ASSESSMENT OF WATER RESOURCES USERS' ASSOCIATIONS CAPACITY ON RIPARIAN ZONE MANAGEMENT IN KENYA: A CASE OF KUYWA WRUA, BUNGOMA COUNTY

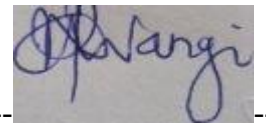
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A Project Research Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of the Master of Monitoring and Evaluation in the department of Monitoring and Evaluation and the school of Business of Africa Nazarene University

2023

DECLARATION

I declare that this applied research project is my original work and that it has not been presented in any other university for academic credit.

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SUPERVISOR'S DECLARATION

I/ confirm that the work reported in this applied research project was carried out by the candidate under my supervision.

Signature:  **---------- Date 01/07/2023**

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DEDICATION

To my family for their unwavering financial, emotional, and spiritual support, without which my academic achievement would not have been possible.

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I would like to express my sincere gratitude to my esteemed supervisor Dr. Wanjiru Nderitu, for the unwavering support, invaluable guidance, and insightful comments throughout the entire research process. Her expertise and mentorship have been invaluable in shaping the development and execution of this study.

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I would like to extend sincere thanks to my loving family, and special appreciation to my mother, who has instilled in me the value of hard work and ethics, and whose constant reassurance has been a source of strength and motivation. Last but not least, I would like to acknowledge the remarkable support and dedication of my fellow students. Their collaborative spirit, willingness to assist, and commitment to teamwork have been truly inspiring and have contributed to my personal and academic growth.

To all those mentioned above and countless others who have contributed in various ways, I am truly grateful for your support, and honoured to have had an opportunity to work with such exceptional individuals.

ABSTRACT

Riparian zones play a vital role in maintaining water quality, enhancing biodiversity, and supporting climate adaptation when effectively managed. This study aimed at assessing the Water Resources Users Associations (WRUAs) capacity on riparian zone management in Kenya. The specific objectives of the study were to assess the influence of WRUAs skills on riparian zone management, to establish the extent to which WRUAs management processes influences riparian zone management, and to examine how WRUAs level of collaboration with other stakeholders influences riparian zone management. The study utilized The Theory of Change (ToC) and stakeholders' theory as guiding frameworks, recognizing the importance of understanding the causal pathway and considering the interest of stakeholders in project success. The target population for the proposed study was 360 and the sample size was 186 which was determined using Krejcie and Morgan table. The respondents were proportionately selected using stratified random simple sampling method. Key informants were purposively selected from relevant departments. Research instruments used were questionnaires and key informants' guides. The validity and reliability of the instruments were assessed through pre-test and Cronbach's alpha analysis whereby, the variables in the study generated a Cronbach's alpha of 0. 772.The study used descriptive and inferential statistics to analyse the data whereby the descriptive analysis included frequencies, percentages, mean and standard deviation while chi-square test was used to test the hypothesis. The results were also triangulated using correlation and regression models. The results revealed that there was a significant relationship between skills and riparian zone management on account of the Pearson Chi-square statistic ($0.002<p=0.05$). Additionally, the test revealed that there was no significant relationship between both management skills and collaboration and riparian zone management on account of Pearson Chi-square statistic being ($0.112>p=0.05$) and ($0.258> p=0.05$) respectively. The findings emphasize the importance of skills development, the complexities of management processes, and the nuanced nature of collaborations in riparian zone management. Based on the study's conclusions, policy and practice recommendations include enhancement of skills, adoption of holistic management, fostering effective collaborations and investing in research and monitoring. Further research can focus on conducting longitudinal studies to investigate the long-term impacts. Additionally, utilizing multivariate analysis, system modelling and comparative studies across different contexts can provide a more comprehensive understanding of complex interactions and trade-offs.

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ABBREVIATIONS AND ACRONYMS

AU	African Union
CBOs	Community Based Organizations
IRBM	Integrated River Basin Management
IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
NACOSTI	National Commission for, Science Technology and Innovation
NEMA	National Environment Management Authority
NGO	Non -Governmental Organisation
RBOs	River Basin Organizations
SCMP	Sub-Basin Management Plan
SCMPs	Sub-Catchment Management Plans
SDGs	Sustainable Development Goals
WCD	WRUAs Development Cycle
WRA	Water Resources Authority
WRUAs	Water Resources User Associations
WSTF	Water Sector Trust Fund
WUAs	Water User Organizations

DEFINATION OF TERMS

Biodiversity: Variety of plants and animals existing within a riparian zone.

Capacity assessment: A process of gathering, measuring, and analysing data to determine the level of knowledge, skills, and performance of an organisation.

Collaboration: A process of working together with others to achieve a common goal. It involves sharing information, ideas and resources as well as engaging in meaningful dialogue to ensure success.

Ecological resilience: Capacity of a riparian zone to respond to disturbance such as climate change or human caused disturbance by resisting damage and recovering quickly.

Evaluation: A process of assessing project effectiveness to ascertain if goals have been met and what changes need to be made the improve the project in future.

Management Processes: Activities and tasks undertaken to meet projects goals and objectives by engaging the right workforce and resources.

Monitoring: A process of regularly collecting information to track, measure progress, identify potential threats and take corrective measures.

Riparian zone management: All practices carried out to protect and restore riparian areas.

Riparian zone: It's a strip of vegetation of a minimum of 6m width between land and a river/ stream on either side that helps in maintaining water quality.

Skills: Abilities, knowledge, learned competencies and proficiencies gained through practice or experience, that are necessary to perform a task.

Stakeholders: Groups, individuals, or institutions who have an interest in water resources management initiatives, and influences, are influenced or impacted by the initiatives.

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Introduction

Ecosystem services contribute to ecological wellbeing which determines the availability of basic natural resources that support human life. Although freshwater is a finite, vulnerable and essential natural resource, there has been a reduction in its availability and predictability due to climate change which threatens biodiversity and livelihoods. Since mid-20th century, the world has been experiencing unprecedented environmental changes on a global scale with different manifestations at the regional and local level. Climate change is inextricably linked to water, and it continues to have significant influence on the hydrological regime (Liambila,2017)

Worldwide, about 785 million people live without access to water for domestic use, and there has been a universal progress to provide safe drinking water in line with the Sustainable Development Goals (SGDs) in the last two decades. However, the biggest challenge to water scarcity is finding a balance between human and environmental water needs while catering for current demands as well as guaranteeing future requirements (Hope et al., 2020). Global ecological systems have been rapidly changing and these variations call for action-oriented approaches to ensure ecological sustainability across the world.

1.2 Background of the Study

Water resources management is not a new field, its concept has been around for several decades. The first global water conference which was held in 1977 at Mar del Plata was to assess the status of water resources to ensure adequate and efficient supply of water. Its implementation was further stressed by the Dublin principle (1992) and Rio's conference agenda 21 where the aspect of Integrated River Basin Management (IRBM) was emphasized. Global water partnership (GWP) defines IRBM as 'a process of coordinating, management and development of resources within a river basin'.

The European Water Framework Directive (2000) highlights the need to reorder water resources management to include the principles of IRBM that ensures assessment that guides future management decisions. The directive enjoins all EU member states to ensure the appropriate administrative arrangements are established for each river basin within their territory (WFD,2000). This ensures learning, accountability,

and effectiveness of any management interventions (Moss,2012). Riparian zone management is a major concept in IRBM since it determines the effectiveness, sustainability and success of those mandated with the management role. Therefore, there is a need to attribute the desired change and impact to the preferred interventions, and it is critical to ascertain that the interventions are being executed in the right manner (Pullin & Knight, 2003, Sutherland, 2003, Margoluis et al., 2009).

Water Resources Authority (WRA) was operationalized in April 2017 although it had been in existence since its establishment under the Kenya Water Act 2002 as Water Resources Management Authority (WRMA). WRA, anchored in the Dublin principles, implements IWRM activities through Water Resources Users Associations (WRUAs) based on local river water basins. The purpose of WRA is to work together with WRUAs and other stakeholder to increase the tree cover in water catchment areas, control of sediments, protection of water from pollutants, implementation of incentives to community through livelihood projects, climate change adaptation and mitigation initiatives.

1.2.1 Riparian Zone management

Riparian zones are ecosystems within a river catchment basin that forms an interface between terrestrial and aquatic ecosystem. A healthy riparian zone enhances ecological resilience, biodiversity conservation, and helps the ecosystem adapt to climate change among other benefits (Riis et al., 2020). This is reflected in the water quality, stream bank stability, the water temperatures, soil richness, tree canopy, pollution levels, flood patterns, and how the community perceives riparian zone management (Vidon, 2010). In Kenya there is no legislation or policy that explicitly manages riparian zones but rather regulations and legislations are fragmented in a range of Acts and policies all outlining the responsibilities of the government, and individuals in protecting the riparian habitats. The Environmental Management and Coordination Act 1999, Water Quality Regulations (2006), Water Resources Management Rules (2007), The National Land Commission, The Agricultural Act (cap 318), Forest Act (2005), The Land Act (2012), The Wildlife (Conservation and Management) Act, and the Water Act 2016 presents an overlapping mandate in riparian zone management.

According to Krosby et al., (2018), flexibility and creativity of the management practices should be considered to enhance the riparian zone ecological resilience and adaptive capacity. A coherent approach to manage the riparian zone requires participation of the government, relevant stakeholders, and the community, who are widely referred to as River Basin Organizations (RBOs). According to Pegram et al., (2013), RBO refers to any institution that is directly involved in the management of river basins, which includes formal basin-scale agencies to informal basin groups. Water Resources User Associations (WRUAs) are mandated with management of riparian zones in Kenya, and operates at the lowest basin level to provides a platform for community participation in collaboration with other stakeholders. Formation of WRUAs is guided by WRUAs Development Cycle (WDC) and developed by Water Resources Authority (WRA) in conjunction with Water Sector Trust Fund (WSTF).

WRUAs are guided by sub-catchment management plans (SCMP), a context-based document which is developed through participatory approach. The document acts as their main management tool that guides all their activities. SCMP guides WRUAs in identifying key issues and enumerates the required interventions based on a prioritized action plan (WRA (c), 2015). The key interventions that aims at improving the integrity of riparian zone and enhance adaptation to climate change include basin protection through establishment of nurseries and planting of indigenous trees, water pollution control through riverbank stabilization, fencing and soil erosion control, Community training and sensitization, and monitoring.

1.2.2. Water Resources Users Associations (WRUA's) Capacity

WRUAs management capacity assessment in this context presents an opportunity to identify strengths and weakness with an aim of learning and further strengthening their action plans. Management of water resources in the past decade assumed that natural resources are predictable and can be controlled. However, the resources are now undergoing a major paradigm shift that necessitate rethinking their management (Mostert et al., 2008).

To understand where they stand and areas that requires further strengthening, assessment of WRUAs capacity in riparian management is paramount. This creates a shared awareness, understanding and agreement among key stakeholders in identifying action points and planning. To be able to assess WRUAs capacity, its

crucial to understand the context in which they operate through examination of their skills, how robust their management processes are, and their ability to engage with other stakeholders in a collaborative manner.

1.2.2.1 WRUA's Skills

WRUA's skills notion on their performance in riparian zone management in this study is viewed through the lens of their project management skills, monitoring and evaluation skills and leadership skills. The water resources situation report 2018/2019 by WRA highlighted that WRUAs needed to be educated in the management and good use of riparian zone. They specifically called to attention their level of skills in trees selection for riparian zone management, and discouraged use of trees species that would cause more harm like the Eucalyptus tree. Consequently, there is a need for the WRUAs to enhance their knowledge and skills on nurseries establishments and tree species selection to enable them rise above this challenge. The report further put a spotlight on lack of resources for water monitoring and related activities as a major factor leading to partial collapse of the monitoring network. Staff with monitoring expertise was consciously lacking in most stations, and the report recommended deployment of technical staff in such stations (WRA,2017).

1.2.2.2 WRUA's Management Process

Management of riparian zone is WRUAs key responsibility that requires a well thought out management process to succeed in protecting and restoring the riparian habitat, as well as minimizing the impacts of human activities (Raymond & Cleary, 2013). Management processes in context of this study entails bringing together the systems (skills, techniques, tools, and knowledge) in a logical flow from initiation, planning, implementing, and monitoring of riparian management activities to attain the desired results. The process for riparian management begins at the demarcation of the riparian zone as stipulated in the WRMR (2007).

Lack of a harmonized definition of riparian zone makes such guidelines less enforceable which pushes the community and the riparian land owners to perceive the riparian zone as idle land that is free to use, which makes their attitude toward management skewed (Matunda,2015). WRUAs management processes are guided by the SCMP and particularly for riparian zone management, analysis of the riparian problem and assessment of need to set objectives is the first step of the process. Although the SCMP does not provide an explicit

management process for WRUAs to follow in riparian zone management, it offers an overview of the general management processes which include problem identification, setting objectives, management plans, monitoring and reporting on progress and sustainability strategies.

1.2.2.3 WRUAs Collaboration

Management interventions requires a synergetic approach to harness the strengths of each sector and avoid duplication of efforts (Galvez & Rojas ,2019). The SCMP is a strategic code of practice for the management of water resources, and it states that WRUAs shall collaborate with other stakeholders to ensure efficient management of water resources. This includes consulting with local communities and other water users in their management plans and strategies. The WDC encourages WRUAs to work with other stakeholders to provide public awareness and education about riparian management, and ensure that interests of all stakeholders are considered in line with the objectives of the Water Act 2016.

