ASSESSMENT OF THE ROLE OF WATER USER ASSOCIATIONS LEADERSHIP ON THE SUSTAINABILITY OF WATER RESOURCES IN MARA CATCHMENT AREA, TANZANIA

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DEPARTMENT OF POLITICAL SCIENCE, PUBLIC ADMINISTRATION, HISTORY AND PHILOSOPHY (PSPAHP)

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CERTIFICATION

The undersigned certifies that they have read and hereby recommends for the acceptance of the dissertation titled: **"Assessment of the Role of Water User Associations' Leadership on the Sustainability of Water Resources in Mara Catchment Area, Tanzania",** in partial fulfilment of the requirements for the Degree of Master of Arts in Governance and Leadership of the Open University of Tanzania.

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DECLARATION

I, **Ogoma Mangasa**, do hereby declare that this dissertation is my own original work and that it has not been submitted to any other University for any academic award. Where other people's works have been used. References have been provided. It is in this regard I declare that this work as originally mine. It is hereby presented in partial fulfilment of the requirements for the Degree of Master of Arts in Governance and Leadership of the Open University of Tanzania.

……

Signature

……

Date

DEDICATION

This dissertation work is dedicated to my Wife Providence Nyamhanga and my parents Osore Mangasa and Grace Osore who have given me better education opportunities through their financial resources not only that but also Dr. Emmanuel Mallya and Dr. Furaha Julius who have been guided me well through the entire process of achievement of dissertation report. God bless you all.

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ABSTRACT

This study evaluated the impact of leadership within water user associations (WUAs) on the sustainability of water resources in the Mara watershed area. A positivist mindset and explanatory research design were employed utilizing a quantitative technique. A sample size of 218 respondents was acquired using simple random sampling among Water User Association leaders and water users, with data collected via questionnaires. Quantitative data were analyzed descriptively. Additionally, linear regression analysis was conducted to examine the association between the variables. The findings indicated that capacity building and training programs were advantageous for water users in managing water resources. Consequently, capacity building and training initiatives have led to the mitigation of costs and disputes that have arisen. The findings indicated that WUA leaders successfully replicated their conflict resolution skills by addressing disputes among farmers, handling physical altercations over water usage, and preventing vandalism related to water use in the catchment region. Furthermore, the findings revealed that engagement and participation of WUAs leaders have been fruitful as WUAs leaders were able to understand issues on climate change and its impacts, participated in knowledge provision to water users, engaged in participatory processes in water conservation and involved in accountability activities. It was concluded that proper management of water resources is vital to all parties in the catchment area. It is recommended that Mara basin management needs to improve and support WUAs leaders' engagement and participation towards sustaining water resources in the area.

Keywords*: Water user associations; Leadership; Sustainability of water resources; Mara catchment area*

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LIST OF ABBREVIATIONS

IWRM	Integrated Water Resources Management
UNCED	United Nations Conference on Environment and Development
WUAs	Water Users Associations
OUT	Open University of Tanzania

CHAPTER ONE

INTRODUCTION

1.1 Chapter Overview

The chapter outlines the problem's background, articulates the problem statement, and delineates the study aims and questions. It additionally delineates the scope, importance, and structure of the investigation.

1.2 Background to the Problem

Water scarcity presently constitutes the most significant threat to destabilize numerous places worldwide, thereby increasing their vulnerability, with an emphasis on enhancing the leadership of water user associations (WUAs). The impact of WUA leadership on the sustainability of water resources has been inadequately examined (Kucher et al., 2023). Water is an essential natural resource that supports life and fulfills diverse social and economic requirements (Natalija et al, 2022). Reports indicate that water resources are becoming progressively vital for future equitable growth (Duran-Sanchez et al, 2020).

The United Nations Conference on Environment and Development in Rio in 1992 (UNCED or the 'Earth Summit') underscored the necessity for public participation in the formulation and execution of various environmental policies and water resource management (Lai et al., 2019). Principle 10 of the Rio Declaration on Environment advocates for extensive public participation in environmental decision-making, asserting that environmental matters are most effectively addressed with the involvement of all stakeholders. Each individual should have adequate access to

environmental information held by public authorities and the opportunity to engage in the decision-making process, particularly regarding water resource management (Boakye & Akbor, 2019).

