage areas in km ²	70

LIST OF TABLES

Table 3.1	Sampling Frame.....	28
Table 3.2	Operationalization of definition of variables.....	32
Table 4.1	Response rate of the study.....	34
Table 4.2	Gender Profile of the Respondents.....	35
Table 4.3	Ages of Respondents.....	35
Table 4.4	Occupation of the Respondents.....	36
Table 4.5	Education Levels of the Respondents.....	36
Table 4.6	Marital Status of the Respondents.....	37
Table 4.7	Composition of Specific WRUAs to the Study.....	38
Table 4.8	Districts of Location of WRUAs under Study.....	38
Table 4.9	Respondents' Training on Water Resources Conservation.....	39
Table 4.10	Trainers of WRUAs on WRC.....	40
Table 4.11	Relevance of WRUA Training Programmes.....	40
Table 4.12	Competence of WRUA Trainers.....	41
Table 4.13	Proposals for Training Improvement.....	41
Table 4.14	Source of Funding for the WRUA Activities.....	42
Table 4.15	Adequacy of Funding to WRUA Activities.....	43
Table 4.16	Consistency of WRUA Funding Cycle with Sub-Catchment Development Cycle...44	
Table 4.17	Reasons for Funding Cycle Inconsistencies.....	44
Table 4.18	Viable solutions to Funding Inconsistencies.....	45
Table 4.19	Experiences of WRUA Merging.....	46
Table 4.20	Effects of WRUA Merging.....	46
Table 4.21	Opinion on Benefits of Merging Small WRUAs.....	47
Table 4.22	Specific Benefits of Merging Small WRUAs.....	47
Table 4.23	Respondents' Level of Knowledge on Environment.....	48
Table 4.24	Environmental Concerns Identical with Respondents' WRUAs.....	49
Table 4.25	Activities that Address Identified Environmental Concerns.....	50
Table 4.26	Adequacy of Proposed Initiatives Relative to the Identified Environmental Concerns.....	51
Table 4.27	Solutions that Fully Address Environmental Concerns Identified.....	51

LIST OF FIGURES

Figure 1	Countries that have a Conservation Trust Fund in world.....	24
Figure 2	Conceptual Framework.....	28

ABBREVIATIONS AND ACRONYMS

%	Percent
ACA	Athi Catchment Area
AfD	French Development Agency
ARPA	Amazon Region Protected Areas
CBO	Community Based Organization
CBS	Central Bureau of Statistics
CDF	Constituency Development Fund
CEEP	Conservation Environmental Education Programme
CONABIO	National Council for Knowledge and Use of Biodiversity
CSO	Civil society organization
DAAD	German Academic Exchange Service
GEF	Global Environment Facility
GoK	Government of Kenya
HH	House Holds
IWRM	Integrated Water Resources Management
KfW	German Development Bank
KHDS	Kenya Household Demographic Survey
KM ²	Kilometres Square
KNBS	Kenya National Bureau of Statistics
KNDF	Kenya National Discourse Forum
M ³	Cubic Metres
MDG	Millennium Development Goal
MEMR	Ministry of Environment and Mineral Resources
MS	Microsoft
MWI	Ministry of Water and Irrigation
NBI	Nile Basin Initiative
NEEAI	National Environmental Education and Awareness Initiative
NGO	Non-Governmental Organization
NRM	Natural Resource Management
NWMP	National Water Master Plan

SCMP	Sub-Catchment Management Plan
SPSS	Statistical Package for Social Sciences
UN	United Nations
UNICEF	United Nations Children’s Fund
UNHDR	United Nations Human Development Report
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USAID	United States Agency for International Development
WC	Water Conservation
WCA	Water Conservation Awareness
WCTP	Water Conservation Technician Program
WDC	WRUA Development Cycle
WKCDD	Western Kenya Community Driven Development (WKCDD))
WRMA	Water Resources Management Authority
WRUA	Water Resource Users Associations
WSB	Water Services Boards
WSTF	Water Services Trust Fund
WUA	Water Users Associations
WWD	World Water Day
WWF	World Wildlife Fund

ABSTRACT

Water although a scarce resource is essential for sustenance of life on planet earth. The scarcity is linked to among other factors, climate change, which has meant that its demand exceeds the water available from the various water resources and above all unsustainable use of the resource. At a global perspective, markedly the Middle East and the sub Saharan Africa are in practical contact with intense scramble over available limited inland water resources. The state is rather severe in shared drainage basins where it has resulted in escalated political conflicts. In Kenya, water resources conservation activities are implemented by WRUAs under the supervision of WRMA. This study purposed to explore the factors influencing performance of WRUAs in conservation of water catchment areas in Kibwezi and propose solutions to the identified challenges and existing gaps. The study was significant since first; it studies factors that influence the efforts of WRUAs in catchment restoration. Second, it identifies challenges and gaps in WRUA operations and proposes relevant and viable solutions. Third, it provides reference to further empirical studies on WRUAs in Kenya and other related studies and finally the study will inform policy makers on the dynamism of WRUA activities particularly in Kibwezi sub catchment. The objectives of the study were: To examine the influence of WRUA training adequacy on conservation of water catchment areas in Kibwezi; To find out the influence of the existing WRUA financing mechanisms on the conservation of water catchment areas in Kibwezi; To explore the influence of merging of small WRUAs on the conservation of water catchment areas in Kibwezi and to examine the influence of environmental knowledge by the WRUA members on the conservation of water catchment areas in Kibwezi. Descriptive survey research design was adopted in the study where administration of questionnaires to participants in the study was done. The target population was the WRUA management committee members from Kibwezi, Mbuuni/Kithangaini/Ithaeni, Muusini, Itetani and Kiboko WRUAs in Kibwezi. The sample size was determined using Krejcie and Morgan's table of determining sample size from a given population where the population of 65 gives a sample size of 56. The researcher met the individual respondents from all the WRUA under study at set dates where the questionnaires were administered. Analysis of the open-ended questions data used qualitative methods of data analysis while quantitative analysis was used to derive statistical descriptions and interpretation of data that relied purely on numerical values. The research found that relevant training programmes influenced performance of WRUAs in conservation of water resources. It was as well found that WRUA financing mechanisms influenced performance of WRUAs since they relied almost entirely on WSTF funding to implement their sub catchment management plans. In addition it was found that knowledge on environment was ranked highest among the respondents as to its influence on conservation of water resources. Lastly it was found that merging of small WRUAs had the least influence in conservation water catchment areas in Kibwezi because it was cited as a major challenge in the area. The study recommended enhanced training to WRUAs that must be relevant to water resources conservation to meet the changing dynamics in environment related issues, adequate, well coordinated and timely disbursement of funding for the WRUAs, a well coordinated and participative approach to the merging of small WRUAs and environmental awareness creation on water resources conservation through public barazas across the entire Kibwezi region to promote and enhance knowledge among the community on water resources conservation.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

There have been discussions and negotiations on water resources on the international agenda which has resulted into elevation of water resources issues into global awareness. Water, although a scarce resource is essential for sustenance of life on planet earth. The scarcity is linked to among other factors, climate change, which has meant that its demand exceeds the water available from the various water resources and above all unsustainable use of the resource (Molle, 2000). At a global perspective, markedly the Middle East and the sub Saharan Africa are in practical contact with intense scramble over available limited inland water resources. The state is rather severe in shared drainage basins where it has resulted in escalated political conflicts (McCartney, 2000).

In the United States of America, the leading Federal agency for assisting in restoring watershed health on private land, Natural Resources Conservation Service (NRCS) provides technical and financial assistance to producers who implement conservation practices and management strategies, including the restoration and protection of wetlands that benefit water quality and improve water management. This is delivered by NRCS through its voluntary Conservation Technical Assistance Programme (CTA). The assistance programme is available to any group or individual interested in conserving natural resources and sustaining agricultural production in USA, (NRCS, 2012). The CTA program functions through a national network of locally-based, professional conservationists located in nearly every county of the United States. Conservation technical assistance is the help NRCS and its partners provide to land users to address opportunities, concerns, and problems related to the use of natural resources and to help land users make sound natural resource management decisions on private, tribal, and other non-federal lands. This assistance comes in form of resource assessment, practice design, resource monitoring, or follow-up of installed practices. Although the CTA program does not include financial or cost-share assistance, clients may develop conservation plans, which may then serve as a springboard for those interested in participating in USDA financial assistance programs. CTA planning can also serve as a door to financial assistance and easement conservation programs provided by other Federal, State, and local programs, (NRCS, 2012). NRCS and its partners use the CTA program to provide technical assistance to farmers, ranchers, local units of

government, citizen groups, recreation groups, tribal governments, professional consultants, State and Federal agencies and others interested in conserving natural resources.

France as a country must face fundamental challenges that include: allowing everyone to have access to drinking water and to the treatment of waste water; preserving water resources and aquatic environments, and taking care of their health; preventing permanent and accidental pollution; preventing and managing floods and droughts, controlling erosion; ensuring food and fish production, while limiting the impacts of agriculture on the environments and resources, including coastal and marine environments and allowing the sustainable development of socio-economic activities which all depend on the availability and quality of the resource: health, services, industry, energy production, transport, navigation, tourism, sports and recreational activities. The main challenge in the coming years will be to adapt to climate change: adaptation of water resources management and planning, but also adaptation of water uses especially in agriculture where significant water savings will have to be made in irrigation, Bommelaer and Devaux, (2012). At the national level, National Water Committee (CNE/NWC) which is chaired by a Member of Parliament nominated by the Prime Minister is the place where stakeholders participate. The committee gathers representatives of the users, associations, local authorities and governmental administrations as well as qualified people and the presidents of Basin committees. It is consulted on the orientations of the national water policy and it gives advice on the draft legal texts (bills, decrees), on the planned reforms and draft governmental action plans. In

France, water management is decentralized at two main levels, Bommelaer and Devaux, (2012). The first level of decentralized management is on a large river basin scale, where river basin authorities are in charge of financing (Water agencies) and dialogue (Basin committees), with a multiyear planning and programming in the basins (SDAGE, action plans of the Water agencies) and with co-ordination by a Basin Co-coordinator Prefect. In each of the seven large metropolitan river basins, the Basin committee, chaired by a local elected official, is made up of representatives from local authorities (40%), users and associations (40%) and the State government (20%). The system of Basin committees aims at ensuring stakeholders' co-ordination and representativeness. All the users are represented at the Basin committee orientates the water policy priorities in the basin by preparing the Master Plan for Water Development and Management (SDAGE) which is then approved by the State government. The second level of decentralization of water resources management concerns the small water cycle (drinking water

supply and sanitation). Thus, the municipalities take care of the management of these services, either alone or in a grouping. Thus, for 36,763 municipalities, there are approximately 35,000 water utilities: 15,000 for drinking water supply, 16,500 for community sanitation and 3,500 for on-site sanitation. The French water organization relies above all on the Law of 16 December 1964 which organized water management at river basin level, with a multi-stakeholder governance by Basin committees, a polluter-pays and user-pays financial mechanism and a 6-year planning of financial actions. The French territory was then divided into seven large river basins (Artois-Picardy, Seine-Normandy, Loire-Brittany, Adour-Garonne, Rhone-Mediterranean, Corsica and Rhine-Meuse). In each one of them, basin authorities were created: the Basin committee (advisory body made up of representatives from the State, local authorities and users) and the Water agency (executive organization). However, although there are seven river Basin committees, there are only six Water agencies, Rhone-Mediterranean basin and Corsica basin are grouped in the same agency. To the 7 large river basins were added the Overseas Basins: Guadeloupe, Guyana, Martinique, Mayotte and Réunion.

Germany is a central European country, and almost all of its major stream systems cross into other countries. The country has a National Water Conservation Plan that takes the features of Germany's natural environment, the hazards threatening water in an industrial country, and the current standard of water conservation, and attempts to define current medium-term objectives, to be presented as the central tasks of water conservation. These tasks are to be undertaken in order of priority. The basic requirements for the water conservation strategies that need to be developed include all naturally occurring water above the ground, still and flowing, including the water bed and the ecosystems of the adjoining valley zone, in as much as the water is the characteristic element of these ecosystems and to the extent that they are functionally associated with the water. The climatic conditions, the water cycle, the drainage conditions, the distribution of waters and the exchange between the surface and ground water are the fundamental elements of the water system and determine the natural functions of the high-quality and abundant water ecosystems *Länderarbeitsgemeinschaft Wasser (LAWA)*, (2000). The water ecosystems do not make up a fixed statistical structure; they change and develop constantly along with geological history, and in recent times due to the influence of mankind. With regard to the requirements of water conservation, a long-term political and technical agreement independent of daily events must be the country's goal.

The current situation presents Germany as a country with a water surplus, although it contains some regions with water shortage. The major geographical areas of Germany are structured and characterized by water. To safeguard the water balance, water conservation policies are needed for the purpose of establishing a network of large, medium and small waterways with high quality water. The North Sea and the Baltic coastal waters are of special economic significance for parts of Germany. The quality of the country's coastal waters is significantly influenced by discharge from Germany. However, these effects are small in relation to the total ecosystems of the North Sea and the Baltic. Much more significant is, for example, air-borne pollution coming from elsewhere. With Germany having a high density of population and industry, the demands placed on water in its many manifestations as ground water, flowing water and still water are therefore unusually high: ground water and surface water is used to supply drinking and industrial water, to irrigate agricultural areas and to generate electricity; surface waterways are used for transport routes, and they are polluted considerably by discharge and use. Technical measures for flood protection burden the water systems; flowing water and still water, including areas of water near the coast, are used for leisure purposes and as desirable sites for accommodation, industry and commerce. In all, these factors pose a considerable threat to the natural functions of water as the basis of life and the natural habitat for humans, animals and plants. The extent of this threat varies between urban and country areas, but the threat exists everywhere nevertheless.