1.3 Statement of the Problem

In Kenya, community participation in water resources management is recognized by the Water Act 2016 and WRMA Rules 2007. The Water Resources Users Associations (WRUAs) model has been established as a means of promoting community-based participation in the management of riparian zones. Despite the existence of 670 WRUAs nationwide, degradation of riparian zone remains a significant issue. The International Water Management Institute (IWMI) pointed out that there is a lack of empirical evidence to quantify the progress made by WRUAs in implementing riparian zone management initiatives, despite their implementation for over a decade (IWMI,2018). This lack of comprehensive assessment hinders the ability to determine the effectiveness of current riparian zone management practices and make informed decisions regarding future investments.

The management of riparian zones often involves Multiple stakeholders, necessitating a coordinated and synergetic approach for sustainable management. However, the absence of a unified legal, regulatory, and policy framework contributes to a lack of universal knowledge and skills on riparian zone management, making enforcement of standards more challenging. This fragmented approach can result in duplication or conflict of efforts, ultimately compromising the sustainability of management initiatives. Furthermore, the

complex nature of riparian zone management, with its multi-temporal and spatial scales and interaction between social and ecological components, widens the gap between scientific knowledge and practical implementation. It is therefore imperative to assess the capacity of WRUAs as social actors in implementing initiatives that support riparian habitat health to determine whether there is a significant relationship between their capacity and effective riparian zone management. Additionally, this study aims to identify gaps in WRUAs skills and current riparian zone management processes related to riparian zones as well as explore opportunities for collaborations with relevant stakeholders to enhance more sustainable management practices.

1.4 Purpose of the study

The purpose of this study was to assess the influence of WRUA's skills, management processes and coordination style on riparian zone management. The assessment was meant to encourage continuous improvement of WRUAs.

1.5 Objectives of the Study

1.5.1 General Objective of the Study

Assessment of water resources users' associations capacity on riparian zone management in Kenya.

1.5.2 Specific Objectives

i. To assess the influence of WRUAs skills on riparian zone management in Kenya.

ii. To establish the extent to which WRUAs management processes influence riparian zone management in Kenya.

iii. To examine how WRUAs level of collaboration with other stakeholders influence riparian zone management in Kenya.

1.5 Research Hypothesis

H_{o1}: There is no significant relationship between WRUA's skills and riparian zone management in Kenya.

H_{o2}: There is no significant relationship between WRUA's management processes and riparian zone management in Kenya.

H_{O_3}: There is no significant relationship between WRUA's level of collaboration with other stakeholders and riparian zone management in Kenya.

1.7 Significance of the Study

The findings of this study hold significant importance for various stakeholders involved in riparian zone management. For WRUAs, the study provides valuable guidance to enhance their capacity and improve their practice. Policy makers can utilize the insights gained to inform the development of evidence-based policies and regulations that address the challenges in riparian zone management. Practitioners will benefit from a deeper understanding of key factors influencing effective management, enabling them to implement targeted strategies and best practices.

1.8 Scope of the Study

This study specifically focused on assessing the capacity of WRUA operating in River Kuywa to implement effective riparian zone management strategies. It examined the WRUA's skills, management processes and collaboration with other stakeholders in relation to riparian zone management. By delving into these specific areas of capacity, the study aimed to provide a comprehensive understanding of the WRUA's capabilities and shed light on the role of stakeholders in supporting their efforts.

1.9 Delimitation of the Study

Due to its cross-boundary nature, River Kuywa transcends a national boundary which presents administrative, policy and cultural challenges to its study both related to data collection and analysis as well as applicability of the findings thereof. Therefore, the study was delimited to the physical scope, thus studied the riparian zone within the Kenyan boundary.

1.10 Limitations of the Study

This study was limited by the unwillingness of Water Resources Authority (WRA) to disclose some critical data and information by making it too costly for the researcher's budget to meet. Additionally, due to the budget constraint, the study and analysis of different WRUAs and individual riparian landowners which would give a wider perspective of riparian zone changes over time was not possible. Therefore, this study only gives a precursor for a more rigorous study.

1.9 Assumptions of the Study

The study assumed that WRUA's project management skills, management processes, and collaborations influenced riparian zone management. The study also assumed that the systematic changes in the riparian zone could be adequately correlated to WRUAs capacity in a linear and straightforward manner.

1.12 Theoretical Framework

The theoretical framework helps in bringing out theories that underpinned the study. Theory of Change and the stakeholder theory were the theories anchoring this study.

1.12.1 Theory of Change

Carol Weiss popularized the Theory of Change in 1995 to explain how interventions are constructed to activate a desirable change. The theory proposed underlying assumptions about why interventions work from the input to the final outcome through a causal pathway that links these activities. In a nutshell, Theory of Change articulates how interventions are conceptualised from their inception implementation to the desired results and ultimate outcome. It explains how and why interventions are expected to achieve intended impact goals by supporting decision making and adaptation (Margoluis et al., 2013).

The theory of change could therefore be used to guide management process throughout the project cycle focusing on systematic and cumulative links between planning, implementation, output, and ultimate goal. This increases the likelihood that the stakeholders will have clearly specified activities that will lead them to their intended outcomes. Kelly (2022) alluded to the fact that the theory of change helps in the management process of a project and supports other activities within the project cycle such as decision making and adaptation. In the context of riparian zone management, the theory of change would outline the steps and strategies necessary to improve the health of riparian zones. Several studies have used the theory of change to provide a structured approach to understanding how interventions are expected to bring about change. A study on forest management in Indonesia used the theory of change approach to develop a framework for understanding how interventions aimed at reducing deforestation and promote sustainable forest management (Sari et al; 2016). Another study in Kenya used the theory of change to develop a framework that enhances sustainability of community-based conservation initiatives (Njuguna et al; 2019). Both studies identified key

assumptions and pathways through which change can occur, including increased knowledge and awareness, improved governance, and enhanced community participation.

Environmental management strategies take place in a complex socio-ecological system as they involve multiple intermediate outcomes, long time frames and confounding variables. As such, the theory of change approach in environmental projects may present some limitations due to its simplification and linearity. A study on a marine conservation project found some limitations of the theory, and highlighted how the theory of change approach may oversimplify socio-ecological systems, leading to incomplete and inaccurate understanding of how change occurs in environmental process (Barton et al; 2020).The author further contended that the approach may also not fully engage stakeholders in the planning and evaluation of environmental projects, leading to a limited understanding of their perspectives and needs. In view of this limitation the stakeholders' theory will also anchor this study to compensate for the limitations inherent in the Theory of Change as appertained to this study.

1.12.2 Stakeholder Theory

The stakeholder's theory was popularized by Edward freeman in 1984 in an inclusive explanation why organizations should recognize and consider the interest of all stakeholders when making decisions, rather than solely on maximizing on stakeholders' value. The theory suggests that organizations can create both short term and long-term value by considering the needs of all the stakeholders (Freeman, 2010). Other authors have suggested that the theory is a valuable tool that can be used as a framework for developing ethical and responsible practices. They argue that considering the interest of involved stakeholders increases chances of project success (Laplume et al., 2008; Colvin et al., 2020).

WRUAs can employ stakeholders' theory for their collaborations and capacity building by recognizing and considering the interest of all stakeholders involved. This includes considering the interests of local communities, riparian landowners, water abstractors, the government, other relevant stakeholders, and the environment. This creates a clear understanding of the interest of each stakeholder, developing strategies to meet those interest and proactively managing any uncertainties that may rise.

1.12 Conceptual Framework

A conceptual framework depicts the relationship between independent and dependent variables. The conceptual framework for this project focused on establishing the relationship between WRUA's capacity and riparian zone management. The framework posits that WRUAs with higher capacity in terms of skills, management processes and collaborations are better equipped to manage riparian zone and realize enhanced ecological resilience and tailor-made responses to climate change adaptation. In contrast those with lower capacities may face challenges in implementing initiatives that supports riparian habitat health.

Independent Variables **Dependent Variables**

WRUAs' Capacity Riparian Zone Management

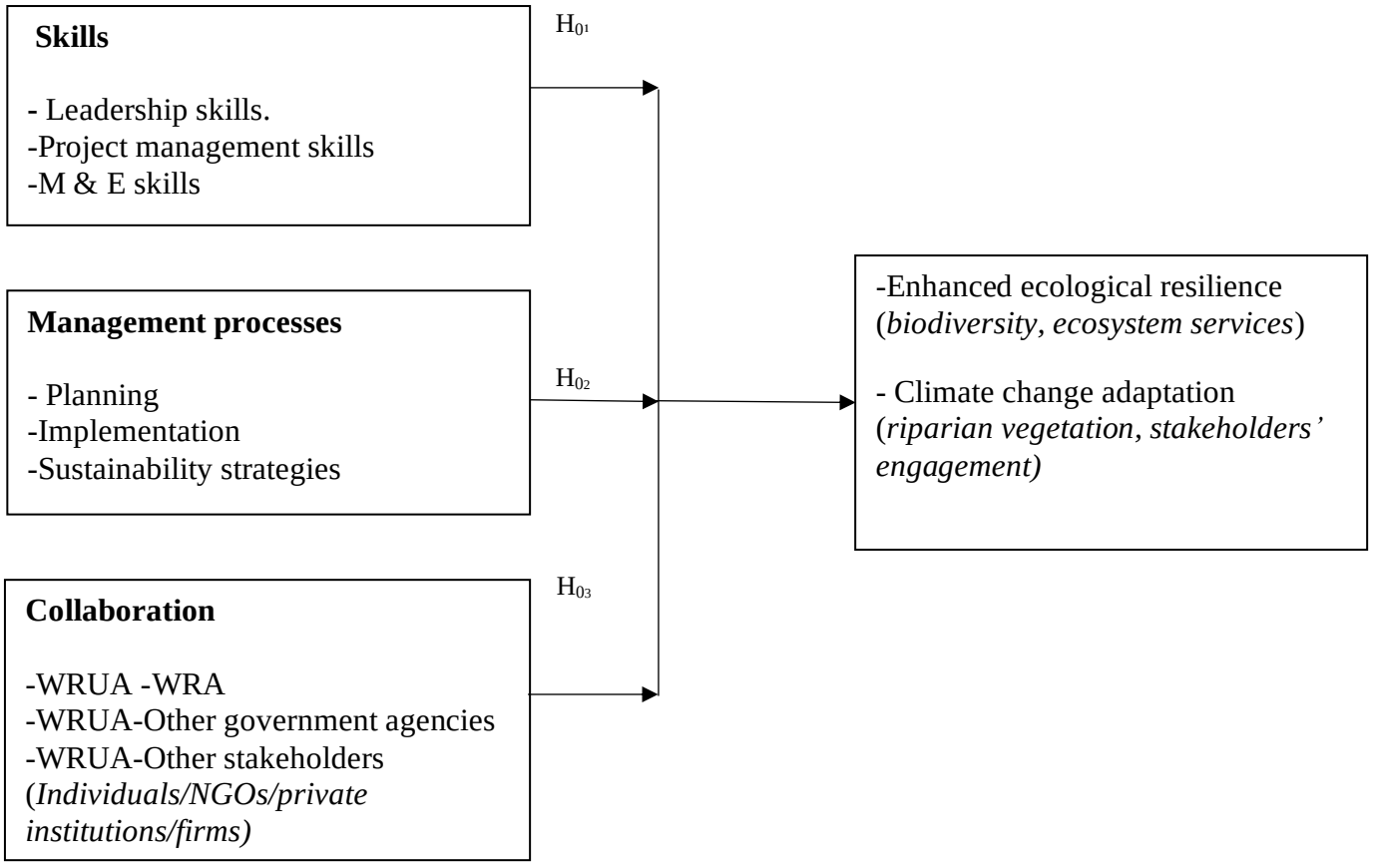


Figure 1. 1: Conceptual framework

Source: (Researcher,2023)

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview

This chapter highlights literature related to riparian zone management, and the responsibility of Water Resources Users Associations (WRUAs) in other contexts referred to as Water Users Associations (WUAs). For the purpose of this study WRUAs and WUAs will be used interchangeably. Information on the capacity of WRUAs and how it relates to overall riparian health will be reviewed based on their skills, their management processes, and their level of collaboration.

2.2 Riparian Zone Management

World Resources Institute estimates that approximately 33 percent of the world's riparian zones have been severely degraded due to human activities which include deforestation, hydrological alterations, and water contamination. In addition, nearly human activities have impacted 40 percent of the world's riparian zones, with a further 20 percent at risk of degradation. Henninger & Revenga (2000) noted that riparian zone degradation is far-reaching, impacting not only local ecosystems, but also human health and livelihoods. To attain the UN-SGDs, a resolution to celebrate 2021-2030 as UN-Decade on Restoration (UN-DER) was reached through adoption of a resolution for preventing, halting of ecosystem degradation. However, Abhilash (2021) observed that application of advanced technology, science, indigenous and local knowledge that enables realization of UN-DER targets is still lacking.

Different authors argue that riparian zone management efforts are triggered by the need to broaden the ecosystem services and enhance ecological resilience of the riparian habitats. Although riparian zones are just a relatively small strip of land (width), they support great biodiversity compared to the surrounding catchment area (Grizzetti et al., 2017, Flávio et al., 2017, Kristensen et al., 2014). Introduction of IRBM at local implementation and policy level through stakeholders' participation to raise awareness and change perceptions and attitude toward riparian zone management has yielded some benefits over time (Yun et al., 2017). According to Pullin and Knight (2003) challenges in the management of riparian zone and optimization of ecosystem services are evident globally, and the threats to the ecosystem in general have intensified.

Sutherland (2003) opined that investments have been made in the last two decades to show that the resources and efforts put towards riparian management are having impacts.