Kucher et al. (2023) asserted that the sustainability and effectiveness of water management via the leadership of Water User Associations (WUAs) in several developing nations, including Ukraine, revealed that around 48.3% of regions exhibited sufficient water management efficiency, 40.8% shown very high efficiency, and 10.9% were rated as average. In regions exhibiting high water efficiency, strategies to sustain current achievements should be adopted, whereas in areas with average efficiency, such as Sub-Saharan Africa, strategies aimed at enhancing water user associations' leadership should be implemented (Richards & Syallow, 2019).

The administration of water resources through the leadership of Water User Associations is increasingly intricate due to factors such as changing climates, increasing numbers of people, management viewpoints, sustainability, and competition among various sectors for water utilization, including agriculture, industry, and energy (Akbari-Alashti et al., 2019). Integrated water resources management (IWRM) is a method aimed at reconciling water demand and availability to facilitate sustainable development. Consequently, Integrated Water Resources Management (IWRM) is essential for facilitating social and operational tasks reliant on water resource management and governance, particularly when heightened human activity may diminish the availability of freshwater (Soltanjalili et

al., 2019; Duran-Sanchez et al., 2020). Despite the development of effective freshwater regulation and distribution methods across cultures, human activities are surpassing the sustainable limits of water supply, resulting in altered usage patterns and conflicts that require resolution by leaders overseeing various regions of catchment (Natalija et al, 2022). Numerous studies have investigated the influence of WUA leadership on the sustainability of water resources, presenting varying perspectives.

Lai et al. (2019) indicated that in empowering Water User Associations (WUAs), it is crucial to educate individuals on financial management, dispute resolution, and decision-making strategies to mitigate non-revenue water tariffs in water resource management across diverse nations.

Richards & Syallow (2019), in evaluating the opportunities and challenges associated with the implementation of Water User Associations (WUAs) in the Mara basin, identified the necessity to improve local expertise in financial management, conflict resolution, decision-making, procedural aspects of establishing and executing activities, and the distributional dynamics of WUA leadership, which culminated in effective community management of water resources. Moreover, it was determined that elite capture, reliance on donor assistance, insufficient meaningful engagement, and challenges in scaling initiatives positively influenced environmental sustainability services in a localized and indirect fashion, while creating opportunities for awareness, expansion of water conservation initiatives, water allocation via a permitting system, and conflict resolution.

Natalija et al. (2022) conducted desk research, a web-based questionnaire, and action research with young water leaders to identify the many methods by which young individuals engage in water conflict and cooperation, revealing their capacity to adopt leadership strategies in handling water disputes. It was additionally shown that young individuals were equipped with financial and decision-making strategies that facilitated the sustainability of water supplies. However, these studies did not rigorously analyze the influence of WUA leadership on the sustainability of water resources.

The Mara River, which encompasses the Mara catchment, is an international river shared by Kenya and Tanzania. This river has significant potential to support community livelihoods, particularly through agricultural production. However, the natural resources within its basin including water, soil, forests, wildlife, and macrophytes have been managed unsustainably, leading to their depletion and degradation. This mismanagement has adversely affected community livelihoods due to insufficient fulfillment of leadership responsibilities (Richards & Syallow, 2019). Unsustainable patterns are evident in the Mara watershed area, where less knowledge exists and few, if any, studies have been conducted to investigate the impact of Water User Associations' leadership on the sustainability of water resources.

This study employs agency theory and stakeholder theory. The agency theory elucidates the function of leaders within water users' associations in the preservation of water resources. Agency theory posits that top managers or leaders (Agents) represent the interests of shareholders or water users (Principals) in their interactions

with others and in the administration of the organization, aiming for efficiency and effectiveness. Capacity building, training, and the engagement and participation of Water User Associations (WUAs) will demonstrate the leaders' capability to resolve conflicts regarding water resources. Consequently, agency theory examines the conflict arising from divergent risk preferences between agents and principles. Furthermore, stakeholder theory compels Water User Associations (WUAs) leaders to clearly define the collective value they generate and the factors that unite their primary stakeholders, namely water users, in fulfilling their objectives. The leadership of WUAs is subject to stakeholder evaluation to determine its efficacy in accordance with stakeholder theory, aimed at improving capacity building, training, engagement, and participation, thereby equipping leaders to effectively address potential conflicts (Ahmet et al., 2023).