Going forward, LAWA, (2000), specifies fundamental objectives and requirements to be satisfied by water conservation strategies. First, the water systems need to be looked at in an integral fashion, by including their peripheral zones and the sub-zones functionally related to them, treating all these things as an indivisible unit, and taking into account the interactions between ground water and surface water. From this viewpoint we can then define the main aims of water conservation politics as follows: protect the surface waters and coastal waters as the natural habitats for humans, animals and plants; protect the ground water as a natural life resource; ensure a lasting water supply for the population, for agriculture, for industry and commerce, for recreation and for fishing. Following these water conservation objectives in a densely populated industrial country like Germany leads to a constant conflict of interests. Given such a situation, the implementation of water conservation strategies while taking into account the unavoidable economic uses of water requires the following: clear political and legal

stipulations; a high standard of technical and scientific expertise; a high level of financial and manpower resources; trans-media standardization and interlinking of water conservation strategies with the strategies of other technical sectors of environmental politics, as well as those of other political spheres. To achieve this, the following is necessary: water conservation strategies must be ensured medium-term permanence, thus satisfying the internationally recognized principles of Agenda 21 of Rio; when dealing with water issues, a high level of consensus is vital on all political levels and among all those involved; when implementing water conservation strategies and strategies in support of water conservation, particular care must be taken to obtain the agreement of those affected. It is finally worth stating that because of Germany's hydrographic situation, water conservation will only succeed if international agreements are passed that harmonize water German conservation policies with the water conservation policies of neighbouring countries. The developing supranational water laws of the European Community, combined with other international agreements in the field of water conservation, are of special importance in this respect.

Scarcity of water is becoming a serious concern worldwide as demand for water continues to climb. In this regard, at the 6th World Water Forum held in March 2012 in Marseille, France, over 35,000 forum participants came together to talk about solutions for problems associated with water resources. In light of this serious situation, all Takeda Group production and research facilities in Japan and other countries are taking steps to reduce water consumption, including the introduction of equipment using recycled water. None of Takeda's pre-integration production sites faced a major water risk since most of the Group's water usage was at sites within Japan, UN Water Development Report, (2012).

At continental level, South Africa and Botswana present scenarios that can be pursued to understand the water conservation issue and factors that affect this subject. Botswana is generally regarded as an African success story (Swatuk and Rahm, 2004). In their paper, *'Integrating policy, disintegrating practice: Water Resources Management in Botswana'* they affirm that nearly four decades of unabated economic growth, multi-party democracy, conservative decision-making and low-levels of corruption have made Botswana the darling of the international donor community. One noticeable consequence of rapid and sustained economic development is that water resources use and demands have risen dramatically in a primarily arid/semi-arid environment. Policy makers recognize that

supply is limited and that deliberate steps must be taken to manage demand. In this regard, and in line with other members of the Southern African Development Community (SADC), Botswana devised a National Water Master Plan (NWMP) and undertook a series of institutional and legal reforms throughout the 1990s so as to make water resources use more equitable, efficient and sustainable. In other words, the stated goal is to work toward Integrated Water Resources Management (IWRM) in both policy and practice. However, policy measures have had limited impact on de facto practice. In this perspective it is found out that a number of constraints that include cultural, power political and managerial combine to hinder resorts towards sustainable forms of water resources use. If IWRM is to be realized in the country, these constraints must be overcome.

In the southern Africa perspective, (Environmental Monitoring Group, 2000), explains that water conservation holds remarkable potential to help the region meet its water needs. Urban and agricultural water use in southern Africa is highly wasteful. In South Africa, for example, it is estimated that nearly half of urban water is wasted through water loss or inefficiency. Similarly, irrigation in Southern Africa, which represents 69 percent of total consumption, is estimated to be less than 50 percent efficient. Making the irrigation practices more efficient by 10 percent across the region would result to 2.5 billion cubic metres saved each year. Further, ensuring that the urban water use across the region is only 10 percent more efficient, then more than 600 million cubic meters would be saved each year. Put together, these savings would provide enough water to supply every person in the region who is currently not served by water services with more than 100 litres per day. Noticeably, effective implementation of water conservation and demand management practices could go a long way toward solving the region's water troubles.

Very few water conservation measures have been implemented in southern Africa to date. A study carried out in 2000 suggested that less than one-third of the 40 million urban water users who are served by developed supply systems were encouraged to use water in an efficient manner. On the contrary although this economic tool can be effective, without other components of a comprehensive water conservation (WC) campaign such as public education it will have little effect. In the agricultural sector, nearly half of all irrigated land is watered by highly inefficient flood irrigation methods, while more efficient methods such as micro jet and drip irrigation are applied on less than 10 percent of irrigated farmland. Whilst in the past water

conservation initiatives have been considered only as strategies linked with environmental or drought response which often led to inefficient water supply planning, the main challenge for the water conservation approach is its integration into the water resource planning process.

The states of affairs of water resources as an issue are not any different or better in Kenya. Kenya receives less than 647m³ of fresh water per capita per year against the United Nation's recommended per capita of 1000m³, making the country one of the most water scarce countries in Africa and the world (WRI, 1994). Competition over water between agricultural, industrial, domestic and municipal needs has worsened, stretching the recovery of hydrological systems (Orie, 1995). Kenya experiences high rainfall variability, low investment in water resources development and poor protection of the existing water resources resulting in extensive degradation (Were et al., 2006).

According to Kenya National Bureau of Statistics, Kenya Demographic and Health Survey 2008-2009 found five out of ten of rural households (53.8%) obtained drinking water from an improved source compared to nine out of ten in the urban households (89.3%). On the other hand, four out of ten of rural households (45.8%) obtained drinking water from non-improved source compared to one out of ten in the urban households (6.3%). From the survey it was evident that more than three out of ten (38.7%) of Kenyan households get their drinking water from a non-improved source, mainly surface water from lakes, streams and rivers. Governance challenges, in the water sector are multi-faceted and mostly focus on the relationships between agencies and their responsibilities, giving little consideration to individuals, households and settlements that are not related to these formal agencies. To address the water accessibility crisis, water conservation is a strategy that communities living within a specific water sub-catchment in a drainage basin employ through Water Resource Users' Associations (WRUAs) for the purposes of cooperatively sharing, managing and conserving a common water resource to improve accessibility to water and eventual sustainability on the same.

1.2 Statement of the Problem

Kibwezi sub catchment area is located in entirely semi-arid climatic conditions in the lower eastern part of Kenya. The major economic activity in the region is subsistence farming which is not favoured by the weather which is mostly dry. The main sources of water for the region comes from rivers, springs and wetlands found within the span of the region, with the

rivers forming tributaries of Athi River. Water scarcity in the region is a big issue in the region and is escalated by the long dry spells that are experienced in the area. Ephemeral tributaries include that span the region include Thwake, Kaiti, Muooni, Makindu and Mtito Andei rivers. There area is highly heterogeneous hence it experiences variable surface water runoff especially in Thwake tributary which can be explained by the infrequent flash floods and very little percolation due largely to the geology of the area. Additional issues which aggravate the problem are catchment degradation as a result of tree-felling in forest and reserve areas. In addition to this, encroachment and cultivation of wetlands has also exacerbated this situation. Apart from these, sand harvesting has been a major economic activity in the area which has adversely affected river banks and destroyed riparian zones of many rivers making them become unstable. These activities destroy surface cover resulting in increased surface run-off and soil erosion. Eroded soils are carried by the surface run-off and deposited in rivers, lakes and dams, resulting in reduced storage capacity.

At the community level, water resources conservation activities are implemented by Water Resources Users' Associations (WRUAs) under supervision of Water Resources Management Authority (WRMA). WRMA works with the WRUAs to come up with sub-catchment plans (SCMPs) that form the guidelines for the activities to be implemented within the catchment. The entire process must ensure stakeholder participation to ensure inclusion of all interested parties (Water Rules, 2007). WRUA membership is drawn to ensure representation and diversity and to cover the different types of water use such as agriculture, livestock, domestic, industrial, energy, fisheries, among others depending the dominant activities in a specific sub-catchment. Gender balance is also considered, where 30% of the female gender participate in management of the WRUA. Area in which a particular WRUA covers is arbitrarily determined but is influenced by a complexity of issues. One major challenge however has been the merging or rationalization of small WRUAs after many WRUAs had been formally registered but within spatial distribution that was unsustainable (WRUA Rationalization Report for Middle Athi Sub Region, 2012).

As a result of the prior water related concerns associated with Kibwezi, hasty measures are necessary to correct the current status conservation of water catchment areas in the area. Training of WRUAs on water conservation, adequate financing of the WRUAs, merging of small

WRUA and knowledge on environment are areas that need closer attention to correct the water catchment conservation inefficiencies in Kibwezi sub catchment.

1.3 Purpose of the study

This research examines factors that influence Water Resource Users' Associations within Kibwezi area of Athi Catchment on conservation of water resources. It therefore purposes to find out the contributing factors to the current water conservation situation within the region and propose solutions to the identified challenges and existing gaps.

1.4 Objectives of the study

The objectives of the study are to:

1. To examine the influence of WRUAs' training adequacy on conservation of water catchment areas in Kibwezi.
2. To find out the influence of the existing WRUA financing mechanisms on the conservation of water catchment areas in Kibwezi.
3. To explore the influence of merging of small WRUAs on the conservation of water catchment areas in Kibwezi.
4. To examine the influence of knowledge on environment by the WRUA members on the conservation of water catchment areas in Kibwezi.

1.5 Research questions

1. Are the WRUA training programmes adequate for water catchment areas conservation within Kibwezi?
2. How useful in relation to conservation of water catchment areas are the existing WRUA financing mechanisms for the WRUAs within Kibwezi?
3. How has merging of small WRUAs in Kibwezi influenced water resources conservation in Kibwezi?
4. What are the knowledge levels on environmental awareness by WRUAs within Kibwezi?

1.6 Significance of the study

This study is important because first, it examines different factors that influence WRUAs in an effort to restore river drainage basins degraded as a result of human activities. It further identifies any challenges and gaps in WRUA operations within Kibwezi and proposes solutions

to the same. Second, the study gives the people of Kibwezi an insight of gaps, challenges and way forward in WRUA activities within the water catchment areas in the region. This will guide choosing of water conservation approaches by the WRUA members. Third, the study provides reference to further empirical studies on WRUAs in Kenya and beyond and similar or related studies. This will aid other researchers in their studies in similar or related work. Four, the findings will inform policy makers of the dynamics of WRUA activities in Kibwezi hence guide future build-up of water conservation strategies for the water catchment areas in the region.

1.7 Basic assumptions of the study

The study assumed that the sample selected was representative of the target population, the respondents answered questions truthfully and honestly and that the respondents willingly participated in the research.

1.8 Limitations of the study

The limitations of the study included language barrier that might have hindered the implementation of the data research tools. Since the researcher understood the local language, this minimized this challenge. The second limitation was that the research was limited to the population size and the resulting sample size. The fact that the research assumed that the selected sample was representative of the target population was an elaborate answer to this challenge. The other limitation was the level of environmental knowledge of the respondents. The research questions on environment related issues was be close-ended to ensure that the respondents chose whatever they perceived as correct their responses. The last expected limitation was unwillingness by some respondents to provide answers to the questionnaires. The researcher's introduction letter to the respondents undertook to maintain confidentiality about the respondents and encouraged the respondents to participate voluntarily to the study and at the same time assured them that their opinions would be kept confidential.

1.9 Delimitations of the study

The research study concentrated on WRUAs that were in their advanced stage of development which is the second stage of funding in the targeted region. Out of the existing 50 WRUAs within Kibwezi, the largest 5 in terms of activity levels were studied. The researcher used descriptive survey design and a questionnaire as a research instrument with the questions being both open ended and close ended. This was to ensure that the research study acquired data

and information that could give an insight at the performance of WRUAs in conservation of water catchment areas in Kibwezi. The data collected was analyzed using descriptive statistics where frequency distributions and percentages were determined. The data was then summarized and findings related and presented in relation to the research questions and objectives.

1.10 Definition of significant terms used in the study

Ephemeral: A body of water that usually dry but filling with water for brief periods during and after precipitation.

Factors: A circumstance, fact, or influence that contributes to a result or outcome.

Performance: The accomplishment of a given task measured against preset standards.

Water Resources Users' Association: A legally registered group within a given sub-catchment drainage that oversees water conservation in that particular area.

Water Catchment Area: This is can be defined to be any lake, swamp, marsh, spring, stream, water course, estuary, aquifer or other body of flowing or standing water whether above or below the ground.

Merge: This is to rationally join two or more smaller entities to yield a larger entity.

Financing mechanism: This is an approach used to avail funding for a project

Training: Is the process of bringing a person to an agreed level of proficiency by practice and instruction.

Knowledge: This is a familiarity with something, which can include facts, information, descriptions, or skills acquired through experience or education.

Political interference: Use of politics to influence decisions in some activity.

WRUA activity: This is any undertaking by a WRUA towards water resources management.

Water resource conservation: This is efficient management, storage, allocation and transfer of raw water.

1.11 Organization of the study

Chapter one gave a general introduction to the study. It presented an insight to water resources conservation as a topic through the background and the problem statement. The background examined water resources conservation at international, country and local levels from the historical aspect to our current situation. The problem statement introduced the significance of carrying out the study and narrowed down to the focus region. The purpose,

objectives, research questions, significance and assumptions of the study were further discussed in this chapter. The chapter concluded with the limitations and delimitations of the study and definitions of the significant terms used.

Chapter two gave a review of literature of the topic under study. The introduction presented some generalizations on water resources conservation as a topic from a global perspective and narrowing it down to Kenyan situation before finally laying it down to Kibwezi sub-catchment. The chapter further reviewed literature about the independent variables under study by expounding on training on water resources conservation, WRUA financing mechanisms from global, regional and local perspective, merging/rationalization of smaller WRUAs with tabulated illustrations and knowledge on environmental awareness. The chapter concluded with a conceptual framework that showed the relationship between the independent, intervening and dependent variables used in the study.

Chapter three dwelt on research methodology used in the study. The chapter conclusively described the research design, target population, sampling procedure and sample size research instruments, data collection procedure and data analysis that were used in carrying out the research. The chapter concluded with a table that showed the operational definition of variables.

Chapter four presented data analysis, presentation of data and interpretation. In this chapter the data was analyzed using a computer software known as statistical software for social sciences (SPSS). The data was then presented in tables because it was one of the easy methods of presenting research data. Interpretations were then drawn from the tabulated data.