Giving a global perspective, Gore and Richardson (2017) used a systematic review to examine the challenges and opportunities of riparian zone management in the 21st century. The authors argue that managing riparian zone requires an interdisciplinary approach that considers ecological, social and economic factors. They also discuss the challenges of riparian zone management including fragmentation of ownership and management responsibilities, the lack of understanding of ecological processes, and the competing demands for water resources. They opined that these challenges can be addressed through adoption of integrated approaches that involves stakeholder's engagement, use of science-based approaches and consideration of social economic factors. Examination of riparian zone management in Latin America using a combination of literature review, case studies and stakeholders' interviews identified lack of Institutional capacity, fragmentation of land use and management responsibilities and limited stakeholder participation in decision making process as the main challenges (Tavares et al; 2017).

Riparian zone management in Sub-Saharan Africa is an important aspect of protecting the environment and maintaining biodiversity. According to González et al., (2017), most countries in the region have adopted similar legislations and policies that aim to protect and restore riparian zones. An investigation of the impact of climate change and land use on riparian vegetation cover in the Kagera River Basin that spans across Burundi, Rwanda, Tanzania, and Uganda used GIS techniques to provide insights into their complex interactions. The authors found that riparian vegetation cover decreased by 28.6% during the study period (1984-2016), and that climate change and land use were the major drivers for this decrease (Falisse et al; (2018). In Kenya, a study on assessment of riparian zone management in the Mara Basin examined the state of riparian management using a combination of field surveys, stakeholders' interviews, and satellite imagery analysis to collect data on state of riparian zones in the basin. The study found that the Basin is largely degraded with limited vegetation cover and high levels of soil erosion. The authors attributed these findings to lack of effective riparian zone management practices, fragmented ownership of land and inadequate enforcement of existing regulations (Ongoro et al; 2015).

The primary motivation in restoration of the hydrological flows in rivers is to deliver benefits to human beings by managing alien species invading riparian zones, and restoration and management of the degraded habitats (Holmes et al., 2008). Some lessons learnt from most restoration programs is that riparian zone management should be guided by a combination of ecological, social, and economic benefit of the ecosystem. At operational level, research should be made pivotal in informing the kind of management processes that are viable and context specific (Le Maitre et al; 2020)

2.3 Water Resources Users' Associations (WRUAs) Capacity

Assessment of the ecosystem has been advocated as a useful tool for providing a holistic evaluation of impacts on human being as documented in the millennium ecosystem assessment (MEA) and the common classification of ecosystem services (CICES) reports (Young & Potschin,2018; Bongaarts, 2019, MEA, 2005).The measurable output of the ecosystem, referred to ecosystem goods and services is what is directly beneficial to the people (Potschin & Haines-Young, 2011).The capacity for riparian zone management is largely dependent on the availability of resources. Countries with higher level of economic development are generally better able to provide adequate support while those with fewer resources may struggle to provide support for riparian management. Additionally, many countries lack the technical capacity to identify and implement appropriate strategies while others may have limited access to information and data on riparian habitats (Boonstra ,2014).

2.3.1 Skills and Riparian zone Management

Skills for riparian zone management depend on the local environment and specific goals for management efforts. Skills ensure that management efforts are effective, efficient, and tailored to the local environment and human needs. The skills enable a good understanding of the complexity in the interactions between natural and human processes and provide necessary tools to plan and implement the right strategies (Ong'wen & kiptala 2017).

Leadership is widely acknowledged and supported as a critical skill in riparian zone management, as it requires bringing together diverse stakeholders to work towards a common goal of protecting and managing riparian zones. There is substantial body of literature on the importance of good leadership in water resources

management (Giordano &Shah ,2014; Uitto & Juuti, 2017; Ong'wen & Kiptala, 2017; Wambugu & Vos 2019). Day et al., (2019) opined that good leadership skills enable realization of set milestones through determination of critical paths which allows effective allocation of available resources. Effective leadership can help ensure that water resources are managed sustainably, and that the needs of all stakeholders are considered. Wambugu et al; (2019) in their study based on combination of field survey, focus group discussion, and interviews with key informants found that effective leadership by WUAs was critical for successful riparian zone management in the Gura River Basin in Kenya. The study underscores the importance of leadership in ensuring successful riparian restoration activities, and the authors highlight the importance of appropriate skills for successful watershed management and provides insights on how community skills can be assessed and strengthened.

Project management skills in Community Based Natural Resources Management (CBNRM) initiatives can help improve the outcome of such projects as suggested by numerous studies. The studies highlight the importance of project management skills in ensuring effective planning, stakeholders' engagement, and resources management (Mekonnen & Karg, 2017; Khanal & Sharma, 2020). Paudyal and Kattel (2017) conducted a study on riverine ecosystem management by local institutions in Nepal on the role of community in forests managing using a case study approach. The researchers conducted interviews and focus group discussions with the target population as well as key informant interviews with subject matter experts within the government. The study found out that the community played an important role in ecosystem management. However, lack of technical resources, inadequate institutional support and conflicting policies and regulations were some of the challenges they faced. The study further highlighted that to ensure that projects are planned, implemented, and evaluated effectively project management skills are paramount.

A study by Wairiu & Kinoti (2017) investigated the factors that influence participation in collective action for riparian management in Kenya. Using a WRUA case study the researchers conducted semi-structured interviews and found that project management skills and institutional support were among the factors that contributed to the success of their initiatives. They recommend that WRUAs and other riparian zone management institutions focus on providing technical support and improving project management skills

to promote effective collective action for riparian management. Richards & Syallow (2018) in their study on pitfalls and opportunities for community based natural resources management in Kenya postulates that there is an elite capture which was discernible for most WRUAs in the study whereby, the committee benefited more from skills enhancement forums leaving out the rest of the members. They contended that most of such challenges was as a result of incompetent leadership and poor management skills.

Monitoring and evaluation skills are essential in riparian zone management as they allow for progress assessment, identification of issues, accountability, learning and adaptation. Numerous studies have provided evidence that monitoring, and evaluation (M&E) skills are important in riparian zone management (Gichuki & Haggblade; 2019, Vargas et al; 2019). Although there are best practices from the environmental conservation perspective, there is no one-size-fit-all M&E design in riparian zone management. The design should be tailor made to suit the prevailing needs and to suit the goals and objectives of management practices Hassall and Garcia (2019) assessed the capacity needs for M&E using systematic literature review, and they found that there is a lack of specific training programs on monitoring and evaluation of climate change adaptation. The authors further observed that most training focuses on general project management skills and concluded that investing in the capacity building of M&E is essential for effective climate change adaptation.

2.3.2 Management Processes and Riparian zone Management

Management processes are key to success of any project initiative as they provide a framework for the implementation throughout the project cycle in a logical manner. Effective riparian management process involves planning, implementing, and maintaining sustainable strategies that help to protect and restore the natural functioning of the riparian ecosystem. According to a study by Cremer et al, (1999) the overall management processes of riparian habitat in Europe are satisfactory due to adoption of more comprehensive processes to rehabilitation of riparian zone. They consider the most viable interventions for the context, and using techniques such as remnants vegetation mapping, historical records, well designed fields trials and scientifically informed seeds palynology for a successful revegetation process (Webb & Erskine, 2003, Olley et al., 2014). Further, Murphy and Sprague (2019) noted that initially Europe had adopted riparian zone buffer design which had not considered a function and site-specific management process, which led to its failure.

Major Lesson learnt from the experience is the need for the riparian buffer assessment and the interrogation of the impacts by the stakeholders in the planning of the projects and initiatives.

Planning entails assessment of the prevailing state of the riparian ecosystem and further setting goals and objectives based on the findings of the problem assessment. At this stage, management plans are developed, the resources needed and strategies necessary are identified, and the capacity of the stakeholders to carry the necessary actions assessed (Kagoro et al; 2017, Sibanda & Van; 2013). According to Buday and Armstrong (2022), the benefits of problem analysis and need assessment prior to undertaking environmental projects is identification of major issues, evaluating their environmental and social impacts, and assessing the resources available to mitigate the negative impacts and enhancing the positive ones.

Implementation of the developed management plans involves getting into action, and may involve activities such as invasive species removal, planting native vegetation, implementing bank stabilization activities and awareness creation among other depending on the context. According to Kagoro et al;(2017) a good management process in riparian zone management contribute to overall ecological resilience, and should be guided by clear goals and objectives, involve stakeholders' input, and use measurable indicators to track progress and evaluate the effectiveness of management practices over time. Regular monitoring and evaluation of the progress is critical in the management process as it helps identify successes and challenges, and make adjustment as required. It also provides opportunity for learning and improvement of future initiatives implementation. Historically, monitoring of environmental projects was done for accountability and reporting and not for learning purposes. As such the ability to demonstrate the effectiveness of interventions in managing the riparian zone was compromised, and the capacity to learn diminished (Stem et al., 2005).

In assessing the success of riparian zone management projects, The European Water Framework Directive (2000) highlights the need for monitoring of restoration works to guide on future management decisions and ensure learning, accountability and effectiveness of any restoration works. It is therefore critical to have a clear plan that incorporates a monitoring and evaluation framework that identifies measurable objectives with clear expected outcomes. This is achieved by identifying both scientific and social indicators that are built into the objectives and design framework to allow proper assessment, evaluation, learning and

management (Buchanan et al., 2010; Morandi et al., 2014). Community level learning can be enhanced through utilization of local knowledge and resources to provide insights into the impacts of the management strategies. However, a platform for sharing the information and best practices is paramount in ensuring that all voices are heard and considered in the management processes. The traditional knowledge by local stakeholders can be merged with current strategies in raising awareness and inspiring the rest of the community to positively change their perception and attitude towards management. Larsson and Larsson (2020) argued that the degree to which organisations including community-based organisations (CBOs) are invested in learning influences the sustainability of the project.

Europe has achieved a consistent and harmonious mapping and assessment of riparian zones. Copernicus, a European flagship initiative for earth observations and monitoring of riparian zone has been pivotal for technological and methodological improvement of monitoring and evaluation systems (Weissteiner et al., 2016). In South Africa ground surveys and other traditional methods were used for monitoring activities in the riparian zones and catchments in general (Olorunfemi,1983). However, the methods could not allow reconstruction of historical changes in the catchments. With advancement of technology other means of monitoring like aerial photography analysis and remote sensing became useful in identifying the rate and extent of change of the target areas (du Plessis et al., 2021). In Kenya, there are tools available to monitor WRUAs activities however, lack of adequate instruments for each sub-basin, inadequate financial resources and technical capacity are some of the limiting factors in riparian zone monitoring. Although there are datasets available on riparian zone management, they are scattered in different government agencies hence a need to collate such data to have a harmonious system for monitoring (Michael et al., 2021, Aarts, 2012)

Sustainability of riparian zone management initiative means the ability of an initiative to protect riparian habitat in the long term while providing ecosystem good and services to the environment and local community. It is the extent to which changes within the riparian ecosystem have far reaching impacts, and the interventions are scalable even when the project period ends, and the donor funding is stopped. This includes ensuring that the resources are equitably managed, protected from pollution and over-use and the initiatives are financially viable (kahinda et al; 2016, Zogaris et al; 2018). Management context of environmental projects

at local levels engages the rules, processes, and decisions to translate and define their sustainability plans. Richards and Syallow (2018) in their study highlighted that Mara WRUA operating within The River Mara Basin engage in beekeeping and dairy farming as an alternative livelihood as an incentive to the group members to remain united and move away from unsustainable practices that affect riparian zones. Application of clearly defined criteria to systematically evaluate and recognize performance, whereby good performance is rewarded, and bad performance sanction is also a good way of ensuring sustainability by keeping the members motivated. Development and promotion of eco-tourism activities, access to education and research opportunities, involvement of local stakeholders in decision making, planning and implementation of the project initiatives are some of the strategies that could significantly influence the sustainability of riparian zone management (González et al., 2017).

2.2.3 Collaborations and Riparian zone Management

The success of basin-level arrangements for water resources management either by the government or by other stakeholders is dependent on basin level governance institutions. While basin-level governance is at the top tier of importance, recognizing sub-basin community's interests may be as important, and therefore they should be guaranteed a voice in decision-making (Mostert, 2017). River Basin Organizations (RBOs) serve as the primary mechanism for water governance. They provide forums for water management reflecting water quality and quantity, water related conflicts, and land use and water use (Butler & Adamowski, 2015). Mukhtarov & Gerlak (2013) argues that many governments, multilateral financing agencies and other institutions such as Global Water Partnership (GWP) have been on the forefront promoting RBOs. Water Users Organizations (WUAs) are RBOs whose organization and stability are highly dependent on the driving force behind their formation, and their roles which are diverse and context specific.

Collaborations among stakeholders, including government agencies, NGOs, landowners, and the community have been shown to be effective in promoting sustainable riparian management practices (Devine et al; 2017, Taylor & Meir ;2019). The authors however noted that more research is needed to evaluate the long-term effectiveness of these approach. According to Chapman and Allan (2020), the interagency collaboration has helped the governments and the landowners to work together through provision of funding

and expertise to community groups and organizations for the restoration projects. The authors highlight that management of riparian zones in Australia is done by a combination of local state and federal laws, and there is always an overlap in the legislation. Despite there being an overlap in the law and policies guiding riparian zone management there is harmonization through effective collaborations between relevant stakeholders.

The African Union (AU) has adopted the African Water Vision 2025, which set out a framework for sustainable water management throughout the continent. The Africa water vision calls for regional and natural strategies to implement water policies based on water resources management principles through adopted of specific legislation related to riparian management (Medinilla, 2018). In South Africa, the National Water Act (1998) and the National Water resources strategy (2003) provide overarching framework of riparian zone management. However, there are also diverse range of governmental agencies and departments that are responsible for managing water resources and biodiversity. According to Mupfumi and Kiy (2013) most departments and Agencies operate in silos lacking proper coordination and collaboration which can lead to inefficiencies and gaps in the management of riparian zones.