In Tanzania, Water User Associations (WUAs) are established as the most fundamental participatory entities for the management of water resources within designated basins. They encompass portions of watersheds and are primarily accountable for water conservation initiatives, conflict resolution regarding water matters, and the allocation of water to irrigators via permitting processes (Kabogo et al., 2019). This study intends to examine the influence of water user associations' (WUAs) leadership on the sustainability of water resources in the Mara watershed area.

1.3 Statement of the Problem

Research regarding the influence of Water Users Associations' leadership in diverse catchment areas on the sustainability of water resources has been limited (Umeodum

et al., 2021). The Mara catchment area encompasses the eastern to northeastern region of the Lake Victoria Basin in Tanzania, covering approximately 29,501.9 km² across six districts: Musoma, Rorya, Butiama, Tarime, Bunda, and Serengeti, where local communities oversee water resource management through the leadership of Water User Associations (WUAs). There are 10 Water User Associations in the Mara catchment. Furthermore, of the 10 Water User Associations, 6 are effective and 4 are ineffective. This ineffectiveness may stem from a deficiency in leadership, jeopardizing the sustainability of local water supplies due to a scarcity of research on these issues.

The establishment of Water User Associations (WUAs) is mandated by the Water Resources Management Act No. 11 of 2009 and its amendment, Act No. 8 of 2022. Each water user group within a basin, including small farmers, domestic users, industrial users, and commercial agriculture, must be represented in a WUA (Kabogo et al., 2019). Water User Associations (WUAs) are established to conserve water from a source and exemplify community engagement in water management and governance, as they oversee conflict resolution, pollution control, and the collection of water user fees on behalf of the Basin water board (Kucher et al., 2023).

Furthermore, water catchment areas, such as the Mara catchment, support life on Earth by supplying food and water to communities that sustainably contribute to the economy and underpin a rich and diverse natural environment, provided they are effectively managed by water user associations (WUAs) possessing strong leadership skills and methodologies (Richards & Syallow, 2019). Research indicates that little

research have been undertaken to evaluate the role of leaders in maintaining catchment areas. This study intends to examine the influence of water user associations' (WUAs) leadership on the sustainability of water resources in the Mara watershed area.

1.4 Objective of the Study

1.4.1 General Objective

To evaluate the impact of water user associations' (WUAs) leadership on the long-term sustainability of the water supply in the Mara watershed area.

1.4.2 Specific Objectives

i. To examine the Capacity building and Training programs done by WUAs leaders in sustaining water resources in Mara Catchment.
ii. To assess the ability of WUAs leadership in resolving conflicts over water issues in sustaining water resources in Mara catchment area.
iii. To examine the engagement and participation of WUAs leadership in sustaining water resources in Mara catchment area.

1.5 Research Questions

i. What are the capacity building and training programs done by WUAs leaders for water conservation in sustaining water resources in Mara catchment area?
ii. Is WUAs leadership able to resolve conflicts over water issues in sustaining water resources in Mara catchment area?
iii. Do the engagement and participation of WUAs leadership sustain water resources in Mara catchment area?

1.6 Significant of the Study

The study equips leaders of associations representing water users (WUAs) with knowledge to enhance water resources via conservation initiatives, emphasizing that effective leadership significantly impacts the governance of water assets. Further, this study provides knowledge to policymakers and water user practitioners with skills by enhancing their ability to resolve conflicts when they happen to come by that would jointly contribute to sustaining and managing water resources in the catchment area where policy interventions strengthened social capital and incentivized WUAs leaders. To the academic community, this study is adding knowledge that aids in solving the challenges WUAs face towards carrying further research in a broader perspective while achieving the congruence between institutional design and local context that hold key factors for sustainable water management.