In chapter five, findings in chapter four were revisited and summarized, and then the findings were discussed according to the specific themes and research questions. Conclusions were then drawn as to the feeling of the researcher regarding the research findings. Finally recommendations which are essentially suggestions were made on what the researcher felt there was need to be looked at regarding the subject of research in addition to the findings of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Water resources conservation forms part of the wider water conservation that is undertaken through efficient management, storage, allocation and transfer of raw water. Protection of freshwater is budding as a global issue of interest due to the steady increase in the use of limited resources by an increasing population, combined with thinning availability due to inadequate management, deforestation and increasing pollution. To ensure achievement of a secure and sustainable water future, the efficiency of current water supply and usage needs to be enhanced. (UNESCAP, 2002) notes that in case of Asian and Pacific region, with one or two notable exceptions, it is common to find up to 50 per cent of treated and piped water either lost during distribution or wasted during use. Developing a culture of water conservation that utilizes existing supplies more efficiently would enable expensive new source development projects to be cancelled or at least postponed for several years. (UNESCAP, 2002)

At a global perspective, Peru presents a good case of challenges that face water conservation. In the Peruvian context, on March 22, 2005, numerous Peruvian readers of “*El Comercio*” (a major newspaper of Peru with nation-wide coverage) were struck by reading the headlines: “Peru would face water scarcity as North African countries.” How come? (Alegría, 2012) writing the paper on ‘*The Challenges Of Water Resources Management in Peru*’ affirms that even though Peru is one of the 17 countries of the world with the most freshwater available per capita, it is was then among the top 30 countries that suffered water stress and scarcity. This was due to the fact that 70% of the Peru population lives in semi-arid and arid regions; whereas the abundant supply of freshwater is located in the lower part of the Amazon basin, scarcely populated. Another reason is because of the poor management and underutilization of available water resources.

However, currently Peru suffers from a water crisis plagued by inefficient end-use, inefficient allocation of water, pollution, depletion of water resources, and widespread water conflicts. Mounting conflicts as a result of historic and structural problems indicates that water management is approaching the crisis level in Peru. The water crisis is a crisis of governance; is not just a matter of economics or technology. This problem tends to be a worldwide illness, UN World Water Development Report –Water for People, Water for Life, (2003). Thus, politics and

policies have the answers for the problem. The UN report concludes: “it is agreed that basic principles of effective governance include: participation by all stakeholder, transparency, equity, accountability, coherence, responsiveness, integration and ethical issues”.

At continental level, South Africa and Botswana present scenarios that can be pursued to understand the water conservation issue and factors that affect this subject. Botswana is generally regarded as an African success story (Swatuk and Rahm, 2004). In their paper, *‘Integrating policy, disintegrating practice: Water Resources Management in Botswana’* they affirm that nearly four decades of unabated economic growth, multi-party democracy, conservative decision-making and low-levels of corruption have made Botswana the darling of the international donor community. One noticeable consequence of rapid and sustained economic development is that water resources use and demands have risen dramatically in a primarily arid/semi-arid environment. Policy makers recognize that supply is limited and that deliberate steps must be taken to manage demand. In this regard, and in line with other members of the Southern African Development Community (SADC), Botswana devised a National Water Master Plan (NWMP) and undertook a series of institutional and legal reforms throughout the 1990s so as to make water resources use more equitable, efficient and sustainable. In other words, the stated goal is to work toward Integrated Water Resources Management (IWRM) in both policy and practice. However, policy measures have had limited impact on de facto practice. In this perspective it is found out that a number of constraints that include cultural, power political and managerial combine to hinder resorts towards sustainable forms of water resources use. If IWRM is to be realized in the country, these constraints must be overcome.

In the southern Africa perspective water conservation holds remarkable potential to help the region meet its water needs. Urban and agricultural water use in southern Africa is highly wasteful. In South Africa, for example, it is estimated that nearly half of urban water is wasted through water loss or inefficiency. Similarly, irrigation in Southern Africa, which represents 69 percent of total consumption, is estimated to be less than 50 percent efficient. Making the irrigation practices more efficient by 10 percent across the region would result to 2.5 billion cubic metres saved each year. Further, ensuring that the urban water use across the region is only 10 percent more efficient, then more than 600 million cubic meters would be saved each year. Put together, these savings would provide enough water to supply every person in the region who

is currently not served by water services with more than 100 litres per day. Noticeably, effective implementation of water conservation and demand management practices could go a long way toward solving the region's water troubles, Environmental Monitoring Group, (2000).

Very few water conservation measures have been implemented in southern Africa to date. A study carried out in 2000 suggested that less than one-third of the 40 million urban water users who are served by developed supply systems were encouraged to use water in an efficient manner. On the contrary although this economic tool can be effective, without other components of a comprehensive water conservation (WC) campaign such as public education it will have little effect. In the agricultural sector, nearly half of all irrigated land is watered by highly inefficient flood irrigation methods, while more efficient methods such as micro jet and drip irrigation are applied on less than 10 percent of irrigated farmland. Whilst in the past water conservation initiatives have been considered only as strategies linked with environmental or drought response which often led to inefficient water supply planning, the main challenge for the water conservation approach is its integration into the water resource planning process.

2.2 Training of WRUAs in Conservation of Water Catchment Areas

In their journal addressing the issues and options for integrated water resources management in Africa, Donkor and Wolde (1997) affirm that one of the most urgent training needs for the water sector is in project planning and preparation at the micro-economic level, water resources sector planning and their relation to national development planning at the macro-economic level. It further notes that there are avenues to improve the human resources situation at the regional level. Education and Training for Water Professionals, on issues concerning water are at crisis levels (Science Magazine, 2012). In USA for example, Western states continue to experience an exponential increase in water-related issues due to over-allocation of surface water, decreasing snow pack trends, doubling population by 2050 and rising pollution. Specifically, Oregon and Washington already require water conservation plans in order to obtain further water rights. Water stressors like climate change, population growth and increasing pollution are compounded by lack of awareness. Educational opportunities that provide technicians with the skills and knowledge needed to design, implement and evaluate water conservation programmes are not in place in higher learning institutions. Agencies and institutions in the water sector rely entirely on job training for their staff on water conservation issues. An example of a water conservation training programme is the 'The Water Conservation

Technician Program’, a career-technical curriculum offered as a two-year Associate of Applied Science degree that trains individuals to evaluate water use patterns; develop, implement, maintain and market conservation programs; perform public outreach; recommend water efficiency techniques; and perform systems analysis to solve problems. The programme is offered by Lane Community College. It is worth noting that more water conservation programmes are being created whether voluntary or mandatory to ensure that the demand on current water sources is lessened and achieve sustainability.

Public Awareness on Water Conservation and Water Efficiency, clients to institutions should be encouraged to set an example in a government-led water conservation awareness (WCA) strategy, (UNESCAP, 2002). Organizational initiatives should use water audits and advice on water-saving devices that support the message given by the government. Educating children and students is essential in inculcating a future society with a water conservation culture and also helps to educate present society when children return home and show their families what they have learned. Formal and informal curricula in schools, colleges and universities provide the medium and several considerations are required. (UNESCAP, 2002) further adds that curricula development and finding ways to introduce water conservation as a subject must be harmoniously addressed jointly by the managing committee and education officials. Experience has shown that water awareness and conservation is best designed to relate to existing subjects being taught and that an interactive and hands-on approach is effective for young children. Material development can then be best managed as a subproject by water professionals and education specialists, assisted by graphic designers. In this respect, jigsaws, board games, quizzes, audio tapes, compact disks (CDs), slides and stories with popular TV or comic-strip heroes can be effective. Teachers must undergo preparatory, in-service training and be provided with a curriculum guide, background information, student worksheets and other material for class work.

2.3 The WRUA Financing Mechanisms in Conservation of Water Catchment Areas

At the global perspective, water resources conservation is financed through a Trust Fund which consists of money or other assets that are legally restricted to for water conservation and kept separate from other sources of money (such as a government agency’s regular budget). Depending on a country’s legal system, trust funds have been established as foundations, nonprofit corporations, or common-law trusts. A Trust Fund consists of money or other assets

that are legally restricted to a specified purpose and must be kept separate from other sources of money (such as a government agency's regular budget). Depending on a country's legal system, trust funds can be established as foundations, nonprofit corporations, or common-law trusts. A conservation trust fund can be incorporated in the country of intended beneficiaries, or it can be incorporated as an offshore fund in a country with more favorable legal regulations and support. Conservation trust funds may be managed as one of three different types of funds: an endowment fund, where the investment income but not the capital is spent; a sinking fund, where the income and part of the capital is spent every year, eventually sinking the fund to zero within a predetermined time frame; or a revolving fund, which continually receives and spends new revenues from earmarked taxes or fees. Most conservation trust funds are today managed as umbrella funds, meaning they are hybrids of the above distinct categories of funds. Umbrella funds are designed to manage fund accounts for different purposes, but under a single legal and institutional structure (Rapid Review of Conservation Trust Funds, 2008).

Emerging sources of financing for conservation trust funds include funding from private sector and market-based mechanisms, such as payments for watershed services and carbon and biodiversity offset revenue. It should however be noted that conservation trust funds are increasingly being considered as viable financing vehicles for administering payments generated from ecosystem services. A good example of this is the case of the *Sierra de las Minas Water Fund*, which has been set up to receive user fees from watershed services. A fund can act as trustee for a payment for environmental services; bundle ecosystem services and/or buyers and sellers to help achieve economies of scale; strengthen institutions engaged in the payment transactions; monitor, evaluate, and enforce compliance with payment contracts; broker negotiations; serve as an equitable distributor of benefits generated by the payment arrangement; and, assist in the valuation of payments (USAID, 2009).

Conservation Finance Alliance Guide (2003) reckons that there are more than 50 conservation trust funds have been established around the world to finance nature conservation (see map, next page). Most of these trust funds have been set up as legally independent institutions (i.e., nongovernmental) which are managed by an independent board of directors. These trust funds usually provide lasting, sustainable funding for conservation activities and/or protected area agencies through a local grant-making process. They have become particularly prevalent in Latin America, where the Latin American and Caribbean Network of Environmental

Funds (RedLAC) was established as an association of more than 20 conservation trust funds. In addition to providing a stable source of funding for conservation, this type of trust fund often benefits the conservation community by promoting coordination among various stakeholders such as NGOs, government agencies, community groups, and the private sector; by offering technical assistance in the design and implementation of conservation strategies; and by building local capacity for biodiversity conservation and sustainable resource management.

Conservation Trust Funds are just one of the tools for financing biodiversity conservation and are not necessarily appropriate or feasible for all countries and all situations. Studies (*The GEF Evaluation of Conservation Trust Funds*, 1998) have suggested four conditions essential for establishing conservation trust funds: the issue or program to be funded needs a commitment of at least 10 to 15 years; the government actively supports establishing a public-private sector mechanism outside direct government control; a critical mass of people from diverse sectors of society have agreed to work together to achieve biodiversity conservation and sustainable development; a basic fabric of legal and financial practices and supporting institutions (including banking, auditing and contracting) exists in which people have confidence.

At the global level, water resources conservation is financed through a Trust Fund which consists of money or other assets that are legally restricted to for water conservation and kept separate from other sources of money (such as a government agency's regular budget). Depending on a country's legal system, trust funds have been established as foundations, nonprofit corporations, or common-law trusts. *Sierra de las Minas Water Fund*, Guatemala is an exceptional conservation trust fund created to generate sustainable funding for the restoration and protection of watersheds in Guatemala's *Sierra de las Minas* Biosphere and Protected Areas. The fund was set up to administer payments to cover the costs of the watershed services provided and as a mechanism to engage a diverse set of stakeholders in the negotiation of equitable payment for the watershed services program. Through the program, some of the major water users in the watershed, including local industries, pay a fee to use the resource. Revenue earned from the fees is managed and disbursed by the fund for watershed restoration and conservation efforts. The *Sierra de las Minas Water Fund* in Guatemala was created in 2002 and became operational in 2006. Various stakeholders make payments into the water fund, which is set up like a trust fund to manage the revenue from the payments for watershed services in the *Sierra de las Minas* Biosphere Reserve. Establishment of the fund was made possible through initial

support from WWF and the Swiss Reinsurance company, combined with subsequent support from the Critical Ecosystems Partnership Fund, Austrian Development Agency (ADA), USAID, DANIDA, and CARE. Current support comes from The Coca-Cola Company (TCCC) and The Coca-Cola Foundation.

The initial funding of roughly \$256,000 enabled the development of a financial plan, establishment of a board of directors, formation of basin committees who could represent stakeholders on the board, and the conducting of initial studies. The water fund has a board of representatives from the largest stakeholder groups in the watershed including agriculture, hydroelectric plants, local authorities, private corporations, and environmental organizations. Once the fund is fully operational, contributions are anticipated from all major sectors within the watershed, including industrial, agro-industrial and irrigation, hydroelectric facilities, municipalities, and tourism. Participating companies are expected to contribute \$25,000 each per year to implement community projects, and can have representation on the Investment Committee that oversees funding allocations. The water fund will require an estimated \$130,000 a year to cover fixed operational costs, and is expected to require \$867,000 a year in combined contributions from donors, investors, and project contracts. The numbers are based on the business plan developed at the outset. Given that it takes time to gain the confidence and participation of donors and investors, this level of activity is not expected to be feasible until the fifth or sixth year of operations.

The Brazilian Biodiversity Fund (FUNBIO) was founded as a nonprofit association in 1995 with the help of a \$20 million dollar grant from the Global Environment Facility (GEF). FUNBIO provides financial and material support to initiatives related to conservation and sustainable use of biodiversity in Brazil. The purpose of establishing the fund as a transparent mechanism was also to attract further funding from the private sector and help raise revenue to ensure long-term sustenance of conservation activities. FUNBIO also administers the Amazon Region Protected Areas (ARPA) Programme and the ARPA trust fund, which has received funding support from the GEF, the government of Brazil, KfW, and WWF. At the end of 2008, the ARPA trust fund had an endowment of about \$24 million and another \$12 million committed by the German government. The program's objective is to expand and consolidate the protected areas system in the Amazon region of Brazil. ARPA is managed like a trust fund and has an

independent management committee that supervises the program. ARPA receives administrative and technical support for projects it undertakes from FUNBIO.