In Kenya, collaborations in the riparian zone management are a challenge due to the jurisdictional fragmentation of laws and policies, and inadequate institutional capacity and coordination. Additionally, the traditional ownership structure of riparian areas often makes it difficult to engage with local stakeholders in management efforts (Mburu et al; 2015) A recent study on effects of land use on the riparian vegetation concluded that creating awareness and building trust through collaborations could change the perceptions and attitude of the local stakeholders by creating a shared understanding of the importance of riparian zone management. Through different levels of collaborations, WUAs should have access to specialized expertise in soil science and water chemistry, hydrology, geomorphology, GIS and remote sensing, geographical tools for mapping, monitoring and evaluation among others (Koskey et al., 2021).

2.4 Summary of Review of Literature and Knowledge gap

The literature review emphasizes the global importance of effective riparian zone management as a response to degradation of these ecologically valuable areas. Activities such as deforestation, hydrological alterations and water contamination have severely impacted riparian zones worldwide, with consequences for

both local ecosystems and human well-being. Restoration and management efforts are essential for achieving the UN Sustainable Development Goals (UN-SGDs) and UN-Decade on Restoration (UN-DER). It is crucial to adopt context-specific approaches that account for diverse challenges and opportunities faced in different regions. However, there is a notable gap in translating the theoretical understanding of capacity into practical guidelines for successful riparian zone management. The literature highlights the need for a deeper understanding of the specific skills required to effectively manage and conserve riparian zones. However, it fails to demonstrate the significance of these components and provide clear cause -effect relationships.

While the reviewed literature is extensive, there is a wide theory-practice divide at operational level such that the significance of the capacities needed for riparian zone management are not well translated as success factors on the ground. Consequently, the literature still grapples with how to translate the construct of capacity into practical guidelines to aid project delivery due to inconsistencies in the conceptualization of these capacities. While some studies have examined the theoretical and practical approaches in different regions, there is need for more research on effectiveness of these approaches in achieving the desired outcomes. Reviewed literature does not provide an understanding of the specific skills needed to effectively manage and conserve the riparian zone, and there even exist differences in the conceptualization of the capacities. Climate change poses additional challenges in the management of riparian zones, and it is crucial to adapt management strategies accordingly. However, the reviewed studies have primarily focused on identifying practices for integrated river basin and land management, failing to adequately address climate resiliency directly. Therefore, more research is needed to explore the adoption of climate-responsive practices and their implications for skills, collaborations and management processes.

Monitoring and Evaluation(M&E) play a vital role in assessing the effectiveness of riparian zone management interventions. However, the literature reveals a lack of standardized methodologies for M&E, which hinders the ability to accurately evaluate outcomes and progress towards the ultimate goal of riparian zone management interventions. Additionally, the availability and accessibility of comprehensive and up-to-date data on riparian zone remains a significant challenge. The scattered nature of data across various government agencies hampers effective management and decision-making. Thus, there is a need for clear

M&E guidelines and frameworks, as well as efforts to harmonize and consolidate data sources for improved management practices. In the reviewed studies, most monitoring practices for riparian zone management are yet to attain acceptable breadths, as they only focus on input and output disregarding the outcomes and the ultimate goals of the interventions due to lack of defined indicators and target.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology that was applied in this study. It incorporates data collection tools, procedures and analysis methods that were used to achieve the set objectives. The chapter entails a detailed description of the study area, target population, sample size determination, sampling method and data collection, analysis, and interpretation of findings.

3.2 Research Design

The research adopted a descriptive survey design to describe the characteristics, opinion, attitude, and behaviour of WRUAs to develop deep insights into the set objectives. According to Salkind (2020), this study design allows the researcher to describe, record and analyse the past and existing condition using both qualitative and quantitative approach. The correlation and regression were used to identify relationships between the independent and dependent variable that aims at establishing if there is a causal relationship between the two variables.

3.3 Research Site

River Kuywa which lies on the upper reaches of the Nzoia River within the Lake Victoria North basin area in Mt Elgon ecosystem was the research site. It is bounded by latitudes 0°25´24´´ N and 0°48´40´´N and longitudes 34°35´53´´E and 34°45´32´´E. It's a transboundary river that changes its name to Lwakhakha River when it crosses to Uganda. The entire river is about 96km, and it is divided into three zones: upper, middle, and lower Kuywa. According to KUWRUA (2008), these zones are named as Kuywa 'A' which lies between Mpakani and the confluent of Kibisi and River Kuywa, Kuywa 'B' lying between Kibisi-Kuywa confluent and Matisi bridge and Kuywa 'C' lying between Matisi bridge and Khalala, where it enters River Nzoia.

3.4 Target population

According to Mugenda and Mugenda (2003) the target population should have visible characteristics to which generalization of the outcome of the study can be made. The target population in this study comprised of 360 Kuywa WRUAs members. Those that are within the upper Kuywa (Zone A) were 138 members, middle Kuywa (Zone B) were 104 members whereas lower Kuywa (Zone C) had 118 from which a representative

sample was drawn. Kuywa WRUA was selected for this study as they have been proactive in riparian zone management activities for at least the last decade having developed a responsive participatory SCMP. They also have well established and functional structures and as such have received funding for riparian zone management activities in the past.

Table 3.1: Target Population Distribution

Kuywa WRUA	Registered Members
Kuywa Zone A	138
Kuywa Zone B	104
Kuywa zone C	118
Total	360

Source: KUYWRUA (2018)

The researcher also purposively selected five officers drawn from WRA, NEMA, Agriculture, forest, and Lands departments within the County as suitable key informants to obtain in-depth information through key informant interviews (KII). However, out of the five, two were not available for the interview at the time and efforts to follow them up were futile.

3.5 Sampling

3.5.1 Sampling Procedure

According to Mugenda and Mugenda (2003), sampling is a process of selecting a small number of elements from a larger defined target group. The proposed project adopted a stratified simple random and proportionate sampling procedures to select a suitable sample size from the target population. The choice of the sampling procedure was informed by the target population which is relatively homogeneous.

3.5.2 Study Sample Size

To determine the sample size, Krecjie and Morgan (1970) table was used to select 186 Kuywa WRUA members as the study sample distributed within the 3 Kuywa WRUA zones. Proportionate formula was then used to calculate sample size for each zone as shown in table 3.2 below.

Table 3.2: Sampling Table

Kuywa WRUA	Registered Members	Sample size (x/360 *186)
Kuywa Zone A	138	71
Kuywa Zone B	104	54
Kuywa zone C	118	61
Total	360	186

Source KUYWRUA (2018)

Further, sampling in each zone was conducted using stratified simple random method. The first step involved identifying the villages that constituted the population. The villages were selected based on their representation and significance in relation to research objectives. Once the villages were identified, the second step was to employ a simple random sampling technique within each stratum (village). This involved assigning a unique identification number to each village and then randomly selecting the required number of respondents from each stratum.

3.6 Data Collection

3.6.1 Data collection Instruments and tools

Semi-structured questionnaire was the primary data collection tool administered to the selected sample of the population. The key informant interview guides were prepared to guide through the interviews. Field observation (transect walk) checklist was useful in triangulating data collected using other tools. A digital camera was also an essential tool during the transect walk as it captured the physical features along the riparian zone. Records and documents from WRUAs were reviewed to get deeper insights into the performance of the group.

3.6.2 Instrument Validity

To determine the validity of the tools content and face validity test approaches were used to ensure that the tools were correct and valid in measuring the intended data, which was done in consultation with supervisor and subject matter experts within the department. The feedback offered confirmed that the tools were valid.

To further enhance the validity of the questionnaire, a pilot study was carried out to identify any ambiguities and other comprehension issues. The feedback allowed necessary refinement and improvement of the tool.

3.6.3 Instrument Reliability

According to Mugenda & Mugenda (2003), to ensure its reliability, the research instrument should yield consistent results after repeat trials, and as such a statistical test was run on the responses to ensure internal consistency. Cronbach's Alpha (CA) was used to test for the instrument reliability and according to Bryman (2016), a value of above 0.7 is acceptable. Variable in this study passed the test of reliability of scale as shown in the table 3.4.

Table 3.3: Reliability Statistics

Cronbach's Alpha	N of Items
0.772	39

Cronbach's alpha is widely considered a measure of internal consistency. The variables in this study generated a Cronbach's alpha of 0.772, therefore they passed the test of reliability of scale.

3.6.4 Data collection Procedure

The procedure involved administering open-ended questionnaires to the respondents and initiating a two-way communication between the interviewer and the respondent. The research assistance was first familiarized with the tool and deployed to the field. For further information gathering and triangulation of the survey, Key informant interviews (KII) were conducted targeting the subject matter specialists in relevant government agencies. A transect walk and photographs were used to corroborate some of the information that was gathered using other tools, especially for clarifying and reviewing some aspect of the interviews. Review of documents such as their financial transactions relating to riparian zone management, their constitution, membership list, SCMP and other relevant documents was useful in enhancing the outcome of the proposed study.

3.7 Data Processing and Analysis

After a successful data collection, preliminary check on the questionnaires was carried out to ensure that all the sections were filled correctly. Data cleaning was then carried out, checking all the data from the field for inaccuracies, incompleteness, and unreasonable entries to ensure compliance with the set standards of data collection. The data collected was analysed using SPSS version 29. Chi-square test was used to test for hypothesis, Correlation and linear regression models were used to measure the association between dependent and independent variables. The data was presented in form of charts, tables, and frequencies.

3.8 Legal and Ethical Considerations

To ensure that the researcher conforms to the standards of conduct of the authorities including Africa Nazarene University, a research permit from the ministry of Education National Council for science Technology and Innovation (NACOSTI) was acquired. During the data collection the participants' consent was also sought before administering the interviews and assured them of their privacy and confidentiality. The research findings are hereby shared with the relevant users with all fairness and without any personal biases. All copyrighted intellectual property referred in the research is acknowledged.

CHAPTER FOUR:DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the results achieved from the data analysis and interpretation. The characteristics of the respondents is expressed using demographic variables, and is organized and interpreted in line with the objectives of the study which are to assess the influence of Water Resources Users Associations (WRUAs) skills on riparian zone management, to establish the extent to which WRUAs management processes influences riparian zone management, and to examine how WRUAs level of collaboration with other stakeholders influences riparian zone management.

4.2 Characteristics of the Respondents

4.2.1 Response Rate

The study targeted 186 respondents from a population of 360 Kuywa WRUA members. 174 questionnaires were dully filled which translated to 94% response rate which is deemed adequate for statistical analysis and conclusion. According to Mugenda and Mugenda (2003), a response rate of at least 70% is enough to make such statistical analysis, therefore making the response rate in this study statistically sufficient.

4.2.2. Gender of the respondents

The study investigated gender distribution within Kuywa WRUA, and the results were as shown in table 4.1.

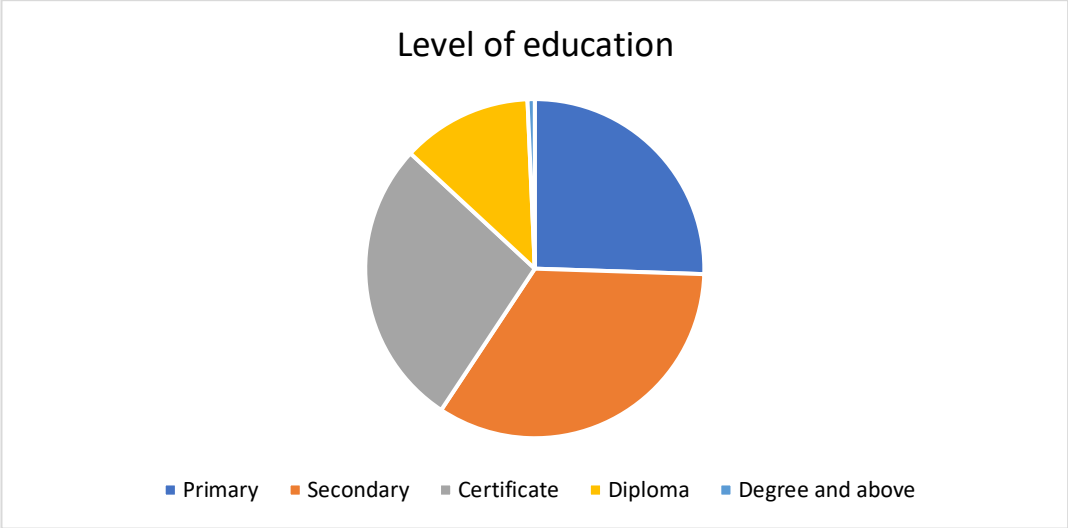
Table 4.1: Distribution of Respondents

Gender	Frequency	Percentage
Male	88	50.5
Female	86	49.5
Total	174	100

The results indicated that out of the 174 respondents, 88 (50.5%) of them were male, while 86 (49.5%) were female.

4.2.3 Level of Education

The respondents were asked to indicate their level of education whereby six categories were considered for this variable: non-formal education, primary, secondary, certificate, diploma and degree and above. The distribution of respondents by level of their education is illustrated in figure 4.1.



Source Researcher (2023)

Figure 4.1: Level of Education

Most respondents (34%) had studied up to secondary school,28% up to certificate level,26% had reached the primary school level, while those who had reached the diploma level and those with degrees and above were at 12% and 1% respectively.

4.2.4 Age

Age is a demographic characteristic that is bound to influence the performance of WRUAs. The age groups were classified into 5 categories. Frequency counts and percentages were used to summarize the responses as tabulated in table 4.2

Table 4.2: Age of Respondents

Range	Frequency	Percent	Cumulative Percentage
18-29	12	6.9	6.9
30-39	21	12.1	19
40-49	46	26.4	45.4
50-59	55	31.6	77
60>	40	23	100.0
Total	174	100	

Majority of respondents (31.6%) fell in the 50-59 age bracket, followed by 40-49 years age bracket at 26.4%, over 60 years age bracket at 23% and 30-39 age bracket at 12.1%. Only 6.9% of the respondents were within the age bracket of 18-29 years.