1.7 Scope of the Study

The study was conducted in the Mara catchment area. It involves WUAs leaders and water users as well. It also examines the capacity building and training activities done by WUAs leaders for water conservation; assess WUAs leadership's ability to resolve conflicts over water issues; and explores the engagement and participation of WUAs leadership in sustaining water resources in Mara catchment area.

1.8 Organization of the Study

The remainder of the study is structured as follows: Chapter two delineates the meanings of essential terminology and examines pertinent literature, including

theoretical and empirical analyses, alongside the conceptual framework. Chapter three delineates the research methodology employed in the study, encompassing research philosophy, design and methods, study area, population and sample size, sampling procedures, data collection instruments, validity and reliability concerns, data management and analysis, along with ethical considerations. Chapter four delineates the results and discussion of the findings, whilst chapter five articulates the conclusion and suggestions that were derived from the study's outcomes.

CHAPTER TWO

LITERATURE REVIEW

2.1 Chapter Overview

This section emphasizes the issues related to the literature review. It delineates the definitions of essential ideas, conducts a theoretical and empirical assessment, identifies the research gap, and ultimately gives the conceptual framework.

2.2 Definitions of Key Concepts

2.2.1 Water Users Associations (WUAs)

Ndelwa (2019) characterizes Water User Associations (WUAs) as official entities established to unite water consumers for the management of a communal irrigation system. A Water consumers' Association (WUA) is a non-profit entity established and governed by a collective of water consumers within one or more hydrological sub-systems, namely distributory canals that supersede a watercourse, irrespective of the farm types involved (Butler and Adamowski, 2010). Membership in the WUA is contingent upon contracts and/or agreements between the members and the WUAs (Noel, 2021). In this study, WUAs refer to organizations that facilitate water users in managing water resources within their localities in partnership with water basin authorities.

2.2.2 Leadership

This is a social impact strategy that optimizes the contributions of others to achieve a goal (Ahmet et al., 2023). Leadership is not defined by authority or power; instead, it arises from social impact, as effective leadership necessitates the engagement of

others. In this study, leadership is defined as the method employed by individuals to leverage their influence to inspire and unite others toward a defined objective.

2.2.3 Water Resources

Fundi and Kinemo (2019) describe water resources as natural water resources that may be beneficial to humans, such as sources for drinking water or irrigation. In this study, water resources refer to all prospective and accessible water suitable for human consumption.

2.2.4 Catchment Area

This is a region from which surface runoff is conveyed by a singular drainage system or the land area delineated by watersheds that drain into a river, basin, or reservoir. It is a geographical area that accumulates water following precipitation, usually enclosed by hills from which water descends and gathers into rivers and streams (Zhang et al., 2023). In this study, a catchment area refers to the region delineated by watersheds that directs water into the river or basin.

2.3 Theoretical Literature Review

This study was informed by agency theory and stakeholder theory as outlined below.

2.3.1 Agency Theory

An agent is an individual who represents a principal. A person legally authorized to act on behalf of another individual or entity (Ahmet et al., 2023). This study use agency theory to elucidate the function of water users' association leaders in the

preservation of water resources. Agency theory posits that top managers and executives (Agents) represent the interests of shareholders and water users (Principals) in their interactions with others and in the pursuit of the efficiency and effectiveness of the organization (Roussy & Brivot, 2019).

Consequently, senior management and executives, specifically those of Water Users Associations (WUAs), are obligated to devise, execute, and sustain sufficient and efficient water resource management to fulfill shareholder objectives related to profit maximization, wealth enhancement, business continuity, and expansion. Chambers & Oder (2020) asserted that the conflict of interest between senior management and shareholders often undermines the expected agency relationship, resulting in agency conflicts. For instance, senior executives typically derive the majority of their salary from their employing organization.