The Mexican Nature Conservation Fund was established as a private, civil association under Mexican law in 1994. The fund's mission is to conserve Mexico's biodiversity and encourage the sustainable use of natural resources. It does so by promoting strategic actions and providing medium- to long-term financial support. It was created through extensive nationwide consultations and with strong backing from then-President Ernesto Zedillo Ponce de León and the NGO and business communities. When the fund was established, it had little guidance on how to focus its grants program. To help determine its strategic direction and emphasis for greatest impact, the fund used feedback from its grantees and others involved in conservation. It provided partial financial support for, and participated actively in, a national priority-setting process led by the National Council for Knowledge and Use of Biodiversity (CONABIO). This process led to the identification of approximately 150 priority areas for biodiversity conservation (*Global Environment Facility*, 1998). This fund is one of the largest in existence having raised close to \$100 million dollars toward its endowment (WWF, 2009). Major donations have come from USAID, the Mexican government, the Global Environment Facility, the David and Lucile Packard Foundation, and the Ford Foundation. Its participatory strategy allows local communities and civil society groups to access grants, training and other support to develop sustainable activities in and around the country's critical ecosystems. A large part of the endowment also goes toward protected areas via the protected area fund managed by the Mexican Nature Conservation Fund.

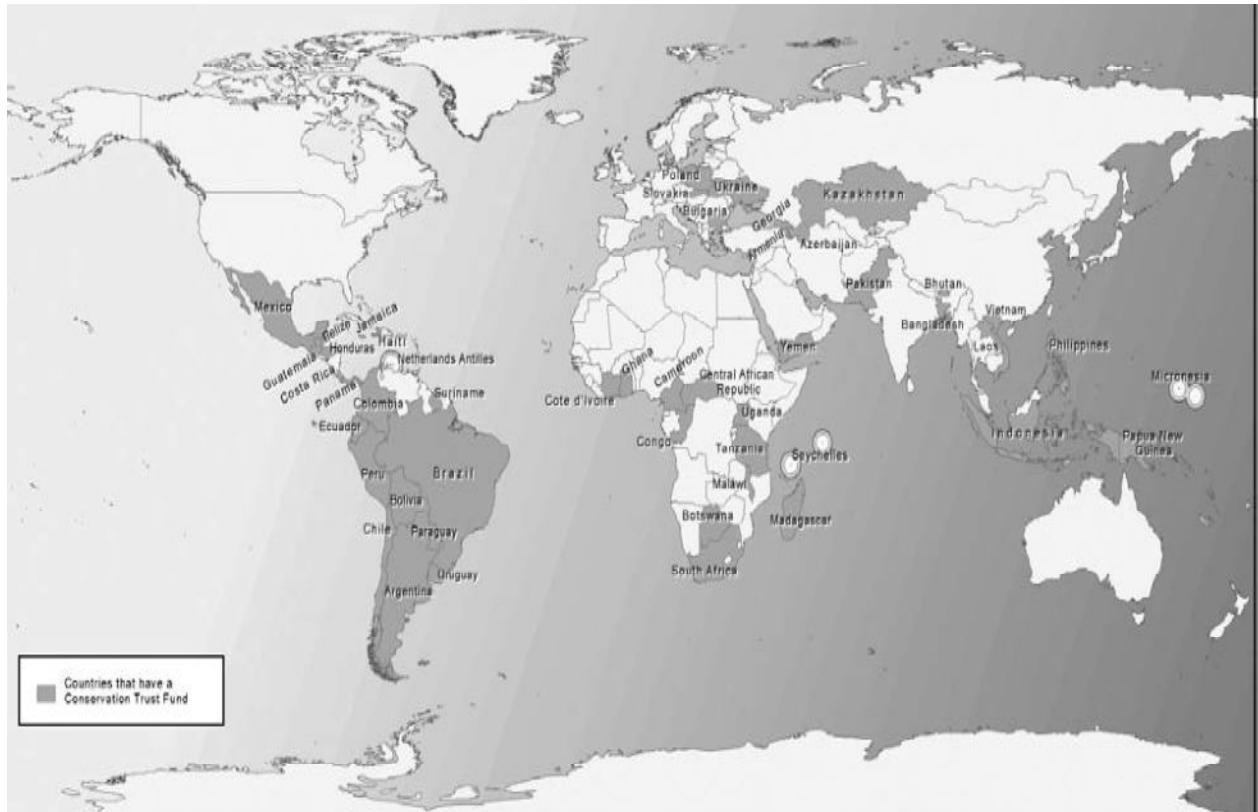
In Africa, options available for financing marine conservation, conservation financing mechanisms need to be evaluated as part of a business plan that includes a sustainable financing strategy. The business plan should be based on an evaluation of the costs of operating MPAs or protecting marine resources, Spergel and Moye (2004). The Madagascar Biodiversity Fund Established in 2005 supports biodiversity conservation in that country by financing and promoting the effective protection of existing protected areas and the creation of new ones. The creation of the foundation was a major step toward securing sustainable financing for the protected areas system and reducing dependence on external funding. Due to its strong institutional base, the foundation has to date attracted significant commitment from the national government as well as bilateral institutions and nonprofit organizations. The foundation has

surpassed its funding goal of \$50 million by 2012 with \$53 million committed to date. This success was achieved largely through two major debt-for-nature swaps negotiated between the governments of France (for \$20 million) and Germany (\$13 million). The French debt-for-nature swap (C2D) was the largest yet for Madagascar. Fund donations have also been made by several other private and public donors including the World Bank, the MacArthur Foundation, WWF, and Conservation International.

The Sangha Tri-National (TNS) Foundation is an independent conservation trust fund that was established to raise millions of dollars for the protection and management of a transboundary forest complex called the Sangha Tri-National. Spanning a breadth of 9 million acres in the Congo Basin, the complex reaches into three countries: Cameroon, the Central African Republic, and the Republic of the Congo. Established in 2007, the foundation has already received over 10 million Euros (\$14 million) in endowment commitments from both public- and private-sector donors, including the German Development Bank (KfW) and the French Development Agency (Afd). The TNS Foundation is one of the first conservation trust funds set up in Francophone Africa. The foundation is one of only six multi-country, regional or transboundary funds in the world. The other regional trust funds are the Mesoamerican Reef Fund, the Foundation for Eastern Carpathian Biodiversity Conservation, the Caucasus Protected Areas Fund, the Sea Sustainable Trust, and the Micronesia Conservation Trust.

In Kenya, there exist a number of avenues for funding projects prepared by WRUAs (WRMA Performance Report1, 2010). One of the possibilities is the access of resources through the WRUA Development Cycle (WDC) which has been established by WRMA and further implemented by the Water Services Trust Fund (WSTF). The WSTF supports not only WRUA projects, but also WRUA establishment and Sub-Catchment Management Plan (SCMP) development. The second available source of funding for WRUA projects comes from development programmes which target specific catchment areas in Kenya. Examples are Western Kenya Community Driven Development (WKCDD) project in Lake Victoria North, Natural Resource Management (NRM) project in Tana and Integrated Flood management project in Lake Victoria South Catchment areas. Other possible areas that can be exploited for financial support of WRUA projects include non-governmental organizations (NGOs), government devolved funds, specifically Constituency Development Fund (CDF) and mobilization from the private sector, most of which are aimed at catchment protection.

Figure 1: Countries across the world with a Conservation Trust Fund



2.4 Merging of Small WRUAs in Conservation of Water Catchment Areas

Water resources conservation activities at the community level are implemented by WRUAs under supervision of WRMA. WRUAs ensure that sub-catchment plans (SCMPs) that form the guidelines for the activities are developed through stakeholder participation to ensure inclusion. WRUAs role is to ensure that that water sharing is harmoniously done to avert any related conflicts (Water Rules, 2007). Since WRUAs are the immediate beneficiaries in their locality, they are able to participate in corporate management of water resources to ensure they are protected. WRUA membership is drawn to ensure representation and diversity and to cover the different types of water use such as agriculture, livestock, domestic, industrial, energy, fisheries, among others depending the dominant activities in a specific sub-catchment. Gender balance is also considered, where 30% of the female gender participate in management of the WRUA. The area of operation of a WRUA is arbitrarily determined but is influenced by a

complexity of issues. One major challenge however has been the rationalization or merging of smaller WRUAs after many WRUAs had been formally registered but within spatial distribution that was unsustainable (WRUA Rationalization Report for Middle Athi Sub Region, 2012). To this end, the process of WRUA rationalization was effected to ensure a manageable number as per the drainage systems within a catchment. (Tables 2.1 showing merging of WRUA coverage areas in Athi Catchment Area and 2.2 showing merging WRUAs in Kibwezi Sub Region showing coverage area in km² are attached as appendices).

2.5 Knowledge on Environment in conservation of Water Catchment Areas

The Ministry of Environment & Mineral Resources (MEMR) endeavours to promote, monitor, conserve, protect and sustainably manage the environmental and mineral resources for national development in its mission statement. In this view, MEMR is fully committed to the realization that a sustainable environment is an essential precondition in national development, poverty suppression and better livelihoods for all generations. In regard of this, MEMR is now implementing a National Environmental Education and Awareness Initiative (NEEAI) to educate and raise awareness on environmental challenges to all Kenyans and to encourage the participation of all stakeholders in environmental conservation and management, (MEMR, 2013).

According to an assessment of the level of awareness/knowledge and practices of environmental management in schools in Kenya in Nairobi County and it established that: One, most of the students are interested in environment management in schools especially waste disposal, water usage and tree planting activity. Two, students from most of the secondary schools in Nairobi County are aware of the common environmental problems in their schools (noise pollution, smelly toilets, air pollution etc). The study recommended that efforts be made by government and school management to organize seminars and workshops for students, teachers and administrators to sensitize them on environmental problems and their consequences Muthui (2012).

Nature Kenya, a local environmental conservancy agency, carries out environmental education at different sites in Kenya through collaborations with Site Support Groups to create awareness on the importance of the environment, ecosystem benefits and the link between the natural resources and sustainable livelihoods. The awareness programme helps the target groups (local communities, school going children, public and visitors) to comprehend sustainable use

and management of natural resources, climate change impacts and mitigation and participatory resource management and how to co-exist in a sustainable manner with nature. The programme nurtures skills, knowledge, values, attitudes and change in behaviour, bringing up environmental responsible citizens who care and protect the environment, thus, instilling a sense of environmental responsibility in our citizens.

The Conservation Environmental Education Programme (CEEP) strives to achieve strategic objectives/results by targeting the relevant target audience. The Conservation Environmental Education programme targets to cater for all age cohorts and socio-economic groups in the country to create awareness on resource management to a wide cross section of the society. Among the groups targeted for environmental education are: School children, to convey environmental education programmes in our education sector that includes schools and tertiary institutions; the general public, to raise awareness levels of environmental issues and encourage members to participate in informed environmental initiatives to conserve the environment; community groups/ resource users, to create awareness on sustainable use of resources and in return promote voluntary self-help schemes in the community to reduce dependence on the resource in use; media, to use media to ensure that there is highlighting of environmental issues in both print and electronic for education purposes and the government, to educate government authorities on environmental issues to formulate and implement sound environmental policies to manage natural resources.

Kenya National Discourse Forum (KNDF), established in 2003 with its headquarters in Kisumu is a multi-stakeholder, membership organization of civil society organizations (CSOs), community-based organizations (CBOs) and non- governmental organization (NGOs) dealing with issues on; environment, agriculture, land use, water and sanitation and energy among others KNDF (2013). The similarity among these organizations is that they operate in the Lake Victoria basin on activities that play a leading role in the socio-economic development. The membership is loose and open to civil society organizations seeking a platform for dialogue on issues, problems and processes related to the development of the Nile river basin. The Forum brings on board considerable strengths in its capacity to establish grass root participation in multi-stakeholder dialogues, on-the-ground research perspectives in programme development and incorporating inter-disciplinary approaches to problem solving across the social sector. Its membership has well established long-term relations with local communities, thus capable of

providing detailed local processes which is often critical to successful project and programme planning and implementation. The key areas of engagement for the multi-stakeholder body are civil society capacity building, research and dissemination, advocacy and networking, mobilization for action, knowledge and communication.

As an example of collaboration, KNDF together with Nile Basin Initiative (NBI), Water Resources Management Authority (WRMA) and Uhai Lake Forum organized the Nile Day, World Water Day and the Lake Victoria Day in February, March and April 2007 respectively. The Nile Day sought to sensitize the communities and other stakeholders on the issues of the Nile, KNDF and NBI programmes and activities and mobilize the communities to undertake activities and participate in programmes that encourage peace building and sustainable utilization of the Nile waters. The World Water Day sensitized the communities on water resources management taking cognizance that water is life although Kenya is a water scarce country. The forum was meant to promote the role of WRMA, KNDF and the communities through Water resource Users Associations (WRUAs) and other CSOs in managing and conserving the scarce water resources. Community water harvesting was given prominence with a special plea to urge communities to construct and protect simple water pans for domestic water uses in their villages. Lake Victoria Day served to sensitize the communities on the unsustainable utilization of the Lake Victoria resources that has led to the current environmental problems of the Lake. Such problems were identified as catchment degradation, heavy soil erosion, pollution of the lake from fertilizers, sewage, chemicals and silt deposits, water hyacinth infestation and the ever decreasing fisheries resources. Particular concern was expressed on the receding lake levels. Communities were urged to take control and ownership of the lake resources and manage for sustainability.