4.2.5 Years of membership

The respondents were asked the number of years they had been members of Kuywa WRUA. The responses were summarized using mode, median and mean to express the number of years of membership as displayed in table 4.3.

Table 4.3: Years of Membership

Statistical Measure	Value
Mean	9.9605
Median	10.0000
Mode	15.00
Standard Deviation	3.80136
Minimum	2.00
Maximum	15.00
Valid	**174**

The mean of years of membership and the median indicates that the distribution of the years of membership is roughly symmetrical at 9.96 and 10.0 respectively. This implies that most of the respondents had been members of Kuywa WRUA for approximately 10 years.

4.2.6 Involvement in the Riparian Zone Activities

To establish if there were members who were in the group but not participating in the riparian zone activities, the respondents were asked if they were involved in the riparian zone management activities or not.

Table 4.4: Involvement in Riparian Zone Activities

Response	Frequency	Percent	Cumulative Percentage
Yes	142	81.8	81.8
No	32	18.2	100.00
Total	174	100.0	

The responses indicated that majority of the members (81.8%) were involved in activities related to riparian zone management activities. With 18.2% of the respondents saying they were not involved in such activities.

4.3 Diagnostic Tests

The normality test and multicollinearity were conducted to ascertain whether the models used in this study adequately met the assumptions to enhance reliability and accuracy of statistical analysis and interpretation.

4.3.1 Normality Test

The Shapiro-Wilk test was used to assess the normality of the dataset collected. The test is used to evaluate whether the sample could have been drawn from a normally distributed population. The results are as shown in table 4.8.

Table 4.5: Normality Test Results

Variable description	Shapiro-Wilk		
	Test Statistics(w)	Df	Sig
Skills	0.98957	173	0.05
Management processes	0.99802	173	0.05
Collaborations	0.13936	173	0.05
Riparian zone management	0.99802	173	0.05

From the normality test table above at 5% level of significance the variables appears to have a normal distribution with p-value ranging from 0.13 to 0.99 being larger than 0.05.

4.3.2 Multicollinearity Test

Table 4.6:Multicollinearity Test

Variable description	Tolerance	VIF
Skills	0.9461	1.01
Management processes	0.9404	1.06
Collaborations	0.9655	1.63
Riparian zone management	0.517	1.09

VIF value of less than 0.1 or greater than 10 implies presence of multicollinearity. A tolerance value tending to Zero implies presence of multicollinearity, while a tolerance tending to 1 implies no multicollinearity, in this case the tolerance level above 0.5 (tending to the value 1) implies there is no multicollinearity.

4.4 Riparian Zone Management

Riparian zone management was the dependent variable in this study. A set of questions were administered to the respondent to capture their opinion regarding the state of riparian zone along River Kuywa. The question on whether the riparian zone vegetation had improved received a 55.9% respondent who said that it had not improved, whereas those who said there was improvement were 44.1%. They were further asked to rate the overall health of River Kuywa and the results are as tabulated in figure 4.2.

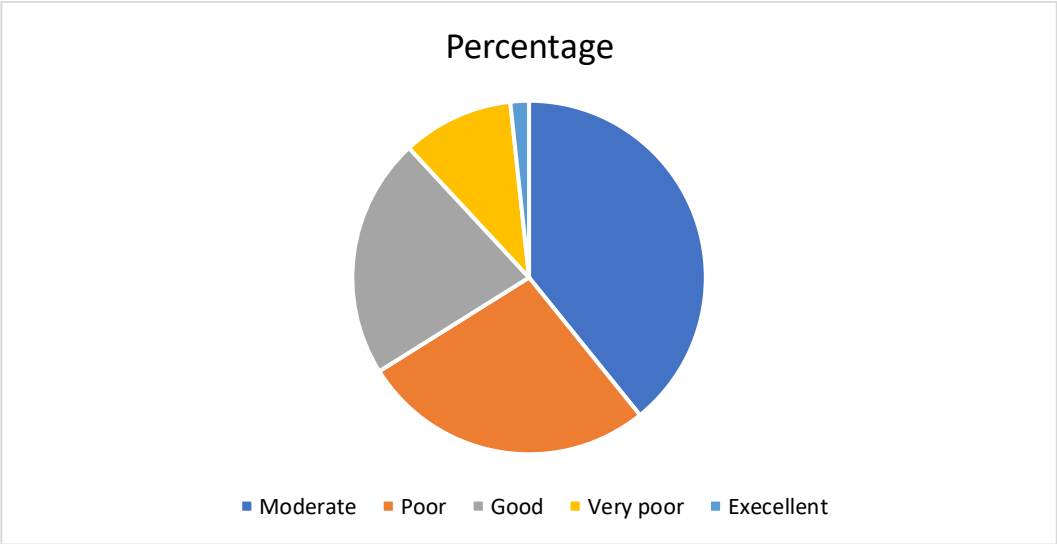


Figure 4.2: Riparian Zone Overall Health

Most of the respondents (39.2%) rated the health of the riparian zone as moderate. 26.9% said it was poor, 22% rated it as good,10.2% very poor while 1.7% excellent.

To be able to establish if Kuywa WRUA were aware of climate change impacts a question on whether they have been monitoring the temperatures and quality of water was asked. Majority (77.9%) of the respondents indicated that they have not been monitoring whereas 22.1% reported were monitoring the two parameters. Out of the 22.1% only 8% opined that monitoring of temperature and water quality had helped them improve the riparian zone management practices while 92% it did not make any difference. To further get deeper insights on impacts of climate change the respondents were asked whether the riparian zone management activities have been effective in providing flood attenuation in the last 5 years , 38.9% said no , 30.5% were not sure while 30.6% were not sure.62.7% of the respondents' also indicated that the overall

population of the indigenous tree species within the riparian zone decreased in the last 15 years,25.4% said there was no change while 11.9% said the trees had decreased.

4.5 Skills and Riparian zone management

4.5.1 Descriptive Analysis

This is the first objective that sought to explore the relationship between WRUAs' skills and the riparian zone management. To achieve the objective, the respondents were asked to indicate if they had attended any training related to riparian zone management. 58.8 % of the respondents indicated that they had attended training related to riparian zone management while 41.2% had not attended such training. When asked to specify the kind of training they had attended, their responses were within these broad categories; soil erosion and conservation, leadership and bookkeeping, terracing, nursery bed establishment and tree planting as presented in the figure 4.3.

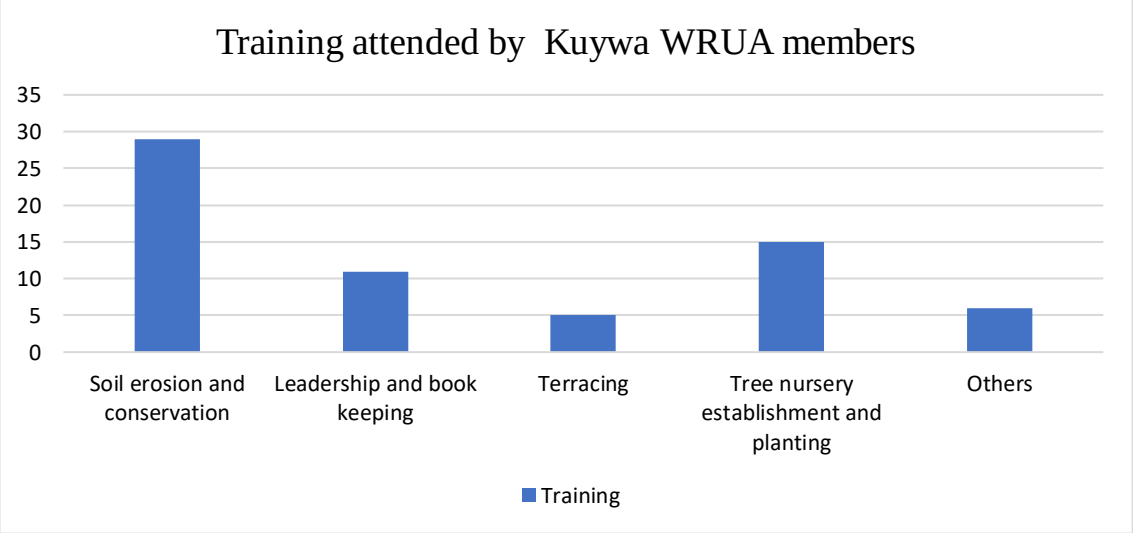


Figure 4. 3: Trainings Attended Related to Riparian Zone Management

The respondents were further asked to indicate their level of agreement with a series of statements depicting their opinion towards their skills for riparian zone management. Eight statements were developed to measure the extent to which WRUA skills influenced riparian zone management. A 5-point Likert scale from 1=strongly disagree 2= Disagree 3= Neutral 4= Agree 5=Strongly agree to check their level of agreement. The results as illustrated in table 4.7

Table 4.7: Analysis of Skills and Riparian Zone Management

	Statements	SD	D	N	A	SA	Mean	Standard deviation
1.	Targeted training is offered to all members.	82(47.1%)	30(17.2%)	30(17.2)	14(8%)	18(10.3%)	2.172	2.101
2.	Roles and responsibilities of members are clear and regularly updated.	40(23%)	22(12.6%)	63(36.2%)	33(19%)	16(9.2%)	2.787	2.557
3.	There are clear guidelines on how to employ experts such as structural and M&E experts.	15(8.6%)	10(5.8%)	88(50.6%)	42(24.1%)	19(10.9%)	3.23	2.869
4.	Staff are employed to supervise or supervise technical SCMP activities every time need arises.	18(10.3%)	5(2.9%)	73(42%)	58(33.3%)	20(11.5%)	3.328	2.979
5.	Capacity building of WRUA members on M&E should be embedded in every project initiative to enhance monitoring skills.	12(6.9%)	29(16.7%)	34(19.5%)	40(22.9)	59(34%)	3.603	3.324
6.	The committee value input of others in decision making and is open to ideas from members.	52(29.9%)	31(17.8%)	40(23%)	31(17.8%)	20(11.5%)	2.632	2.484
7.	Committee members pick the members who are to attend training/workshops or any learning forum.	23(13.2%)	8(4.6%)	18(10.4%)	47(27%)	78(44.8%)	3.856	3.594
8.	WRUA is independently implementing all the tasks related to riparian zone management.	35(20.1%)	78(44.8%)	41(23.6)	13(7.5%)	7(4%)	2.305	2.003
	Composite mean and standard deviation						1.314	2.703

The respondents had varying levels of agreement with various statement that gave the characterization of their skills for riparian zone management. Out of 174 respondents, 82(47.1%) who were the majority strongly disagreed with the statement “Targeted training on riparian zone management has been offered to all members”. Both that disagreed and remained neutral were at 30 (17.24%) each ,8.05 % agreed while10.3 %

strongly agreed. The mean rating for this statement was 2.172 and the standard deviation of 2.101. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. Responding to whether they had organized learning forums for WRUA members in the recent past, the respondent from the ministry of agriculture said:

> *"Yes, we have organized several forums for WRUA members and even other community members whose shamba are touching River Kuywa. The learning forums provide a platform for WRUA members to come together, exchange experiences and enhance their understanding of best practices in riparian zone management. Recently, we had a forum that covered sustainable water use and soil conservation strategies. We even conducted demos on how to make terraces".*

More than half of the respondents (50.6%) remained neutral regarding the statement "There are clear guidelines on how to employ experts such as structural and M&E experts",24.1 % agreed ,10.9% strongly agreed,8.6% strongly disagreed while 5.8% disagreed. The statement was associated with a mean rating of 3.23 and a standard deviation of 2.869. This mean rating was higher than the overall mean score meaning the statement affected the riparian zone management positively. Regarding the statement "Staff are employed to implement or supervise technical SCMP activities every time need arise" 42% of the respondents which were the majority were neutral ,33.3% agreed, 11.5% strongly agreed, 10.3 % strongly disagreed while 2.9% disagreed. This statement had a mean of 3.328 and a standard deviation of 2.979 which is higher than the composite mean of 1.314 with standard deviation of 2.703, implying that the statement positively influence the riparian zone management.

The key informants responded to the question on availability of clear guidelines on how to employ experts to implement or supervise riparian zone management activities. One of the respondents said:

"*We only engage expert when the project has external funding".*

The respondent further explained that:

> "*Engaging experts in riparian zone management activities can sometimes be challenging even if the project is doors funded. The challenges are related to deciding on the*

appropriate rate to pay them while the community members and the WRUA members feel like they have people they can front for the roles at a significantly lower financial implication. While the expert can provide valuable insights, striking a balance and ensuring that the engagement process is inclusive and does not elicit conflict can be a challenging task".

In relation to the statement "Capacity building of WRUA members on M&E should be embedded in every project initiative to enhance monitoring skills", 34% strongly agreed while 22.9 % agreed with the statement. 19.5% of the respondent remained neutral, 16.7% disagreed and 6.9% strongly disagreed. The item reported an average score of 3.603 with a standard deviation of 3.324. This mean score was higher than the overall mean implying that the statement affected riparian zone management positively. Majority of the respondent (29.9%) strongly disagreed with the statement "The committee values input of other members in decision making" while 23 % were neutral and 17.5 % also disagreed with the statement, those who agreed with the statement were 27% and those who strongly agreed were 11.5%. The mean score and standard deviation were 2.632 and 2.484 respectively. This mean score was higher than the composite mean implying that the statement positively affected riparian zone management.