Shareholders or water users frequently diversify their investments over other organizations; hence, the risk-taking of any single organization is of diminished concern to them. Due to the top management's reluctance to assume risks, they may not execute and sustain efficient resource administration plans (RMPs), potentially resulting in significant both economic and other losses stemming from inadequate risk management by the top managers as agents. In this study, suitable attitudes among top management can mitigate aim incongruence of top managers/leaders and shareholders/users of water in the implementation of effective RMPs. Principals and agents behave rationally and employ the contracting process to optimize their wealth (Jensen & Meckling, 1976).

Rousey and Brevet (2019) contend that water users groups oversee the agents (managers/leaders); however, they frequently fail to meet their objectives due to substandard challenges. The substandard issues primarily stem from the restricted autonomy of the WUA leaders, insufficient managerial support, limited service scope, and ineffective communication. To date, scholars like Chambers and Oder (2020) have promoted the enhanced role and quality of WUA leaders to facilitate effective RMPs. According to agency theory, leaders of WUAs are anticipated to be vigilant and supportive in facilitating effective RMPs to enhance the entity's value by sustaining water supplies in the Mara catchment area.

2.3.2 Relevance of the Theory

Agency theory examines the conflict arising from divergent risk preferences between agents and principles. The principal and agent may pursue conflicting actions due to differing levels of risk tolerance. Shareholder wealth maximization may be neglected as actors may follow their own self-interests (Lai et al., 2020). The agency dilemma arising from the separation of ownership and management pertains to the presumed conflicting objectives of the involved parties.

2.3.3 Weakness of the Theory

The deficiency of the agency theory in real managing of water resources by WUA leaders is its failure to elucidate the condition of the water resources to be administered. The idea posits that the leaders of WUAs are entirely rational decision-makers who will act in their own self-interest. Nonetheless, the leaders of the WUAs do not consistently act as logical decision-makers, and their choices may be swayed

by personal biases. The resultant consequence yields erroneous judgments regarding the efficacy of WUA leaders (Bosse & Phillips, 2016).

2.3.4 Stakeholders' Theory

Stakeholders are entities and individuals with a vested interest in an organization's actions and outcomes, upon which the organization depends to fulfill its objectives. This study's stakeholder theory is predicated on the premise that values are inherently and explicitly integral to organizational operations. The theory requires leaders of Water User Associations (WUAs) to express the collective value they generate and identify the factors that unite their primary stakeholders, namely water users, to fulfill their objectives (Ahmet et al., 2023). The leadership of WUAs is subject to stakeholder inspection to evaluate its efficacy in accordance with stakeholder theory. Danisco and Rus (2013) contend that the sustainability of water resources information must cater to users' specific objectives. Information about water users in the public sector is essential for assessing performance, ensuring accountability within government organizations, enhancing efficiency and effectiveness, and facilitating decision-making to promote the sustainable use of water resources.

The leadership of Water User Associations in sustaining water resources requires an expanded notion of accountability, which can be informed by Herbert Simon's organizational theory. In the public sector, the core of the theory posits that several stakeholders and water users own a vested interest in a financially sustainable government. The primary objective of conserving water resources is to diminish

knowledge asymmetry between stakeholders/water consumers and the authorities of Water User Associations managing watershed areas. The social compact between the leaders of the Water User Associations and the water users bestows legitimacy upon the people within the stakeholder framework.

2.3.5 Relevance and Weakness of the Theory

Stakeholder theory is significant because it acknowledges that organizations are influenced by more than just people who own ownership or leadership rights. Ahmet et al. (2023) contended that the belief that water users manage the organization is predominantly a fallacy; in reality, executives and leaders of Water User Associations wield the most authority. The traditional organizational model, in both legal and management aspects, has proven inadequate in regulating self-serving managerial conduct. The primary implication of stakeholder theory for organizational governance is the requirement for governance frameworks that foster alignment among agents, principals, and other parties with legitimate interests in the business.

Umeodum et al. (2021) assert that the primary critique of stakeholder theory pertains to the challenge of defining who qualifies as authentic stakeholders. Another contention is that addressing stakeholders' interests might result in corruption, as it provides agents the chance to misappropriate wealth from shareholders to others. The objective of examining these theories is that agency theory elucidates the function of agents (managers) who must, in various ways, protect the interests of stakeholders (WUAs). Furthermore, agency theory will be extensively applied, since

top managers and WUA leaders, acting as agents in the Mara catchment region, are obligated to discharge their duties on behalf of stakeholders and water users, who serve as principals in pursuit of effective organizational performance.