2.6 Conceptual Framework

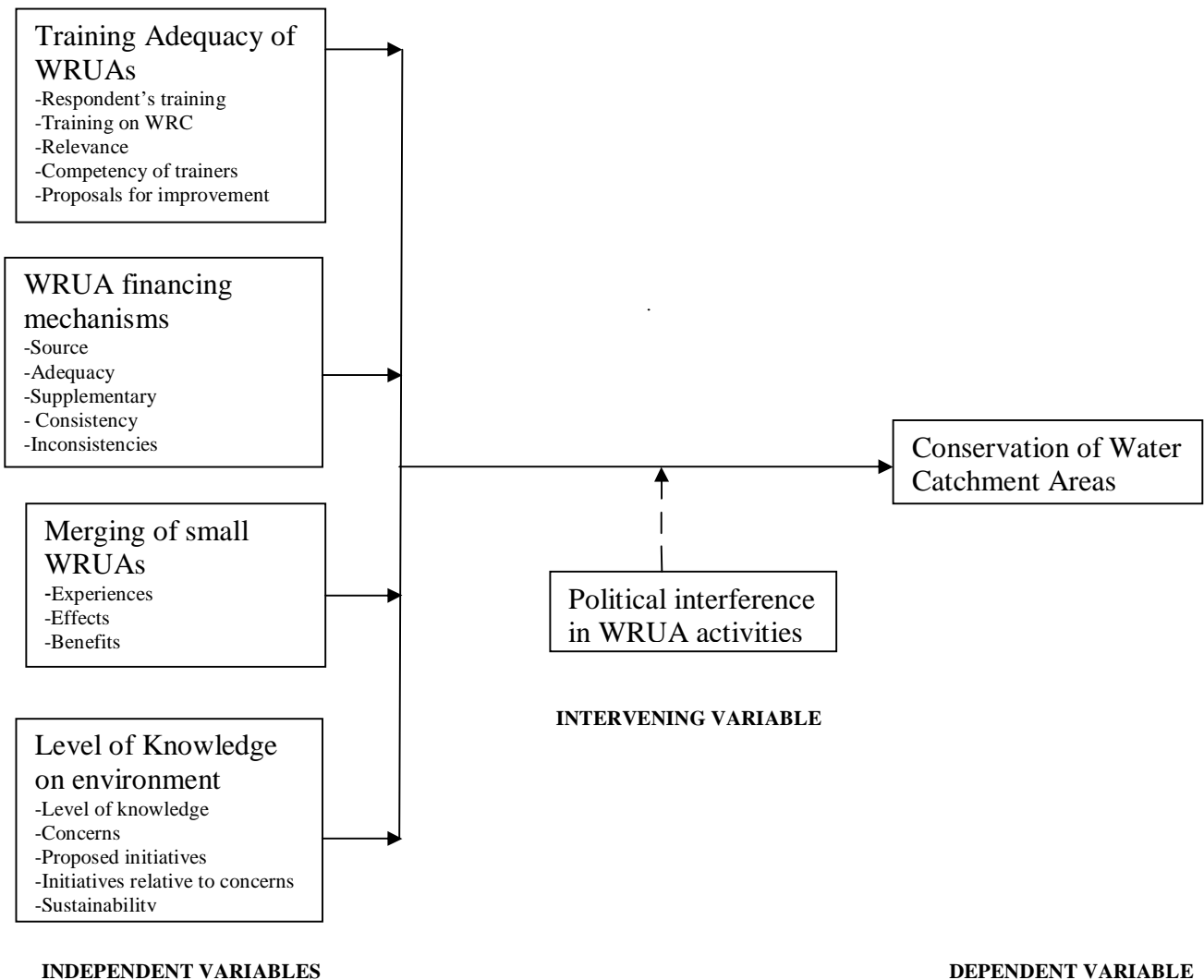


Figure 2: Conceptual Framework

2.7 Summary and Research Gaps

This chapter introduced literature review on water resources conservation at global, regional and local levels. It further provided literature on independent variables that were training adequacy, financing mechanisms, merging of small WRUAs and knowledge on environment on conservation of water catchment areas. The conceptual framework shows the interrelations between the variables considered in the study. Literature review however identified research gaps on training of WRUAs and its adequacy, existing financing mechanisms for the WRUAs, merging of small WRUAs to larger ones and knowledge on environment in Kenya in relation to conservation of water catchment areas in Kibwezi, Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter conclusively describes the research design, target population, sampling procedure and sample size research instruments, data collection procedure and data analysis that were used in carrying out the research.

3.2 Research Design

(Donald, 2006) notes research design as the structure of the research, which is the “glue” that holds all the elements in a research project together. (Orodho, 2003) further defines a research design as the scheme, outline or plan that is used to generate answers to research problems. The type of research design adopted in the study was descriptive survey design. Informed by this design, the researcher collected data by interviewing and administering questionnaires to respondents. (George, 1997) notes that descriptive survey involves asking questions (often in the form of a questionnaire) to a large group of individuals either by mail, by telephone or in person. (George, 1997) further adds that when answers to a set of question are solicited in person, the research is called an interview. It can be used when collecting information about people’s attitudes, opinions, habits or any of the variety of education or social issues (Orodho & Kombo, 2002).

3.3 Target Population

The target population was the WRUA management committee members from the five (5) largest WRUAs in Kibwezi which are Kibwezi, Mbuuni/Kithangaini/Ithaeni, Muusini, Itetani and Kiboko WRUAs who were sixty five (65) in number. These WRUAs are the most developed in this region and their study would provide data to enable the researcher draw important generalizations from the study. The choice of selection of the target population was guided by purpose of the study which was to explore factors that influenced performance of WRUAs in Kibwezi and the information on performance would have been best gathered from the management committees for the different WRUAs.

3.4 Sampling Procedure and Sample size

A sample frame is a complete listing of all the sampling units or elements that can adequately represent that population (Franfort-Nachmias & Nachmias, 1996). However there is no such a complete formal list that can adequately satisfy a researcher as a sample frame (McDaniel Jr. & Gates, 1996). In such instances, it is suggested that the researcher develops a sample frame that produces a representative sample of the population elements with the desired characteristics or attributes.

Table 3.1: Sampling Frame

WRUA Name	Population of management committee members
Kibwezi	12
Mbuuni/Kithangaini/Ithaeni	9
Muusini	15
Itetani	15
Kiboko	15
Totals	66

Source: Middle Athi WRUA merging report, 2012.

3.4.1 Sample size

Out of the 50 WRUAs within Kibwezi sub-catchment area, the largest 5 WRUAs which are: Kibwezi WRUA which had 600 registered members and 12 management committee members, covering 105Km²; Mbuuni/Kithangaini/Ithaeni WRUA which had 500 members after merging of the 3 WRUAs, 9 management committee members and spanning 137Km²; Muusini WRUA which had 600 registered members and awaiting merger with small WRUAs, with 15 management committee members and spanning 129Km²; Itetani which had 4500 members after merging with smaller WRUAs, with 15 management committee members spanning 110Km² and Kiboko WRUA which had 800 registered members, 15 management committee members and covering 120Km² were studied to gather data. Sample size for this study was obtained using the Krejcie and Morgan (1970) table of determining sample size from a given population (attached as Appendix III). With a confidence level of 95%, margin of error of 5% and a target population

of sixty five (65) WRUA management committee members, the table gave a sample size of fifty six (56) WRUA management committee members from across the five (5) WRUAs.

3.4.2 Sampling procedure

Mugenda and Mugenda (2003) define sampling as giving a number to every subject or member of the accessible population and picking the number at random. From the target population of sixty five (65) WRUA management committee members drawn from the five (5) WRUAs under study, the fifty six (56) samples were random selected to ensure equal chance of participation to the entire sample population. Each member of the sample population was assigned a number and the numbers were placed in a container from which numbers were picked at random. All the subjects corresponding to the numbers picked then formed the research sample.

3.5 Research Instruments

The study used structured disguised questionnaires (both open and closed ended questions) to gather primary data from the research subjects as far as the issues under research affect water resources management in Kibwezi area. In the case of closed-ended questions, the respondent was asked to select from a fixed list of replies or multiple options while in the case of open-ended questions, the respondent was asked to give their personal reply to the questionnaire item. Closed-ended questions were used since according to Mugenda and Mugenda (2003) they are easy to analyse and economical in terms of time and money. Open ended questions on the other hand were used to let the respondents express what they considered to be most important, Mugenda and Mugenda (2003). The questionnaires were developed by the researcher. Use of questionnaires was justified since it enabled answers to a set of questions to be solicited in person through interviews.

3.6 Reliability of the Research Instrument

Reliability is a measure of the degree to which a research instrument yields consistent results after repeated trials, Mugenda & Mugenda, (2003). Bowling (2002), notes that during questionnaire design, the interviewer should aim to clarify any inconsistencies or conflicting responses with the participant or group. To ensure reliability of the research instrument in this study, internal consistency of the data was determined.

3.6.1 Pilot Testing

According to Njuguna (2011), citing Mugenda and Mugenda (2003), the research instrument should be pre-tested using between 1% and 10% of the sample size. The research instrument was pre-tested in a pilot study of five (5) respondents, each from none sampled population of WRUAs in Kibwezi.

3.7 Validity of the Instrument

Mugenda and Mugenda (2003) contend that the usual procedure in assessing the content validity of a measure is to use a professional or expert in a particular field. In order to ensure content validity, the questionnaires were composed of carefully constructed questions to avoid ambiguity and in order to facilitate answers to all the research questions. The study supervisor was also consulted to give input and approval of the research questionnaire. This ensured that the content addressed the intended purpose and avoided ambiguity. The instrument was also presented to a Catchment Management Officer at WRMA Machakos office, an expert on water resources conservation and who works within the area under study.

3.8 Data Collection Procedures

This procedure followed a systematic process of development of the research proposal, identification of the study area, target population, sampling frame, and sample size. The research proposal was submitted for approval and permission to collect data after which the researcher obtained contacts and physical addresses of respondents from the different WRUAs. The researcher then organized to meet with the individual respondents from each WRUA at a set date for each WRUA to self-administer the questionnaires.

3.9 Data Analysis Techniques

The data collected was grouped and subjected to nominal, ordinal, ratio and interval scales of measurements. The data was then coded to allow for analysis using a computer application known as Statistical Package for Social Sciences (SPSS). Analysis of the open-ended questions data made use of qualitative methods of data analysis. This involved derivation of explanations and making use of interpretations of the findings basing on descriptions of open-ended questions. Quantitative analysis on the other hand involved derivation of statistical descriptions and interpretation of data that relied purely on numerical values. It further involved making conclusions from numerical values through the process of quantification that can allow

reliability, comparability and validity of the findings. The findings were then presented in tables with percentages and frequencies used to present descriptive analysis findings. The information was finally summarized and findings related and presented in relation to the research questions and objectives.

3.10 Ethical Considerations

Ethical issues in this research were addressed through the use of the introductory letter (Appendix I) which accompanied the questionnaire. It follows that the following ethical issues were be addressed: Consent and voluntary participation of the respondents was sought and presumed obtained by willingly responding; Right to know the purpose of the study and how the process was to be conducted was communicated in both the letter and the questionnaire and the right to confidentiality and anonymity was assured and the data and information arising thereof was treated and reported on in such a way that it would not be traced to any person.

Throughout this research project report, the work of others was acknowledged through use of citation and references. The principle of objectivity was adhered to during the entire research process including the design, data collection, analysis and interpretation of data. In particular, analysis and interpretation of data was conducted in an objective way in order that the results did not affect the participants or mislead those who read the project report. It is my view that in upholding of the above, most of the ethical issues were addressed.

3.11 Operational Definition of Variables

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

Table 3.2 Operationalization of variables

Variable	Type of variables	Indicators	Measurement	Measurement scale	Data analysis method
Factors influencing conservation of water catchment areas in Kibwezi, Kenya	Dependent	<ul style="list-style-type: none"> - Evidence of adequate training programmes on environmental conservation - Well coordinated financing mechanisms for WRUA activities - Implementation of WRUA activities as indicated in their SCMPs - Acceptable level of knowledge on environment 	-Effectiveness of water resources conservation as shown by records and responses	Ordinal	<ul style="list-style-type: none"> -Descriptive statistics -Central tendency -Frequency distribution
Training of WRUAs on conservation of water catchment areas	Independent	<ul style="list-style-type: none"> - Training sessions on environmental conservation held for WRUA members - Training sessions on environmental conservation held for WRUA trainers - Outputs of the environmental conservation training sessions - Outcomes of the environmental 	<ul style="list-style-type: none"> -Adequacy of the trainings held for water resources conservation - The number of WRUA members trained - The number of WRUA trainers trained 	Ordinal	<ul style="list-style-type: none"> -Descriptive statistics -Central tendency -Frequency distribution

		conservation training sessions			
WRUA financing mechanisms in conservation of water catchment areas	Independent	<ul style="list-style-type: none"> - Availability of financing records for the WRUAs -Identification of the sources of funding for the WRUAs - Information on adequacy of funding available to the WRUAs -Availability of alternative WRUA funding sources 	<ul style="list-style-type: none"> -Adequacy of existing WRUA financing sources -Gaps in WRUA financing - The number of staff trained 	Ordinal	<ul style="list-style-type: none"> -Descriptive statistics -Central tendency -Frequency distribution
Merging of small WRUAs in conservation of water catchment areas	Independent	<ul style="list-style-type: none"> - Availability of records on mergers from the WRUAs - Development adoption of new SCMPs for the merged WRUAs -Adoption of new SCMPs for the merged WRUAs 	<ul style="list-style-type: none"> -Total number of WRUAs in existence after the merging exercise -The number of WRUAs merged -Activities carried out by the merged WRUAs 	Ordinal	<ul style="list-style-type: none"> -Descriptive statistics -Central tendency -Frequency distribution
Knowledge on environment in conservation of water catchment areas	Independent	<ul style="list-style-type: none"> -General knowledge on environmental issues -Identification of environmental concerns in Kibwezi Sub Region 	<ul style="list-style-type: none"> -Level of academic qualifications -Background on environmental management 	Ordinal	<ul style="list-style-type: none"> -Descriptive statistics -Central tendency -Frequency distribution

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the analysis, presentation and interpretation of data collected from the fielded items in the study questionnaire. Analysis was done using descriptive statistics and inferential statistics and findings of the study were presented in form of tables. The data was then interpreted according to the research questions.

4.2 Response Rate of the Study

This gives information on the number of the study respondents who returned the questionnaires the researcher administered for research data collection. Fifty six (56) questionnaires were issued to randomly selected respondents

Table 4.1: Response rate of the study

	Frequency	Percentage
Responses	52	92.86
Non Responses	4	7.14
Total	56	100

Fifty two (52) questionnaires were completed and returned, giving a response rate of 92.86%. As for the 4 unreturned questionnaires which represent 7.14%, this can be attributed to the inability by the respondents to return the questionnaire to the agreed questionnaire collection points and on the agreed dates. This means that the response rate was acceptable for the study since it was above 75% which is the threshold.