As pertains to the statement "Committee members pick WRUA members to attend training/workshop or any other learning forum" a majority (44.8%) strongly agreed, 27% agreed,13.2% strongly disagreed 10.4% were neutral while 4.6% disagreed. The mean rating for this statement was 3.856 and the standard deviation of 3.594. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. Concerning the statement "WRUA is independently implementing all tasks related to riparian zone management" 44.8 % disagreed while 20.1% strongly disagreed with the statement.23.6% were neutral regarding this item, 7.5% strongly agreed and 4 % agreed with the statement. The mean rating for this statement was 2.305 and the standard deviation of 2.003. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. On the last statement "Roles and responsibilities of members are clear and regularly updated" 36.2% of the respondents who were the majority were neutral ,23% strongly disagreed, 12.6%

disagreed, 19% agreed while 9.2% strongly agreed. This statement had a mean of 2.787 and a standard deviation of 2.557 which is higher than the composite mean and standard deviation implying that the statement positively influences the riparian zone management.

4.5.2 Inferential Analysis of Skills and Riparian Zone Management

Correlation, regression, and hypothesis testing were conducted to test the relationship between WRUAs skills and riparian zone management.

Hypothesis Testing.

'Ho: There is no significant relationship between WRUA's skills and riparian zone management in Kenya', a crosstabulation of skills and riparian zone management was analysed and tabulated as below

Table 4.8: Chi-Square Test for Skills

Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.568[a]	4	.002
Likelihood Ratio	16.339	4	.003
Linear-by-linear Association	8.512	1	.004
N of Valid Cases	**174**		

a. 0 Cells (0.0%) have expected count less than 5. The minimum expected count is 5.73.

Table 4.9:Symmetric Measures

Test	Value	Approximate Significance
Nominal by Nominal	.298	.002
Cramer's V	.298	.002
N of Valid Cases	**174**	

The Chi-square test shows that there is no sufficient evidence to support the above hypothesis as shown by the Pearson Chi-Square at 5% significance level. Therefore, the null hypothesis was rejected on account of the Pearson Chi-square statistic (0.002) being less than the p-value (0.05).

Correlation of skills and riparian zone management.

Table 4.10: Correlation Test for Skills

Variable		Riparian zone management	Skills
Riparian zone management	Pearson's correlation sig.(2-tailed)	1	-0.1553
Skills	Pearson's correlation sig.(2-tailed)	-0.1553	1
N		174	

The table present a weak and negative linear association between skills and riparian zone management (r= -0.1553). The association was also found to be statistically significant at 5% level of significance r= -0.1553, $p<0.05$.

Regression analysis of skills against Riparian zone management

A linear regression model was used to provide insights into the strength and the direction of the relationship between WRUAs' skills and riparian zone management. The results are presented in the table below.

Table 4.11: Model for Skills and Riparian Zone Analysis

Model Summary	R-squared	Adjusted R squared	Error of the estimate
1	0.0889	0.0448	0.47948

The coefficient of determination (R-squared) value means that a change of 8.49% in the skills would affect the riparian zone management.

Table 4.12: ANOVA Results for Skills and Riparian Zone Management

ANOVA				
Model	Sum of squares	DF	Mean squares	F
Regression	3.7035	8	0.4629	2.01
Residual	37.9344	165	0.2299	
Total	41.6379	173		

The F-value (2.01) is larger than 0.05, therefore suggesting that there is no significant difference between the means of the skills disaggregated variables.

4.6 Management Processes and Riparian Zone Management

4.6.1 Descriptive Analysis

Nine statements were also developed to measure the extent to which WRUA management processes influenced riparian zone management Using a 5-point Likert scale as illustrated in table 4.13

Table 4.13: Analysis of Management Processes and Riparian Zone Management

Statements	SD	D	N	A	SA	Mean	Standard deviation
1. Problem analysis and need assessment for riparian zone management undertaken and agreed on by all stakeholders.	62(35.6%)	38(21.8%)	53(30.5%)	11(6.3%)	10(5.8%)	2.247	2.043
2. The set objectives address the root cause of riparian zone degradation and create the intended impact.	32(18.4%)	25(14.4%)	54(31%)	52(29.8%)	11(6.3%)	2.914	2.646
3. There is a well-established M&E framework with relevant output, outcome, and impact indicators.	64(36.8%)	30(17.2%)	63(36.2)	12(6.9%)	5(2.9%)	2.218	1.98
4. The problem analysis and need assessment results are used as an input for riparian zone management.	20(11.5%)	17(9.8%)	93(53.4%)	32(18.4%)	12(6.9%)	2.994	2.644
5. Activities are carried out with clear plan of action and coordination between the WRUA committee and members.	19(10.9%)	14(8.1%)	42(24.1%)	82(47.1%)	17(9.8%)	3.368	3.036
6. Baseline surveys are conducted, and such data is accessible. Lessons learnt, experiences and best practices from previous activities are documented.	69(39.6%)	21(12.1%)	64(36.8%)	8(4.6%)	12(6.9%)	2.270	2.093
7. Members have access to minutes, reports, records, and other relevant documents for continued learning and improvement.	96(55.1%)	23(13.2%)	35(20.1%)	10(5.8%)	10(5.8%)	1.937	1.819
8. The group contribute money and engage in income generating activities to sustain their financial needs.	26(14.9%)	12(6.9%)	36(20.7%)	82(47.1%)	18(10.4%)	3.310	2.652
9. There are incentives for WRUA members who report good performance and sanction for those who report poor performance.	43(24.7%)	28(16.1%)	71(40.8%)	21(12.1%)	11(6.3%)	2.592	2.342
Composite mean and standard deviation						1.375	2.662

Out of the total number of those who responded to the statement “Problem analysis and need assessment for riparian zone management undertaken and agreed on by all stakeholders”, 35.6 % strongly disagreed with the statement ,30.5 % were neutral ,21.8% disagreed, 6.3 % agreed while 5.8% strongly agreed. The statement was associated with a mean rating of 2.247 and a standard deviation of 2.043. The mean rating for this item was higher than the overall mean score which was 1.375 and standard deviation of 2.662 implying that the statement affected the riparian zone management positively. Regarding the statement “The set

objectives address the root cause of riparian zone degradation and create the intended impact" 31% of the respondents who were the majority were neutral ,29.8% agreed, 18.4% strongly disagreed, 14.4 % disagreed while 6.3% strongly agreed. This statement had a mean of 2.914 and a standard deviation of 2.218 which is higher than the composite average of 1.375 with standard deviation of 2.662, implying that the statement positively influences the riparian zone management.

As pertains to the statement "There is a well-established M&E framework with relevant output, outcome and impact indicators" 36.8% strongly agreed, 36.2% were neutral,17.2% disagreed 6.9 % agreed while 2.9% strongly agreed. The mean rating for this statement was 2.218 and the standard deviation of 1.98. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. On access of M&E tools and expertise another key informant said:

> *"There is substantial knowledge on variety of tools for monitoring changes in the riparian zone, however, the extent of access varies due to capacity and resources available to deploy a robust M&E system. These challenges are hindering us from actively tracking and evaluating changes in the riparian zone. The only indicator that we are currently monitoring regularly as an institution is water quality although WRUAs themselves do not have access to tools for such activities. Partnership with other stakeholders such as NGOs and research institutions would provide support and expertise in developing and implementing robust M&E systems".*

Concerning the statement "The problem analysis and need assessment results are used as an input for riparian zone management" 53.4 % were neutral, 18.4% agreed with the statement, 11.5% strongly disagreed, 9.8% disagreed and 6.9% strongly agreed with the statement. The mean rating for this statement was 2.994 and the standard deviation of 2.644. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. In relation to the statement "Activities are carried out with clear plan of action and coordination between the WRUA committee and members", 47.1% agreed while 24.1 % were neutral.10.9% of the respondent strongly disagreed with the statement, 9.8% strongly agreed and 8.1% disagreed. The item reported an average score of 3.368 with a

standard deviation of 3.3036. This mean score was higher than the overall mean implying that the statement affected riparian zone management positively.

Majority of the respondent (39.6%) strongly disagreed with the statement "Baseline surveys are conducted, and such data is accessible. Lessons learnt, experiences and best practices from previous activities are documented." While 36.8 % were neutral and 12.1 % disagreed with the statement, those who agreed with the statement were 4.6% and those who strongly agreed were 6.9 %. The mean score and standard deviation were 2.270 and 2.093 respectively. This mean score was higher than the composite mean implying that the statement positively affected riparian zone management. During one of the key informant interviews, the respondent from Water Resources Authority weighed in on the issue of whether baseline surveys are conducted specifically on riparian habitats and whether such data was accessible, this is what they had to say:

> "*Although baseline surveys are conducted especially if the project is donor funded, the accessibility of the data is still limited. There seems to be a lack of effective mechanism in place to ensure data availability and usability, WRUAs do have the capacity to interpret such reports. The extent to which such information is disseminated and integrated into future planning and implementation process is unclear".*

More than half of the respondents (55.1%) strongly disagreed with the statement "Members have access to minutes, reports, records, and other relevant documents for continued learning and improvement",20.1 % were neutral ,13.2% disagreed, and those who agreed and disagreed were at 5.8% each. The statement was associated with a mean rating of 1.937 and a standard deviation of 1.819. This mean rating was higher than the overall mean score meaning the statement affected the riparian zone management positively. Regarding the statement "The group contribute money and engage in income generating activities to sustain their financial needs" 47.1% of the respondents which were the majority were agreed ,20.7% were neutral, 14.9% strongly disagreed, 10.4 % strongly agreed while 6.9 % disagreed. This statement had a mean of 3.310 and a standard deviation of 2.652 which is higher than the composite mean of 1.375 with standard deviation of 2.662, implying that the statement positively influenced the riparian zone management.

4.6.2 Inferential Analysis of Management processes and Riparian Zone Management

***Hypothesis testing*.**

Ho: 'There is no significant relationship between WRUA's management processes and riparian zone management in Kenya', a crosstabulation of management Process and riparian zone management is as displayed in the table below.

Table 4.14: Chi-Square Test for Management Processes

Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.294[a]	4	.258
Likelihood Ratio	5.239	4	.264
Linear-by-linear Association	2.963	1	.085
N of Valid Cases	**174**		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 3.78.

Table 4.15: Symmetric Measures

Test	Value	Approximate Significance
Nominal by Nominal	.169	.258
Cramer's V	.169	.258
N of Valid Cases	**174**	

The Chi-square test results show that there is sufficient evidence to support the above hypothesis at 5% level of significance. We therefore failed to reject the null hypothesis on account of the Pearson Chi-square statistic (0.258) being higher than (0.05).

***Correlation between management processes and riparian zone management*.**

Table 4.16: Correlation Test for Management Processes

Variable		Riparian zone management	Management process
Riparian zone management	Pearson's correlation sig.(2-tailed)	1	
Management process	Pearson's correlation sig.(2-tailed)	-0.1452	1
N		174	

The table present a weak and negative linear association between management processes and riparian zone management (r= -0.1452). The association was also found to be statistically significant at 5% level of significance r= -0.1452, $p<0.05$.

Regression analysis of management processes against Riparian zone management.

Table 4.17: Model for Management Processes and Riparian Zone Analysis

Model Summary	R-squared	Adjusted R squared	Error of the estimate
1	0.0951	0.0396	0.48078

The coefficient of determination (R-squared) value means that a change of 9.5% in the management processes would affect the riparian zone management.

Table 4.18:ANOVA Results for Management Processes and Riparian Zone Management

ANOVA				
Model	Sum of squares	DF	Mean squares	F
Regression	3.9611	10	0.3961	1.71
Residual	37.6768	163	0.2311	
Total	41.6379	173		

The F-value (1.71) is larger than 0.05, therefore suggesting that there is no significant difference between the means of the management processes disaggregated variables.

4.7 Collaborations and Riparian Zone Management

4.7.1 Descriptive Analysis

The third objective aimed at examining how WRUAs level of collaborations with other stakeholders influenced riparian zone management. The respondents were asked which other agencies/institutions were involved in riparian zone management. Their responses were as shown in the chart below.

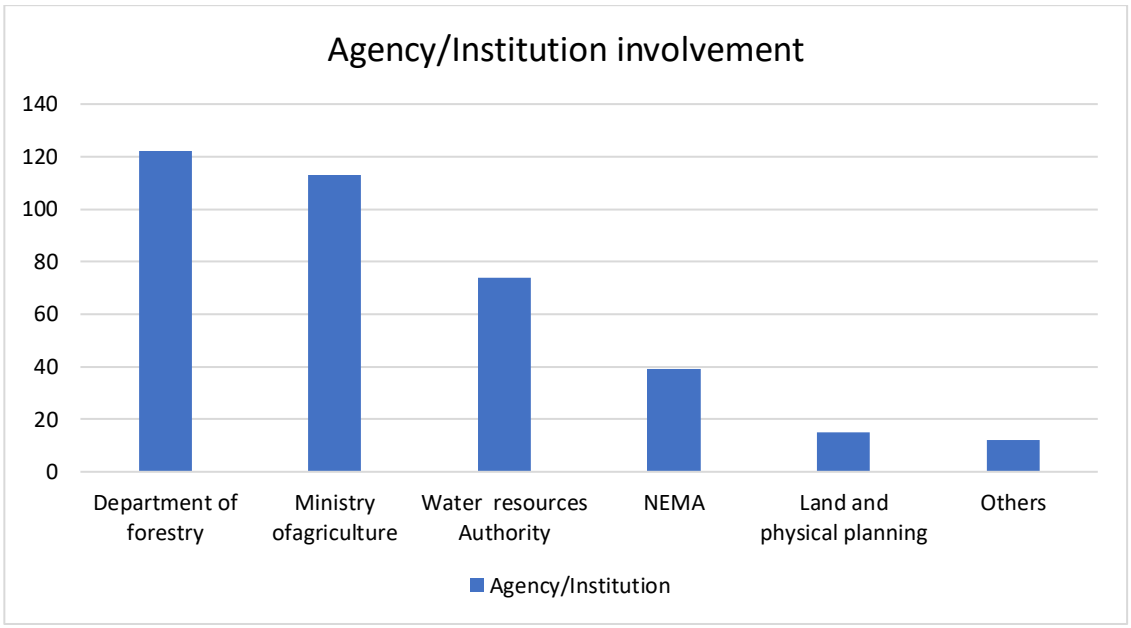


Figure 4.4: Agencies/Institutions Involved in Riparian Zone Management

The respondents were further asked which institution should have jurisdiction to manage riparian zones and their responses were as presented in the chart below.