4.3 Background of the Respondents

The respondent's background information is necessary to describe the characteristics of the individual participant in a particular study. It has some ethical significance in that the researcher justifies that the research involved real subjects and not based on his personal subjective generalizations.

4.3.1 Gender Profile of the Respondents

The respondents were asked to indicate the gender profile in terms being male or female.

Table 4.2: Gender Profile of the Respondents.

Gender	Frequency	Percentage
Male	32	61.5
Female	20	39.5
Totals	52	100

Table 4.2 revealed that majority of the respondents 32 (61.5%) were men while the female were 20 (39.5%). The female were slightly above a third and this is evidence or an indicator that the WRUAs have implemented the requirements of the constitution of Kenya which require that either gender should have a third of representation in all public institutions or offices.

4.3.2 Age of the respondents

The research wanted to find out the age of the respondents. The findings are tabulated in Table 4.3.

Table 4.3: Age of Respondents

Age	Frequency	Percentage
21-40	10	19.2
41-60	28	53.8
61-80	14	27.0
Totals	52	100

The findings in Table 4.3 revealed that, majority of the respondents 28 (53.8%) were of age between (41–60) years. This was followed by age between (61–80) years at 27%. The least was age between (21-40) years. This implied that age between (41-60) years formed majority of opinion makers in the society, followed by age between (61-80) years and lastly age between (21-40) years.

4.3.3 Occupation of the respondents

The research targeted the WRUA management committee members from the WRUAs in Kibwezi.

Table 4.4: Occupation of the Respondents

Occupation	Frequency	Percentage
Employed	3	5.8
Not Employed	35	67.3
Business Person	13	25
Non response	1	1.9
Totals	52	100

In Table 4.4 the researcher established that the majority 35 (67.3%) were unemployed, followed by 13 (25%) who were business people and the least 3 (5.8%) were employed. This implied that conservation of water resources in Kibwezi was laid squarely on the hands of unemployed who are available to take up leadership of the management committees.

4.3.4 Education Levels of the Respondents

The researcher was interested in establishing the respondents' level of formal education.

Table 4.5: Education Levels of the Respondents

Education Level	Frequency	Percentage
Primary	16	30.8
Secondary	30	57.7
Tertiary	6	11.5
Totals	52	100

In Table 4.5 the researcher established that majority 30 (57.7%) of the respondents had secondary school as their highest education level, followed by 16 (30.8%) with primary school education and the least was 6 (11.5%) who had tertiary education as their highest education level. The findings implied that a high number 46 (88.5%) of respondents lacked tertiary education necessary for proper management of the WRUAs.

4.3.5 Marital Status of the Respondents

The researcher was interested in establishing the marital status of the respondents'. This information was necessary because it informed the researcher on the social engagements of the respondents.

Table 4.6: Marital Status of the Respondents

Marital Status	Frequency	Percentage
Single	1	1.9
Married	47	90.4
Divorced/Separated	1	1.9
Widowed	3	5.8
Totals	52	100

From the responses on Table 4.6, majority of the respondents (90.4%) were married. This was followed by widowed at 3 (5.8%). The least were both the single and divorced/separated at 1 (1.9%). This showed that this was a socially stable society and an evidence of social; responsibility within the community.

4.3.6 The Respondent's WRUA Background Information

The respondent's WRUA background information was necessary to capture basic information as regards the WRUAs under study.

4.3.6.1 Composition of Specific WRUAs to the Study

The researcher was interested in knowing the number of respondents drawn from each specific WRUA. The findings were presented in Table 4.7.

Table 4.7: Composition of Specific WRUAs to the Study

Name of WRUA	Frequency	Return rate	Percentage
Kibwezi	11		21.2
Mbuuni/Kithangaini/Ithaeni	6		11.5
Muusini	14		26.9
Itetani	13		25
Kiboko	8		15.4
Totals	52		100

As evidenced by Table 4.7, Muusini WRUA had the majority of respondents 14 (26.9%), Itetani was second at 13 (25%), Kibwezi was third at 11 (21.2%), Kiboko was fourth at 8 (15.4%) while Mbuuni/Kithangaini/Ithaeni had the least at 6 (11.5%). The sampling design was random sampling and therefore Muusini and Itetani had their entire WRUA committee members in the sample frame. This explained the high frequencies in the study form these two WRUAs.

4.3.6.2 Districts of Location of WRUAs under Study

The researcher wanted to identify by name of district in Kenya where the WRUAs under study are located. The findings are tabulated in Table 4.8

Table 4.8: Districts of Location of WRUAs under Study

Name of WRUA	Home District
Kibwezi	Kibwezi
Mbuuni/Kithangaini/Ithaeni	Kathiani
Muusini	Mwala
Itetani	Mbooni West
Kiboko	Kiboko Twaandu Makindu

Table 4.8 revealed that all WRUAs under study were from different districts that are covered by Kibwezi water catchment.

4.4 Influence of Adequate WRUA Training on Conservation of Water Catchment Areas.

Training on water resources conservation is important in efficient management of water resources at community level. The quality of such training therefore guarantees better management of the same natural resource. However any training programme must be evaluated by the participants for the purpose of future improvements.

4.4.1 Respondents' Training on Water Resources Conservation

The researcher wanted to find out if the respondents' WRUAs had ever been trained on water resources conservation. Table 4.9 shows the responses to the questionnaire item.

Table 4.9: Respondents' Training on Water Resources Conservation

Trained on WRC	Frequency	Percentage
Yes	43	82.7
No	9	17.3
Totals	52	100

Based on the responses on Table 4.9, majority 43 (82.7%) of the respondents had been trained on water resources conservation while 9 (17.3%) had not. The findings implied that 9 (17.3%) of WRUA managers at the community level had not been trained on water resources conservation. This also implied that capacity building at the community level was below expectation since the trained WRUA managers imparted their skills to their fellow members in the WRUAs.

4.4.2 Trainers of WRUAs on WRC

The WRMA is the primary organization that plans and holds training programmes in WRUAs to build capacity on water resources management in communities. The researcher wanted to find out from the respondents, who had conducted the trainings in their WRUAs on water resources conservation, whether it had been WRMA or any other organization. Table 4.10 shows the responses to the questionnaire item.

Table 4.10: Trainers of WRUAs on WRC

Trainer	Frequency	Percentage
WRMA Staff	16	30.8
WRMA staff and Rural Focus	12	23.1
Taita Forum	1	1.9
Rural Focus Kenya Ltd	8	15.4
NGOs	15	28.8
Totals	52	100

From the responses on Table 4.10, it was found out that majority 16 (30.8%) of the respondents were trained by WRMA staff, followed by NGOs at 15 (28.8%). Collaboration between WRMA and Rural Focus Kenya Ltd came third at 12 (23.1%), Rural Focus Kenya Ltd came fourth at 8 (15.4%) while Taita Forum was the least at 1 (1.9%). This implied that WRMA staff carried out majority of the training programmes in the WRUAs under study, a revelation of undertaking of its lead role in WRUAs' activities as expected by law. In addition it was found out that development NGOs have continued to actively engage in water resources conservation in Kibwezi area as evidenced by Table 4.10.

4.4.3 Relevance of WRUA Training Programmes

One of the requirements of training programmes to ensure they are effective is relevance. This ensures that a long term impact is left by the intervention. The researcher wanted to find out from the research subjects how they rated the relevance of the training on water resources management offered to their WRUAs. Table 4.11 shows the findings.

Table 4.11: Relevance of WRUA Training Programmes

Relevance of training	Frequency	Percentage
Not at all	0	0
Average	7	14
Medium	24	48
High	14	28
Very high	5	10
Totals	50	100

The responses in Table 4.11 showed majority of the subjects 24 (48%) rated the relevance of training to be Minimum, followed by 14 (28%) who rated it at High, followed by 7 (14%) who rated it at Average, and lastly 5 (10%) who rated it at Very High. This was interpreted to mean that although there were differences in ratings on relevance of the training programmes, all those who responded agreed to the relevance of the training programmes. Two respondents however did not give their opinion. This was attributed to their indifference regarding the matter.

4.4.4 Competency of WRUA Trainers

The researcher sought the opinion of the respondents on whether the WRUA trainers who had trained them possessed adequate training skills to effectively fit the purpose of training the WRUA community. Table 4.12 shows the responses.

Table 4.12: Competence of WRUA Trainers

Competency of WRUA Trainers	Frequency	Percentage
Competent	31	59.6
Not Competent	21	40.4
Totals	52	100

The results in Table 4.12 showed that 31(59.6%) had the opinion that trainers were competent against 21 (40.4%) thought the contrary. Since more than half of the respondents thought they were competent this was interpreted to mean the respondents were confident with the trainers.

4.4.5 Improvement of WRUA Training Delivery

The research wanted to find out what the respondents' would propose to improve delivery of the training programmes. Table 4.13 shows the findings.

Table 4.13: Proposals for Training Improvement

Proposal	Frequency	Percentage
More training	19	37.5
Indifferent	33	63.5
Totals	52	100

According to the responses, the majority, 33 (63.5%) were of the opinion that the training was adequate against 19 (37.5%) who needed further training. Since the majority were of opinion that the training was adequate this was interpreted to mean that the training delivery met its intended objectives. The proposal for improved training programmes was attributed to the respondents' willingness to continue learning more about water resources conservation.

4.5 Influence of WRUA Funding Mechanisms on Conservation of Water Catchment Areas.

Like most development activities and or projects at the community level in a developing country, financial resources play a pivotal role towards successful realization and success of the same. The source of funding, the reliability of the funding, financing alternatives available and consistency of funding with the project activities are key factors to success or failure of the projects. Funding for community projects may be insufficient for the planned project activities. The project donors may therefore give the community a leeway to source for alternative financial support for their project to supplement the donor funding.

4.5.1 Source of Funding for the WRUA Activities

The researcher wanted to find out the source of funding for the different WRUAs. Table 4.14 shows the findings.

Table 4.14: Source of Funding for the WRUA Activities

Source of WRUA funding	Frequency	Percentage
Water Services Trust Fund	42	80.8
NGOs	10	19.2
Totals	52	100

According to the responses on Table 4.14, 42 (80.8%) of the respondents indicated to get funding for their WRUAs from Water Services Trust Fund while the remaining 10 (19.2%) indicated that their WRUAs got funding from a combination of two sources, Water Services Trust Fund and NGOs. This confirmed WSTF to be the main source of funding for WRUAs. The respondents who indicated they got funding from NGOs were unable to state them, which was attributed to lack of information on who funded their WRUAs.

4.5.2 Adequacy of Funding to WRUA Activities

From the given alternatives, the respondents were asked to choose among the alternatives on their opinion on the adequacy of the funding for their specific WRUAs. Table 4.15 shows the responses.

Table 4.15: Adequacy of Funding to WRUA Activities

Funding adequacy	Frequency	Percentage
Adequate	2	3.8
Inadequate	50	96.2
Totals	52	100

According to the responses in Table 4.15, majority 50 (96.2%) felt that the funding for the WRUAs was inadequate while 2 (3.8%) felt it was adequate. This meant that the WRUA funding was inadequate as indicated by an overwhelming majority.

4.5.3 Supplementary Funding Available to WRUAs

The researcher sought to find out from the respondents what they thought would be viable alternative avenues to finance their WRUA activities. Based on the responses received, the respondents had varied opinions; however, all felt there was need to seek additional funding for their WRUA activities. They felt that additional funding to their WRUAs could have been sourced from other avenues such as NGOs, revolving funds, grants, devolved funds such as CDF, county government support and in-Kind support from individual WRUA members.

4.5.4 Consistency of WRUA Funding Cycle with Sub-Catchment Development Cycle

A Sub-Catchment Development Cycle is a guideline to the implementation of water conservation project activities within a particular Sub-Catchment, together with specific budgets, timelines for their implementation and evaluation plans. The researcher wanted to find out from the respondents their opinion on the consistency of the WRUA Funding Cycle relative to the Sub-Catchment Development Cycle. Their opinions are tabulated in Table 4.16.

Table 4.16: Consistency of WRUA Funding Cycle with Sub-Catchment Development Cycle

Funding Cycle Consistent	Frequency	Percentage
Consistent	3	5.8
Inconsistent	47	90.4
Don't know	2	3.8
Totals	52	100

The findings in Table 4.16 were that majority of the respondents, 47 (90.4%) felt that there inconsistencies of the WRUA funding cycle relative to the Sub-Catchment Development Cycle. However, 3 (5.8%) felt that there was consistency while 2 (3.8%) did not know. Going by the majority who formed 90% of the respondents, it meant that all the WRUA activities were not being implemented as per the Sub Catchment Management Plans that guide their implementation.

4.5.5 Reasons for Funding Cycle Inconsistencies

The researcher wanted to explore factors that contribute to inconsistencies between WRUA Funding Cycle with the respective Sub-Catchment Development Cycle. The findings from the respondents are tabulated in Table 4.17.

Table 4.17: Reasons for Funding Cycle Inconsistencies

Reason	Frequency	Percentage
Slow operations in WRMA offices	13	25
Bureaucracy	8	15.4
Delays in Funding	21	40.4
Inadequate Funding	10	19.2
Totals	52	100

The findings in Table 4.17 revealed majority at 21 (40.4%) indicated Delays in Funding as the reason for inconsistencies, followed by Slow operations in WRMA offices at 13 (25%), followed by Inadequate Funding at 10 (19.2%) and lastly Bureaucracy at 8 (15.4%). This implied that all reasons in given in table 4.17 were behind funding inconsistencies in the WRUAs.

4.5.6 Viable solutions to Funding Inconsistencies

The researcher wanted to explore from the respondents their opinion on what could have been viable solutions to the identified funding cycle inconsistencies. Table 4.18 presents the findings.