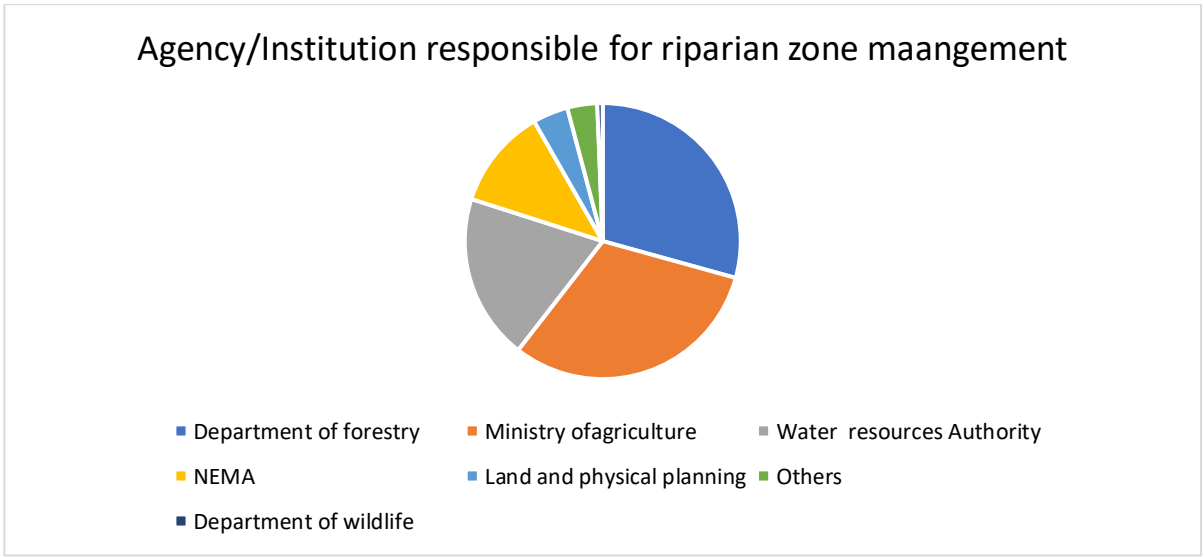


Figure 4.5: Riparian Zone Management Jurisdiction

Eight statements were also developed to measure the extent to which WRUA collaborations influenced riparian zone management. Using a 5-point Likert scale from their level of agreement was checked. The results as illustrated in table 4.19.

Table 4.19: Analysis for Collaboration and Riparian Zone Management

	Statements	SD	D	N	A	SA	Mean	Standard deviation
1.	WRA takes up all issues raised by WRUA and together find solutions to all of them.	9(5.2%)	14(8.1%)	84(48.2%)	59(33.9%)	8(4.6%)	3.247	2.837
2.	WRUA and WRA have a strong working relationship based on legal recognition of mutual respect.	4(2.3%)	11(6.3%)	113(65%)	39(22.4%)	7(4%)	3.195	2.742
3.	WRUA has built a close coordination with other governmental agencies in the planning process, implementation procedures and practices.	12(6.9%)	6(3.4%)	59(33.9%)	83(47.7%)	14(8.1%)	3.466	3.072
4.	WRUA engages community members through awareness creation and sensitization.	5(2.8%)	10(5.8%)	21(12.1%)	86(49.4%)	52(29.9%)	3.977	3.570
5.	WRA informs WRUA's when conducting any activity within the riparian zone.	9(5.2%)	10(5.8%)	62(35.6%)	82(47.1%)	11(6.3%)	3.437	3.029
6.	WRUA is fully engaged in developing partners for specific issues and has clear strategy and policies to engage relevant stakeholders.	16(9.2%)	17(9.8%)	94(54%)	34(19.5%)	13(7.5%)	3.063	2.697
7.	WRUA aligns its planning and implementation with existing government policies and priorities.	9(5.2%)	9(5.2%)	45(25.8%)	99(56.9%)	12(6.9%)	3.552	3.140
8.	Proof of benefit and results in activities through collaboration can be seen at the project level.	9(5.2%)	10(5.8%)	55(31.6%)	88(50.5%)	12(6.9%)	3.483	3.076
	Composite mean and standard deviation.						1.239	3.476

Regarding the statement “WRA takes up all issues raised by WRUA and together find solutions to all of them” 48.2% of the respondents which were the majority were neutral ,33.9% agreed, 8.1% disagreed, 5.2 % strongly disagreed while 4.6% strongly agreed. This statement had a mean of 3.247 and a standard deviation

of 2.837 which is higher than the composite mean of 1.239 with standard deviation of 3.476, implying that the statement positively influence the riparian zone management. Majority of the respondent (65%) were neutral on the statement "WRUA and WRA have a strong working relationship based on legal recognition of mutual respect" While 22.4 % agreed and 6.3 % disagreed with the statement. Those who strongly agreed with the statement were 4% and those who strongly disagreed were 6.9 %. The mean score and standard deviation were 3.195 and 3.466 respectively. This mean score was higher than the composite mean implying that the statement positively affected riparian zone management.

Concerning the statement "WRUA has built a close coordination with other governmental agencies in the planning process, implementation procedures and practices" 47.7 % agreed, 33.9% were neutral, 8.1% strongly agreed, 6.9 % strongly disagreed and 3.4 % strongly disagreed with the statement. The mean rating for this statement was 3.466 and the standard deviation of 3.072. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. Key informant respondents were asked their views on whether institutions and organisations other than WRA are involved in riparian zone management. The agriculture officer said that:

> "*Other institutions and organisations within the County are open for engagement in riparian zone management activities. In fact, Kuywa WRUA implemented vetiver grass planting project which was spearheaded by the ministry of agriculture. However, the efforts can be more rewarding if research institutions can come on board to enhance management activities that are fact based. There are challenges though due to institutional and governance challenges whereby different institutions or organisations have different structures, regulations, decision making processes among other which presents different perspective and conflict of interest".*

In relation to the statement "WRUA engages community members through awareness creation and sensitization", 49.4% agreed while 29.9 % strongly agreed.5.8% of the respondent disagreed with the statement, 12.1% were neutral and 2.8% strongly disagreed. The item reported an average score of 3.977 with

a standard deviation of 3.570. This mean score was higher than the overall mean implying that the statement affected riparian zone management positively.

Those who agreed with the statement “WRA informs WRUA's when conducting any activity within the riparian zone” were 47.1% ,35.6 % were neutral ,6.3% strongly agreed, 5.8 % disagreed while 5.2% strongly disagreed. The statement was associated with a mean rating of 3.437 and a standard deviation of 3.029. The mean rating for this item was higher than the overall mean score which was 1.239 and standard deviation of 3.476 implying that the statement affected the riparian zone management positively. Regarding the statement “WRUA is fully engaged in developing partners for specific issues and has clear strategy and policies to engage relevant stakeholders.” 54% of the respondents who were the majority were neutral ,19.5% agreed, 9.8% disagreed, 9.2 % strongly disagreed while 7.5 % strongly agreed. This statement had a mean of 3.063 and a standard deviation of 2.697 which is higher than the composite mean and standard deviation, implying that the statement positively influences the riparian zone management.

Responding to the statement “WRUA aligns its planning and implementation with existing government policies and priorities” 56.9 % agreed while 25.8 % were neutral. Those that strongly agreed with the statement were 6.9%, whereas those who strongly disagreed and agreed were equal at 5.2% for each category. The mean rating for this statement was 3.552 and the standard deviation of 3.140. The mean score was higher than the overall composite mean score indicating that the statement affected the riparian zone management positively. On the last statement “Proof of benefit and results in activities through collaboration can be seen at the project level” 50.5% of the respondents who were the majority agreed ,31.6 % were neutral, 6.9% strongly agreed, 5.8% disagreed while 5.2% strongly disagreed. This statement had a mean of 3.483 and a standard deviation of 3.076 which is higher than the composite mean and standard deviation implying that the statement positively influences the riparian zone management.

4.7.2 Inferential Analysis of Collaborations and Riparian Zone Management

Hypothesis testing.

Ho: There is no significant relationship between WRUA’s level of collaboration with other

stakeholders and riparian zone management in Kenya', a crosstabulation of collaborations and riparian zone management is as displayed in the table below.

Table 4.20: Chi-Square Test for Collaboration

Test	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.503[a]	4	.112
Likelihood Ratio	7.409	4	.116
Linear-by-linear Association	1.847	1	.174
N of Valid Cases	**174**		

a.1 cell (10.0%) have expected count less than 5. The minimum expected count is 4.96.

Table 4.21: Symmetric Measures

Test	Value	Approximate Significance
Nominal by Nominal	.201	.112
Cramer's V	.201	.112
N of Valid Cases	**174**	

The Chi-square test results show that there is sufficient evidence to support the above hypothesis at 5% level of significance. We therefore failed to reject the null hypothesis on account of the Pearson Chi-square statistic (0.112) being higher than (0.05)

Correlation between collaborations and riparian zone management

Table 4.22: Correlation Test for Collaborations

Variable				Riparian zone management	Collaborations
Riparian zone management	Pearson's correlation	sig.(2-tailed)		1	
Collaborations	Pearson's correlation	sig.(2-tailed)		-0.1364	1
N				174	

The correlation results depict a negative relationship between collaborations and riparian zone management, albeit, quite a weak one. The association was also found to be statistically significant at 5% level of significance $r= -0.1364$, $p<0.05$.

Regression analysis of collaborations against riparian zone management

Table 4.23: Model for Collaboration and Riparian Zone Management

Model Summary	R-squared	Adjusted R squared	Error of the estimate
1	0.0849	0.0463	0.47909

The R-squared (coefficient of determination) value is the measure of the extent to which a change in the independent variable would affect the dependent variable. In this case the collaborations would cause a 8.49% change in the riparian zone management.

Table 4.24: ANOVA Results for Collaborations and Riparian Zone Management

ANOVA				
Model	Sum of squares	DF	Mean squares	F
Regression	3.5361	7	0.5051	2.20
Residual	38.1018	166	0.2295	
Total	41.6379	173		

The F-value (2.20) is larger than 0.05, therefore suggesting that there is no significant difference between the means of the collaborations disaggregated variables.

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND RECCOMENDATIONS

5.1 Introduction

This chapter presents discussion of the assessment conducted to evaluate the capacity of Water Resources User Associations (WRUAs) in managing riparian zones focusing of Kuywa WRUA in Bungoma County. It also provides the summary of the findings and gives the conclusion and recommendations of the study. The study was guided by the following objectives: To assess the influence of WRUAs skills on riparian zone management in Kenya; To establish the extent to which WRUAs management processes influences riparian zone management in Kenya, and to examine how WRUAs level of collaboration with other stakeholders influences riparian zone management in Kenya. By analysing the findings in light of the research objectives, these discussions aim to provide insights into the current state of the WRUAs capacity for riparian zone management.

5.2 Discussions

Gender distribution, level of education and age demographics can have significant implications for riparian zone management. This study asserts that gender equity and age diversity are paramount in achieving effective and inclusive riparian zone management initiatives. Recognizing the distinct contribution and concern of both genders is a fundamental step towards promoting inclusiveness and equal opportunities for participation. This study exhibited a balanced presentation of male and female WRUA members, which is an encouraging indication of equitable involvement. Moreover, the age distribution among WRUA members holds significant implications for success of riparian zone management efforts. Each age group brings a unique perspective, experiences and approaches to environment stewardship.

The presence of older members, who have accumulated years of membership and possess invaluable knowledge of historical changes and ecological processes, greatly enhances decision-making and storytelling. However, it is important to address the limited involvement of younger members, particularly within 18-29 age bracket, who typically possess greater technological savvy. The generational gap within WRUAs poses challenges in utilizing digital tools and platforms for effective monitoring and evaluation (M&E). To bridge this gap, target efforts should be made to engage younger members with higher level of education. By

providing comprehensive training and raising awareness regarding the importance of M&E, the understanding of climate change impacts, benefits of adaptive management, and knowledge base can be enhanced. This agrees with Morandi et al; (2014) view on fostering collaborations to create opportunities for knowledge sharing and innovative approaches.

5.2.1 Skills and Riparian Zone Management

The findings of the first objective reveals a significant relationship between WRUAs skills and riparian zone management, indicating that WRUAs with higher level of skills are more likely to demonstrate better practices and outcomes in managing riparian zones. These findings align with the previous research by Richard and Syallow (2018) that emphasizes importance of capacity building and training programs for enhancing water resources governance. It is evident that investing in skills development can have a positive impact to the overall quality of riparian zone management.

However, it is essential to recognize that skills alone are not the sole determinant of successful riparian zone management. While higher skills generally lead to better outcomes, the complex and interconnected nature of riparian zone management should not be overlooked. The observed weak and negative linear association between skills and riparian zone management may not fully capture the intricate dynamics at play. Non-linear and interactive factors may influence the effectiveness of riparian zone management, suggesting the need for a holistic approach that goes beyond individual skills. Incorporating best management practices that considers ecological resilience and sustainability is crucial for long-term success.