Table 4.18: Viable solutions to Funding Inconsistencies

Reason	Frequency	Percentage
Well coordinated funding	28	53.8
Ensuring adequate funding	13	25
Minimizing bureaucracy	11	22.2
Totals	52	100

Findings in Table 4.18 revealed the majority 28 (53.8%) thought that Well Coordinated Funding to the WRUAs to be the best solution to funding inconsistencies, followed by Ensuring Adequate Funding for the WRUAs at 13 (25%) and lastly Minimizing Bureaucracy in disbursing the WRUA funds at 11 (22.2%). This implied that a well coordinated funding to the WRUAs that was proposed by over 50% of the respondents was the most effective solution to funding inconsistencies since it would do away with all the contributors to inconsistencies in WRUA funding.

4.6 Influence of Merging Small WRUAs in Conservation of Water Catchment Areas.

Merging of WRUAs involves integrating the small WRUAs into the already existing larger ones to ensure ease of administration by reducing on the number of entities that need to be overseen by WRMA and WSTF. In addition merging WRUAs ensure their sustainability through efficient use of the limited resources for water resources conservation.

4.6.1 Experiences of WRUA Merging

The research study wanted to find out from the subjects whether they had been affected in any way by the merging of small WRUAs with already existing larger ones. Their responses to the questionnaire item are tabulated in Table 4:19.

Table 4.19: Experiences of WRUA Merging

Experience of WRUA Merging	Frequency	Percentage
Yes	33	63.5
No	19	36.5
Totals	52	100

The findings in Table 4.19 indicated that majority 33 (63.5%) of the respondents had experienced merging of WRUAs while 19 (36.5%) had not. This implied that majority of the WRUAs had been affected by merging of small WRUAs and in effect their implementation plans had been affected due to the changed boundaries of coverage.

4.6.2 Effects of WRUA Merging

The research study wanted to find out from the research subjects how specifically they had been affected by the WRUA mergers. Their responses to the questionnaire item are tabulated in Table 4:20.

Table 4.20: Effects of WRUA Merging

Effect	Frequency	Percentage
Accommodating Small WRUA(s)	32	61.5
Non response	19	36.5
Other(s)	1	1.9
Totals	52	100

The findings in Table 4.20 revealed that the majority, 32 (61.5%) of the respondents had accommodated small WRUAs, followed by 19 (36.6%) who did not give response to the item and lastly 1(1.9%) did not understand how exactly he was affected by the merging of small WRUAs. The findings implied that most of the respondents had been affected through accommodating other WRUAs. The high non-response to the questionnaire item was attributed to the fact that the section of the questionnaire was open-ended and the respondent might have had no specific response to the item.

4.6.3 Opinion on Benefits of Merging Small WRUAs

The researcher wanted to find out the opinion of the respondents on the benefits if any, resulting from merging small WRUAs. The responses to the questionnaire item are tabulated in Table 4:21.

Table 4.21: Opinion on Benefits of Merging Small WRUAs

Beneficial	Frequency	Percentage
Yes	25	48.1
No	27	51.9
Totals	52	100

The findings revealed that the majority, 27 (51.9%) were of the opinion that the merging of small WRUAs with larger ones was non-beneficial against 25 (48.1%) who concurred that it was. Since standalone WRUAs receive funding to solely implement its activities, it was expected that since the respondents were direct managers of these funds at the community level, then the indifference was attributed to reduced access or total loss of authority over the use of the funds.

4.6.4 Specific Benefits of Merging Small WRUAs

The study sought to explore from the respondents specific benefits of merging small WRUAs with the existing larger ones. The findings are tabulated in Table 4.22.

Table 4.22: Specific Benefits of Merging Small WRUAs

Specific Benefit	Frequency	Percentage
Ease of administration	35	67.3
Sustainability	14	26.9
Ease of management by WRMA/WSTF	3	5.7
Totals	52	100

The findings revealed that majority, 35 (67.3%) were of opinion that merging small WRUAs would ease administration of the organizations, followed by sustainability of the WRUAs at 14 (26.9%) and lastly ease of management of WRUAs by both WRMA and WSTF. The findings implied that the ease with which WRUAs were administered and the WRUAs' sustainability were more important considerations to the respondents than how easy WRMA/WSTF managed the entities.

4.7 Influence of Knowledge on Environment on Conservation of Water Catchment Areas.

The endeavour to promote, monitor, conserve, protect and sustainably manage the environment for national development requires availability of well informed professionals. In addition, it has been globally realized that a sustainable environment is an essential precondition in national development, poverty suppression and better livelihoods for all generations.

4.7.1 Respondents' Level of Knowledge on Environment

The study wanted to find out from the respondents their perceived levels of knowledge on environment. Their responses to the questionnaire item are tabulated in Table 4:23.

Table 4.23: Respondents' Level of Knowledge on Environment

Level	Frequency	Percentage
Poor	1	1.9
Basic	10	19.2
Good	30	57.7
Very good	8	15.4
Excellent	3	5.8
Totals	52	100

The findings in table 4.23 revealed majority, 30 (57.7%) perceived themselves to have had Good knowledge on environment, followed by Basic knowledge at 10 (19.2%), followed by Very Good knowledge at 8 (15.4%), followed by Excellent knowledge at 3 (5.8%) and lastly Poor knowledge at 1 (1.9%). This implied that the majority 51 (98.1%) had acceptable knowledge on environment.

4.7.2 Environmental Concerns Identical with Respondents' WRUAs

The researcher wanted to find out the environmental concerns among five (5) given choices that the research subjects identified with their WRUAs. The respondents had the option to choose several choices. Their responses to the questionnaire item are tabulated in Table 4.24.

Table 4.24: Environmental Concerns Identical with Respondents' WRUAs

Environmental Concerns	Frequency	Percentage
Sand scooping	47	28
Illegal use of land next to rivers	31	18.3
Water pollution	37	21.8
Deforestation	31	18.3
Destruction of springs/wetlands	23	13.6
Totals	169	100

The study findings in Table 4.24 revealed majority, 47 (28%) indicated Sand Scooping as the environmental concern identical with their WRUA. This was followed by water pollution at 37 (21.8%), then illegal use of land next to rivers and deforestation both at 31 (18.3%) and lastly destruction of springs /wetlands at 23 (13.6%). This implied that all the water resources conservation related environmental concerns raised were identifiable with all the WRUAs represented in the study but at different scales in different WRUAs.

4.7.3 Proposed Initiatives in Response to Environmental Concerns in WRUAs

The research study wanted to find out activities that would have been proposed as initiatives in response to the environmental concerns identifiable in areas where their WRUAs are located. Their responses to the questionnaire item are tabulated in Table 4.25.

Table 4.25: Activities that Address Identified Environmental Concerns

Activity	Frequency	Percentage
Sensitization on environment	19	14.84
Forestation	31	24.22
River pegging	10	7.81
Weir building	8	6.25
Sand dam construction	18	14.06
Wetland/spring protection	23	17.97
Patrol of pollution spots	2	1.56
Gabbion construction	14	10.94
Water pan construction	13	10.16
Totals	128	100

As per the findings in Table 4.25 majority 31 (24.22) of the respondents proposed forestation as an activity to address the identified environmental concerns. Wetland/spring protection was second at 23 (17.97) who proposed, sensitization on environment was third at 19 (14.84%), sand dam construction was fourth at 18 (14.06%), gabbion construction was fifth at 14 (10.94%), water pan construction was sixth at 13 (10.94%), river pegging was seventh at 10 (7.81%), weir building was eighth at 8 (6.25%) and patrol of pollution spots was last at 2 (1.56%). This implied that although forestation was the popular solution to address the identified environmental concerns, it could not be a standalone solution hence there was need to incorporate all the other solutions for sustainable and effective results.

4.7.4 Adequacy of Proposed Initiatives Relative to the Identified Environmental Concerns

The study wanted to find out the adequacy of the proposed activities in addressing the environmental concerns within WRUAs in Kibwezi. The responses to the questionnaire item are tabulated in Table 4.26.

Table 4.26: Adequacy of Proposed Initiatives Relative to the Identified Environmental Concerns

Adequate Enough	Frequency	Percentage
Yes	6	8.7
No	46	92.3
Totals	52	100

The findings in Table 4.26 were that majority 46 (92.6%) were of the opinion that the proposed initiatives were inadequate against 6 (8.7%) who concurred. The results implied that due to the dynamism of environment and issues surrounding the subject, there is never been a perfect solution to a single environmental concern but only sustainable solutions to manage the environment.

4.7.5 Solutions that Sustainably Address Environmental Concerns Identified

The respondents who answered in the negative as to whether they considered their proposed activities to sustainably address all the environmental concerns within their WRUAs were requested to give opinion on what could have been done to fully address environmental concerns identified. Their responses to the questionnaire item are tabulated in Table 4.27.

Table 4.27: Solutions that Sustainably Address Environmental Concerns Identified

Solution	Frequency	Percentage
Creation of environmental awareness	33	44
Formulating an environmental conservation policy	23	30.66
Constructing electrical fences around springs/wetlands	9	12
Suspending sand harvesting	5	6.67
Stopping deforestation	5	6.67
Totals	75	100

The findings in Table 4.27 revealed that majority, 33 (44%) of the respondents were of the opinion that awareness creation would sustainably address environmental concerns identified. This was followed in second by formulating an environmental conservation policy at

23 (30.66%), followed in third by constructing electrical fences around springs/wetlands at 9(12%), finally followed by both Suspending sand harvesting and Stopping deforestation at 5 (6.67%). This implied that for sustainable results regarding the concerns identified, a combination of all the above initiatives would have yielded the best results.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarized the study findings and drew conclusions from the data collected. In this chapter, recommendations to the stakeholders in water resources conservation in Kibwezi were made to improve the performance of the WRUAs in conservation of water catchment areas in Kibwezi sub catchment. Areas of further research were also cited in this chapter.

5.2 Summary of findings

The purpose of this section was to provide an outline to the results of the research study that was carried out to determine the factors influencing WRUAs in conservation of water catchment areas in Kibwezi.

The study found that influence of adequate training programmes influenced performance of WRUAs in conservation of water catchment areas in Kibwezi. This implied that a well coordinated and inclusive approach to development of training programmes was necessary for the training programmes to be effective.

The study found that influence of WRUAs financing mechanism was ranked high among the respondents to the research study. This was because of the inconsistencies associated with the funding cycle by the respondents that included delays in funding, slow operations at WRMA offices, inadequate funding and bureaucracy. The study also found that the WRUAs relied majorly and almost entirely on WSTF funding to implement their sub catchment management plans.

Influence of merging of small WRUAs in conservation water catchment areas in Kibwezi was lowest among the respondents. This was attributed to the managers of the WRUAs having had opposition to loss of control of the funds.

The study found that the influence of level of knowledge on environment in conservation water catchment areas in Kibwezi was ranked highest among the respondents. This was attributed to the direct relationship between the two since better knowledge on environment

would have resulted to making informed choices and better management of water resources as a result.

5.3 Discussion of Findings

The discussion of the outcomes was based on the outputs from Statistical Package for Social Sciences software. The study was to establish the influence of WRUA training programmes in conservation water catchment areas in Kibwezi, found that relevant training programmes influenced performance of WRUAs in conservation of water resources. This agrees with Donkor and Wolde, (1997) who found that there were urgent training needs for the water sector in project planning and preparation at the micro level, water resources sector planning and their relation to national development planning at the macro-economic level. This further agrees with UNESCAP (2002) who affirm in their report on public awareness on water conservation and efficiency that clients to institutions should be encouraged in setting an example in government-led water conservation awareness strategy.

With a view to establish the influence of WRUA financing mechanisms in conservation water catchment areas in Kibwezi, the study found that it was ranked high among the respondents to the research study. The study also found that the WRUAs relied almost entirely on WSTF funding to implement their sub catchment management plans. This is in agreement with the findings of Conservation Finance Alliance Guide (2003) that reckoned that there are more than 50 conservation trust funds have been established around the world for the purpose of financing nature conservation. The same argument is supported by WRMA Performance Report 1 (2010) according to which there is a number of avenues for funding WRUA prepared projects, the major one of which is the WRUA Development Cycle (WDC) which has been established by WRMA and further implemented by the Water Services Trust Fund (WSTF).

The study with a view to establish the influence of merging of small WRUAs in conservation water catchment areas in Kibwezi found that the respondents ranked merging of WRUAs lowest. This is in agreement with (WRUA Rationalization Report for Middle Athi Sub Region, 2012) that cited rationalization or merging of smaller WRUAs as one major challenge after many WRUAs had been formally registered but within spatial distribution that was unsustainable.

In an effort to establish the influence of knowledge on environment in conservation water catchment areas in Kibwezi the study found that it was ranked highest among the

respondents. This is supported by MEMR, (2013) who asserts that the realization of a sustainable environment is an essential precondition in national development, poverty suppression and better livelihoods for all generations which can be achieved through implementing a National Environmental Education and Awareness Initiative (NEEAI) to educate and raise awareness on environmental challenges to all Kenyans and to encourage the participation of all stakeholders in environmental conservation and management. This is further supported by Muthui (2012) in an assessment of the level of awareness/knowledge and practices of environmental management in schools in Kenya in Nairobi County who found out that students from most of the secondary schools in Nairobi County were aware of the common environmental problems in their schools (noise pollution, smelly toilets, air pollution etc). Muthui (2012) in the same study recommended that efforts be made to further sensitize the students on environmental problems and their consequences.

5.4 Conclusions of the Study

Water resources conservation is a multi-faceted issue that can only be successful through a well coordinated approach involving all stakeholders. To restore the degraded water catchment areas in Kibwezi which are majorly as a result of human activities in the region, hasty measures need to be taken to prevent adverse effects in the long term. The study considers that with a well coordinated approach, conservation of water resources can be realized and impact any society positively in relation to the macro-economics of the same society.

The study found out that relevant training programmes coupled with adequate, timely and well coordinated funding mechanisms together with acceptable levels of knowledge on environment are directly related to WRUAs' success in conservation of water resources in Kibwezi. Merging of small WRUAs was directly related to easy administration and sustainability of the WRUAs although it was not found to be beneficial to the WRUAs according to the respondents.

5.5 Recommendations of the Study

Water is a scarce resource and essential for sustenance of life on planet, whose scarcity is linked to among other factors, climate change which is directly associated with human activities. The issues surrounding water resources conservation need to be understood at global, local and community levels and interventions thereof planned and implemented at all these levels.

1. The study suggests the need for enhanced training to WRUAs which should be relevant to water resources conservation to meet the changing dynamics in environment related issues. It should be further ensured that the training level for WRUA management committee members is raised from the current 82.7% to 100% is to have skilled conservation managers during WRUA activity implementation. The quality of such training should however be guaranteed to ensure better management of the same natural resource. In addition the training programmes must be evaluated through participant feedback for the purpose of improvements.
2. The study further suggests well adequate and timely disbursed funding for the WRUAs that is well coordinated. Adequate funding would ensure that all the planned WRUA activities are implemented to completion. Timely disbursement of the funds would guarantee that the WRUA activities are implemented as per the WRUA Funding Cycle with the respective Sub-Catchment Development Cycle and avoid any inconsistencies thereof. A well coordinated approach to funding the WRUAs would ensure that issues of bureaucracy, delays at WRMA offices, delay in funding and inadequate funding are well addressed. In addition, other avenues of funding to supplement the WDC funding from WSTF to lessen dependence on this single source of funding for the WRUAs.
3. The study suggests a well coordinated and participatory approach to the merging of small WRUAs. This would ensure support and acceptance from the affected communities since the research indicates that the issue is unpopular with the respondents. Benefits of the process would be easy administration of the WRUAs due a reduction in number of the entities, sustainability of the WRUAs due to efficient allocation of resources and by easy management by WRMA/WSTF.
4. The study finally suggests creation of environmental awareness on water resources conservation through public barazas across the entire Kibwezi region to promote and enhance knowledge among the community on water resources conservation. It is further suggested that environmental management policy is formulated to oversee both legal and activity implementation aspects of water conservation within Kibwezi.

5.6 Suggestions for further Studies

There is need for further research to be done on the research topic. This will help identify other factors that affect performance of WRUAs in conservation of water resources in Kibwezi.

The study addressed itself to the influence of training of WRUAs, financing mechanisms for WRUAs, merging of small WRUAs and knowledge on environment on conservation of water catchment areas in Kibwezi. This study was therefore not exhaustive of the many factors that affect WRUAs in their activities and therefore would recommend research in this area. This will help identify other issues that affect WRUAs activity implementation in Kibwezi sub catchment.

The areas include:

1. To analyze the role of gender in the conservation of water resources in Kibwezi.
2. To investigate the benefits that communities accrue from programs associated with water resources conservation in Kibwezi.
3. To explore the community capacities to sustain their water development projects.
4. To suggest a possible model for implementation of WRUA activities in Kibwezi.

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APPENDICES

Appendix I: Letter of Transmittal on Data Collection Instruments

Noel Ndeti,
P. O. Box 26281- 00100,
Nairobi.
22nd April 2013.

Dear Sir/Madam,

Re: Factors Affecting Performance of Water Resource Users' Associations in Conservation of Water Catchment Areas in Kibwezi, Kenya.

I am a Master of Arts student (Project Planning and Management), School of Continuing and Distance Education, Nairobi Town Centre, registration number L50/71993/2011. I am carrying out a study on 'Factors Affecting Performance of Water Resource Users' Associations in Conservation of Water Catchment Areas in Kibwezi, Kenya'.

To facilitate this study, you have been randomly selected as a participant in answering the questionnaire. You are requested to respond to all the questions as your response will be very useful to this study.

Kindly note that this is confidential data that will only be treated with utmost confidentiality and shall only be used for academic research purposes only.

Yours sincerely,

Noel Ndeti

Appendix II: Water Resource Users' Associations Questionnaire

Instructions

Put a tick (✓) against the most appropriate answer where the choices are given and any other appropriate information in the space provided.

Part A: Background of the respondent

	Questions and filters	Coding Categories
1	What is your gender	Male..... <input type="checkbox"/> Female..... <input type="checkbox"/>
2	How old are you?	1-20..... <input type="checkbox"/> 21-40..... <input type="checkbox"/> 41-60..... <input type="checkbox"/> 61-80..... <input type="checkbox"/>
3	What do you do to earn for a living?	Employed..... <input type="checkbox"/> Not Employed..... <input type="checkbox"/> Business person..... <input type="checkbox"/>
4	What is your highest level of education attained?	Non formal..... <input type="checkbox"/> Primary..... <input type="checkbox"/> Secondary..... <input type="checkbox"/> Tertiary..... <input type="checkbox"/>
5	What is your marital status?	Single..... <input type="checkbox"/> Married <input type="checkbox"/> Divorced/Separated <input type="checkbox"/> Widowed <input type="checkbox"/>

Part B: The WRUA Background Information

	Questions and filters	Coding Categories
1	What is the name of your WRUA?	Kibwezi..... <input type="checkbox"/> Mbuuni/Kithangaini/Ithaeni..... <input type="checkbox"/> Muusini..... <input type="checkbox"/> Itetani..... <input type="checkbox"/> Kiboko..... <input type="checkbox"/>
2	What is the locality of the WRUA?
3	What is the size of the WRUA in square kilometers (Km ²)?	100Km ² to 120Km ² <input type="checkbox"/> 120 Km ² to 140 Km ² <input type="checkbox"/> 140 Km ² to 160 Km ² <input type="checkbox"/> Over 160 Km ² <input type="checkbox"/>
4	How many members belong to the WRUA?	Less than 500..... <input type="checkbox"/> More than 500..... <input type="checkbox"/>
5	What water conservation activities are undertaken by the WRUA?	Rehabilitation or construction of earth dams or pans..... <input type="checkbox"/> Rehabilitation or construction of gabbions or weirs..... <input type="checkbox"/> Protection of wetlands or springs..... <input type="checkbox"/> Establishment of tree nurseries or seedling planting..... <input type="checkbox"/> Roof water harvesting..... <input type="checkbox"/> Capacity building on water resources management..... <input type="checkbox"/>

Part C: Adequacy of WRUA Training

No.	Questions and filters	Coding Categories
1	Have you ever been trained on water resources conservation?	Yes <input type="checkbox"/> No..... <input type="checkbox"/>
2	If the answer to (1) above is <u>YES</u> , who trained you?	WRMA staff..... <input type="checkbox"/> Other (specify)..... <input type="checkbox"/>
3	In a rating scale of 1 to 5, 5 being the maximum and 1 being the minimum, how would you rate the relevance of training?	1..... <input type="checkbox"/> 2..... <input type="checkbox"/> 3..... <input type="checkbox"/> 4..... <input type="checkbox"/> 5..... <input type="checkbox"/>
4	Do you consider the WRUA trainers adequately trained for the purpose of training WRUAs on water conservation?	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/>
5	If the answer to (4) above is <u>NO</u> what would you propose to be done for improvement of the training?

Part D: The Usefulness of WRUA Funding Mechanisms

No.	Questions and filters	Coding Categories
1	From the given alternatives, where does your WRUA get funding from?	WRUA development cycle funding from Water Services Trust Fund... <input type="checkbox"/> Non-governmental organization... <input type="checkbox"/> Government devolved funds e.g CDF..... <input type="checkbox"/> Other(s) specify please..... <input type="checkbox"/>
2	Do you find the current WRUA funding adequate for the WRUA activities?	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/> I don't know..... <input type="checkbox"/>
3	If the answer to the above question (2) is <u>NO</u> what other sources of funding are available to complement the WRUA funding?
4	In your opinion, is the WRUA funding cycle consistent with the sub-catchment development cycle?	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/> I don't know..... <input type="checkbox"/>
5	If the answer to the above question is <u>NO</u> what do you think are the reasons for the funding inconsistencies?
6	Propose viable solutions to the reasons in (5) above.

Part E: Merging of Small WRUAs

No.	Questions and filters	Coding Categories
1	Has your WRUA been affected by the process of merging (joining to one) smaller WRUAs in any way?	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/> I don't know..... <input type="checkbox"/>
2	If the answer to the above question is <u>YES</u> , in what way?	Joining a larger WRUA..... <input type="checkbox"/> Accommodating smaller WRUAs <input type="checkbox"/> Other(s) (specify).....
3	In your opinion has merging of smaller WRUAs been of any benefit?	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/>
4	a) If the answer to the above question is <u>YES</u> , what are the benefits? Enumerate them. b) If the answer to the above question is <u>NO</u> , give the reason(s).

Part F: Level of Knowledge on Environment

No.	Questions and filters	Coding Categories
1	In a scale of between 1 and 5, with 5 being the maximum and 1 being the minimum, how would you rate your level of knowledge on environmental conservation?	1..... <input type="checkbox"/> 2..... <input type="checkbox"/> 3..... <input type="checkbox"/> 4..... <input type="checkbox"/> 5..... <input type="checkbox"/>
2	Choose amongst the given environmental concerns that you can identify within the area where your WRUA is.	Sand scooping..... <input type="checkbox"/> Illegal use of land next to rivers... <input type="checkbox"/> Water pollution..... <input type="checkbox"/> Cutting down of trees..... <input type="checkbox"/> Destruction of springs/wetlands/wetlands..... <input type="checkbox"/>
3	What activities has your WRUA initiated to address the concerns in (2) above? Enumerate them.
4	Do you consider the activities in (3) above adequate to address all the environmental concerns that your WRUA faces?	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/>
5	If the answer is <u>NO</u> , what in your opinion should be done to address all the environmental concerns?

Thank you for taking part in this study.

Appendix III: Table for Determining Sample Size from a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: “N” is population size
“S” is sample size.

Source: Krejcie, Robert V., Morgan, Daryle W., *“Determining Sample Size for Research Activities”*, Educational and Psychological Measurement, 1970.

Appendix IV: WRUAs in Athi Catchment Area

No	WRUA	Sub Region	Merged with/Remarks
1	Uuni	Middle Athi	Mbuuni/Kithangaini/Ithaeni and kakuyuni (proposed)
2	Mivukoni Kyambuli		mutangu (proposed), yathue-kambiti (proposed) & katangi dam (proposed)
3	Itetani		kali, ngwani/kikumumu/uvaani and wanzauni (proposed)
4	Muambwani		kyamela (proposed) and kyunguni (proposed)
5	Mwania		lini
6	Manza		miw'ongoni, maruba
7	Ndeini		kyawango, wamunyu (proposed) & kambiti (proposed)
8	Kaiti Kampi		ngutwa-nduenguu and kanzanzu
9	Kyuu		utangwa and mwea-ngai,
10	Nzeveni		mavindu, upper mbanya, wathi, Ithanga, yandue-mbanya and ngaa-miu.
11	Kasikeu/Muani/Enguli		kalengeni, lower muooni, vulueni, Mutyambua, manooni, katheka-matooni, mutiswa, Mungyani and katani
12	Nthunguni-Muvaa		kauti, muusini, syanamu and uthini
13	Kathithyamaa-Matetani		matungulu-mwatati, muisuni-muselele, nzoweni, kathaana and kikalu.
14	Mungyani		kalengeni, lower muooni, vulueni, Mutyambua, manooni, katheka-matooni, mutiswa, Kasikeu/Muani/Enguli and katani
15	Kithumani		kwa mukumi, kikuu and kyambiti (proposed)
16	Gitangu/Gitathuro	Upper Athi	Mweteta.
17	ONKARU	Nairobi	Kirichwa
18	Rimpa		Isinya
19	Entarara	Nolturesh-lumi	Osoit
20	Tsunza-Madzi	Coastal Athi	Mwainzi

Appendix V: Table showing merging of WRUAs in Kibwezi with coverage areas in km²

NAME OF WRUAs.	MERGED WRUAs	Area in Km²	DRAINAGE SYSTEM
Kikuu	<ul style="list-style-type: none"> • Kikuu • Yandia 	129km ²	3FA
MukioThwake	<ul style="list-style-type: none"> • Mumbini • Kyamuvya • Muini • Ngamu • Mukiothwake • Katumbikyanganga 	174km ²	3ED
Lauka-	<ul style="list-style-type: none"> • Ngamba • Lauka 	100km ²	3EB
YandueMbanya	<ul style="list-style-type: none"> • Nzeveni • Upper Mbaya • Mavindu • YandueMbanya • Wathi • Ngaamiu 	100km ²	3EB
TawaKiteta	<ul style="list-style-type: none"> • Utithini 	100km ²	3EB
Itetani	<ul style="list-style-type: none"> • Itetani • Kali • Iiani • Kango/kitithini • Wanzauni • Ngwanikikumi 	110km ²	3ED
Utangwa	<ul style="list-style-type: none"> • Kyuu • Utangwa • MweaNgai • Mbuani. 	160km ²	3EB
MwaniIiniWrua	<ul style="list-style-type: none"> • Iini • MbembaniMusingila • Mwania 	107km ²	3EB
Maruba	<ul style="list-style-type: none"> • Miwongoni • Maanza 	99km ²	3EA
MbuuniKithagainiIthaini	<ul style="list-style-type: none"> • KyaanaKalangi • Uuni • Mbuuni • Mukanga 	137km ²	3EA
MuvaaMuooni	<ul style="list-style-type: none"> • Kauti • Muusini • Muvaa 	129km ²	3EA
KathithyamaMuisuniMuselele	<ul style="list-style-type: none"> • Muisuni • Kathithyamaa 	101km ²	3EA
KangundoKawetheiKathana	<ul style="list-style-type: none"> • Kathaana • Uthini • Nzoweni • Mutanda 	116km ²	3EA
Miindu	<ul style="list-style-type: none"> • Upper Miu • Miindu 	100km ²	3DA

Muooni	<ul style="list-style-type: none"> • Manooni • Vulueni • Katheka-Matooni • Kithumani • Kalengeni • KasikeumuaniEnguli • Mutiswa • Mungyani • Katani • Mutyambua 	129km ²	3FA
Muambwani	<ul style="list-style-type: none"> • Mawini • Mbiani • Muambwani • Kithunze 	136km ²	3FA
KwaMukumi	<ul style="list-style-type: none"> • Kithumani • UmojawaNzai • KwaMukumi 	129km ²	3FA
TutiniMuooni	<ul style="list-style-type: none"> • Lower Muooni • Matiku • Muini • Iteta 	126km ²	3FA