5.2.2 Management Processes and Riparian Zone Management

The analysis explored the relationship between the management processes and riparian zone management within the context of WRUAs. The findings revealed interesting insights, suggesting a significant relationship between management processes and positive outcomes in terms of biodiversity conservation, water quality and overall ecological resilience and sustainability. This concurs with Kagoro et al, (2017) observation that good management processes in riparian zone management contribute to overall ecological resilience. However, it is crucial to acknowledge the complexity and multifaceted nature of this relationship. While descriptive analysis indicates a positive influence, further statistical tests did not provide strong

evidence of a significant association between the variables. This highlights the limitation of the categorical nature of the analysis and the potential influence of various contextual and adaptive factors on the relationship.

This study emphasizes the need to recognize that success outcomes in riparian zone management cannot be solely attributed to management processes. There may be trade-offs and confounding factors that were not captured in the analysis. This highlights the importance of a comprehensive approach that considers context-specific elements, socio-economic conditions, and adaptive management strategies. This aligns with Barton et al; (2020) understanding that environmental conservation projects are complex and multifaceted and may involve non-linear interactions with other factors. Subsequently, there is a need for further research and exploration to deepen the understanding of the relationship between management processes and riparian zone management.

5.2.3 Collaborations and Riparian Zone Management

The findings highlights the importance of collaboration in riparian zone management. Kuywa WRUA identified various agencies that they believed would play a significant role in this process. This aligns with previous research by Chapman and Allan (2020), which emphasized the need for interagency collaboration to support environmental restoration projects through funding and expertise. The analysis of collaboration variables suggests that effective collaboration among stakeholders can enhance the outcome of riparian zone management. The findings agrees with Tylor and Meir (2019) who emphasized the significance of collaboration in natural resources management for knowledge sharing, coordinated actions, resource pooling and collective decision-making.

Although the analysis did not provide enough evidence to show that there is a significant relationship between collaborations and riparian zone management, the non-significance relationship suggests the need for a deeper understanding of the complex dynamics involved. The involvement of multiple stakeholders with varying level of commitment and different modes of engagement makes the relationship between collaboration and riparian zone management outcomes non-linear. Similar challenges were observed by Mburu et al; (2015) in Kenya, where jurisdictional fragmentation and inadequate institutional capacity and coordination posed obstacles to riparian zone management. Furthermore, the weak and negative relationship suggests that

collaborations may not be the sole determinant of riparian zone management outcomes, and does not imply a causal relationship.

5.3 Summary of Main Findings

The main objective of this study was to assess the Water Resources Users Associations on riparian zone management, and three specific objectives were derived from this objective. The first one was to assess the influence of WRUAs skills on riparian zone management, the second was to establish the extent to which WRUAs management processes influences riparian zone management, and lastly to establish how WRUAs level of collaboration with other stakeholders influences riparian zone management. A hypothesis was formulated for each of the three specific objectives. 1Ho: there is no significant relationship between skills and riparian zone management was rejected, while the researcher failed to reject hypotheses 2Ho: there is no significant relationship between management processes, and riparian zone management and 3Ho: there is no significant relationship between collaborations and riparian zone management.

In regards to skill and riparian zone management, the analysis revealed a significant positive influence. This implies that enhancing skills such as knowledge, expertise and technical abilities can contribute to improved management practices and outcomes of riparian zone management. The findings on the second objective indicates that specific aspects of management processes may not have a substantial impact on riparian zone management. It is therefore important to consider the influence of other factors since the relationship between management processes and riparian zone management in complex and multifaceted. On the 3rd objective, the analysis revealed a weak and negative relationship between collaborations and riparian zone management. Although the correlation is weak, it was found to be statistically significant. However, collaborations alone may not be the sole determinant of the riparian zone management outcome.

Overall the findings provide valuable insights into the relationship between skills, management processes, collaborations and riparian zone management. They highlight the importance of skills development, the complex nature of management processes and the need to understand the dynamics of collaborations. Incorporating these findings into riparian zone management initiatives can contribute to more effective and sustainable outcomes.

5.4 Conclusions

In conclusion, the age and level of education among WRUA members play a crucial role in determining the effectiveness of riparian zone management. The diversity of age groups provide an opportunity for intergenerational collaboration, while higher level of education contribute to enhanced skills, knowledge and collaborations. The findings regarding the relationship between skills, management processes, collaborations for riparian zone management offer valuable insights for understanding and improving the management of these ecologically important areas. These findings underscore the significance of skills development, the complexities of management processes, and the nuanced nature of collaborations in riparian zone management. By considering these factors and leveraging the strength of different age groups and educational backgrounds, WRUAs can optimize their management processes and enhance overall effectiveness of riparian zone management.

5.5 Recommendations

Based on the research findings, the following actions are recommended;

5.5.1 Policy Actions

This study recommends development of policy initiatives and frameworks that enhance the capacity of WRUAs and prioritize holistic riparian zone management. Additionally, policies should focus on fostering effective stakeholders' collaboration and promote inclusive decision-making involving local communities, government agencies, NGOs, scientific experts, and encouraging utilization of research findings through collaborations between researchers, practitioners and policy makers.

5.5.2 Practice Actions

The recommended practice actions include providing educational resources for WRUA members to enhance their skills, fostering a learning culture for continuous development and incorporating local knowledge in decision-making. A review of WRUA's Sub-Catchments Management Plans (SCMPs) is also required to include initiatives gearing toward climate change adaptation and monitoring. Further, encouraging younger WRUA members to participate in research activities, and implement regular M&E practices that contribute to scientific knowledge in riparian zone management and inform adaptive processes.

5.6 Areas of Further Research

Based on the findings of this study, further research can explore the impacts of skills development, management processes and collaborations on riparian zone management outcomes over time through longitudinal studies. By assessing the durability and sustainability of specific interventions, insights can be gained into the long-term effectiveness of capacity building efforts. Additionally, investigating contextual factors such as geographical location, socio-economic condition and governance structures can help understand how these factors interact with the other variables to influence riparian zone management outcomes. This will enhance development of more context-specific and tailored management strategies.

Examining the simultaneous effects of multivariable including skills, management processes, collaborations and other contextual factors, is essential to develop a comprehensive understanding of their combined influence on riparian zone management outcomes. Integrating these variables through multivariate analysis or system modelling can provide insights into complex interactions and trade-offs within the riparian zones. Furthermore, conducting comparative studies across different riparian zones allow for the examination of varying ecological, socio-economic and governance contexts. Comparative studies can identify common patterns, best practices, and lesson learned, guiding the development of effective management approaches that can be adapted to different contexts.

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APPENDICES

Appendix 1: Questionnaire for Water Resources Users' Associations (WRUAs)

Instructions

The information that will be provided in this questionnaire will be confidential and use exclusively for academic purposes. Kindly tick (✓) to indicate correct answer where choices are given. Write your answer in the spaces provided where choices are not given.

SECTION A: DEMOGRAPHIC DATA

1. Gender Male () Female ()
2. What is your age in years? 18 – 29 () 30 - 39 () 40 – 49 () 50 - 59 () >60 ()
3. Indicate the highest educational level attained

   Non-formal Education ()

   Primary ()

   Secondary ()

   Certificate ()

   Diploma ()

   Degree and above ()

5. Occupation_____
6. How many years have you been a member of Kuywa WRUA? _____

SECTION B: RIPARIAN ZONE MANAGEMENT

1.How would you describe the state of River Kuywa's riparian zone?

2. Has Kuywa WRUA been monitoring the temperatures and quality of water in River Kuywa?

   Yes () No ()

   If yes has the monitoring of temp and quality of water helped improved the riparian zone health?

3.Has the riparian zone management practices been effective in preventing flooding of River Kuywa in the last 5 years?

4. Has the overall population of indigenous trees species changed in the last 15 years?

SECTION C: SKILLS FOR RIPARIAN ZONE MANAGEMENT

1. How can you describe the state of Kuywa riparian zone?

   Very good () Good () Degraded () Very degraded ()

2. Are you involved in riparian zone management activities? Yes () No ()

If yes, tick the activities appropriately (multiple responses allowed)

(a) Tree nursery establishment ()

(b) Removal of Eucalyptus tree from the riverbank ()

(c) Indigenous tree Planting ()

(d) Fencing ()

(e) Awareness creation ()

(f) Water quality surveys ()

3. Have you attended any training on riparian zone management? Yes () No ()

If yes, specify_____

4. How do you rate the skills for riparian zone management? Use a 5-point scale to state your level of agreement or disagreement where 1= strongly disagree 2=Disagree3=Neutral 4=Agree 5= Strongly agree.

Statement		SD (1)	D (2)	N (3)	A (4)	SA (5)
C1	Targeted training on riparian zone management has been offered to all members.					
C2	Staff are employed to implement or supervise Technical SCMP activities every time need arise.					
C3	There are clear guidelines on how and when to employ experts such as structural and M&E experts					
C4	Capacity building of WRUA members on M&E Should be embedded in every project initiative to Enhance monitoring skills					
C4	Roles and responsibilities are clear and periodically					

	updated to reflect change.					
C5	The committee value input of others in decision making and is open to ideas from members.					
C6	Committee members picks the members who are to attend training/workshop or any other learning forum.					
C7	WRUA is independently implementing all the tasks related to riparian zone management.					

SECTION D: MANAGEMENT PROCESSES IN RIPARIAN ZONE MANAGEMENT

1. Have you engaged in any activity to identify the riparian management needs and priorities?

Yes () No ()

If yes, explain_____

2. Who else was involved in the activity above? (Tick appropriately, multiple selection allowed)

Community leaders ()

WRUA committee ()

WRA staff ()

All WRUA members ()

Others (specify)

3. How do you rate the management processes for riparian zone management? Use a 5-point scale to state your level of agreement or disagreement where 1= strongly disagree 2=Disagree3=Neutral 4=Agree 5= Strongly agree.

Statement		SD (1)	D (2)	N (3)	A (4)	SA (5)
D1	Problem analysis and need assessment for riparian zone management undertaken and agreed on by all stakeholders					
D2	The set objectives address the root causes of riparian					

	Zone degradation and create the intended impact					
D3	The problem analysis and need assessment results are used as an input for riparian zone management.					
D4	Clear and realistic objectives that reflect the need and dreams of the groups are set.					
D5	Activities are carried out with clear plan of action and coordination between the WRUA committee and members.					
D6	There is a well-established M&E framework with relevant output, outcome, and impact indicators.					
D7	Baseline surveys are conducted and such data is accessible. Lessons learnt, experiences and best practices from previous activities are document.					
D8	Members have access to minutes, reports, records, and other relevant documents for continued learning and improvement.					
D9	The group contribute money and engage in income generating activities to sustain their financial needs.					
D10	There are incentives from WRUA members who report good performance and sanction for those who report poor performance.					

SECTION E: COLLABORATION IN RIPARIAN ZONE MANAGEMENT

1. Apart from WRUA, which other agencies/institution do you know are involved in riparian zone management (Multiple) _____

2. In your opinion, which institution should have jurisdiction to manage riparian zones? (Multiple)

3. How do you rate WRUAs collaboration level for riparian zone management? Use a 5-point scale to state your level of agreement or disagreement where 1= strongly disagree 2=Disagree3=Neutral 4=Agree 5= Strongly agree.

Statement		SD (1)	D (2)	N(3)	A (4)	SA (5)
E1	WRUA and WRA have a strong working relationship based on legal recognition of mutual respect.					
E2	WRA takes up all issues raised by WRUA and together Find solution to all of them					
E3	WRA informs WRUAs when conducting any activity within the riparian zone.					
E4	WRUA is fully engaged in developing partners for specific issues and has clear strategy and policies to engage relevant stakeholders.					
E5	WRUA aligns its planning and implementation with existing government policies and priorities.					
E6	WRUA has built a close coordination with other governmental agencies in the planning process, implementation procedures and practices.					
E7	WRUA engages other community members through awareness creation and sensitization.					
E8	Proof of benefit and result in activities through collaboration can be seen at the project level.					

Appendix 2: Key informant Interview (KII) guide

1. Have you in the recent past organized learning forum for WRUA members? (Probe)
2. Do you engage experts to implement or supervise any riparian zone activities? How is WRUAs' performance evaluated? How often are SCMP reviewed, specifically on activities relating to riparian zone management?
3. Do you have access to M&E tools and expertise to track changes? How is monitoring done? Are there M&E guidelines? Do you have a specific budget for M&E?
4. Do you engage in any activity to identify and prioritize riparian zone management? How are the problems that need to be prioritized picked? How are proposals for riparian zone management developed?
5. Do you have essential information to execute riparian zone interventions? Is there any baseline data collected specifically on riparian habitats? Do you have access to such baseline data?
6. Are management activities within the riparian zone assigned to individuals/organisations/ institutions?

Thank you for your time.

Appendix 3: Research Authorization

29th March 2023

E-mail: researchwriting.mba.anu@gmail.com/ monitoringandevaluation@anu.ac.ke
NACOSTI: registry@nacosti.go.ke Tel. 0202711213

Our Ref: 18m03dmme025
The Director,
National Commission for Science,
Technology and Innovation (NACOSTI),
P. O. Box 30623, 00100
Nairobi. Kenya

Dear Sir/Madam:
RE: RESEARCH AUTHORIZATION FOR: 18M03DMME025

PATRICIA MWANGI is a postgraduate student at Africa Nazarene University in the Master of ARTS IN MONITORING AND EVALUATION (MME) program. In order to complete her program, Patricia is conducting research entitled: **ASSESSMENT OF WATER RESOURCES USERS' ASSOCIATIONS (WRUAs) CAPACITY ON RIPARIAN ZONE MANAGEMENT IN KENYA: A CASE OF KUYWA WRUA, BUNGOMA COUNTY.**
Any assistance offered to her will be highly appreciated.

Yours Faithfully,



Dr. Wanjiru Nderitu

MME, Coordinator,

School of Business Studies,

Africa Nazarene University.

Appendix 4: NACOSTI Permit

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