2.4 Empirical Literature Review

2.4.1 Capacity Building and Training Programs done by WUAs Leaders in sustaining Water Resources in Mara Catchment

Shemer et al. (2023) conducted a study in Pakistan revealing that the demand for freshwater resources surpasses the current supply, necessitating the utilization of all alternative water sources, including the desalination of saltwater, seawater, and wastewater. To guarantee universal access to water, it is essential to implement various measures related to capacity building and training, including centralized governance, educational initiatives, advancements in water catchment and harvesting technologies, infrastructure enhancement, irrigation and agricultural practices, pollution management, investments in innovative water technologies, and transboundary water collaboration. This study offered a thorough examination of strategies for employing alternate water sources, focusing specifically on saltwater desalination and wastewater treatment methods. Specifically, membrane-based technologies were rigorously evaluated, emphasizing their energy consumption, expenses, and environmental repercussions.

Zhang et al. (2023) conducted a study examining a framework for informing fCBC that integrated distinctive characteristics of FWRs, including their status as fugitive resources, heightened risk of adverse externalities, and extensive spatial distribution,

essential for realizing CBC's potential in attaining environmental and developmental outcomes in freshwater contexts. The existing research was critically reviewed and synthesized, adapting the Nature Conservancy’s Voice, Choice as well as Action framework, which is structured within four pillars (Secure rights with equitable externality consideration; Strong belonging capacity; Effective multi-stakeholder mediums; Sustainable livelihood and advancement opportunities) and two crossovers elements (Cultural connections; Equity and power balancing). Recommendations were provided to enhance facilitation and bolster community empowerment in Community-Based Conservation (CBC). The application of the framework in the conservation planning process for fCBC projects across four regions yields significant insights for the development of effective CBC programs.

Kavand et al. (2023) conducted a study examining the influence of water conservation policies to the reallocation of crop- and water-land resources, emphasizing the significance of these policies' effects on farmers' profits in their acceptance and implementation at the basin level. The findings indicated that climate change will diminish crop yields by 0.5–4%, decrease water availability by 12–19%, and elevate crop water requirements by 0–4%. The implementation of a policy to modify irrigation technology, in conjunction with restrictions on groundwater usage, will mitigate the impact of climate change on farmers' profits, augment their anticipated return per unit area by 5%, and elevate the economic efficiency of water utilization from 5,283 to 6,002 IRR/m3. However, the strategy of raising water prices cannot enhance farmers' profits at the basin level or improve the financial effectiveness of water utilization, despite its potential to decrease water consumption.

Demonstrating the enhancement of farmers' profits and livelihoods through the implementation of integrated water resource conservation policies can significantly incentivize farmers to adopt these measures, facilitate optimal water resource management, and mitigate conflicts regarding water usage in this basin.

2.4.2 Ability of WUAs Leadership in Resolving Conflicts over Water issues for the Sustainability of Water Resources

The IUCN (2020) study in Tanzania revealed that sub-catchment Water User Associations (WUAs) represent the most basic tier of management within the water management framework. The WUAs were established to aid the Basin Water Office in handling conflicts over water resources in the Basin. These associations were accountable for the local management of allocated water resources, mediation of disputes between users and groups within their jurisdiction, data collection and information dissemination, involvement in the formulation of water utilization plans, preservation and safeguarding of water resources and catchment areas, promotion of efficient and effective water use and return flows, enforcement of legal statutes and implementation of water rights conditions, and pollution control. It was advised that Water User Associations establish sub-catchment committees and appoint representatives to Basin Boards and Catchment Committees to improve water resource management.

A study by Ahmet et al. (2023) examined the relationship between natural resources with governance disputes, while evaluating the function of governance in the management of natural resources. The findings delineated three major categories of

governance difficulties (pertaining to capacity, connectedness, and knowledge) and three dimensions of effective governance (effectiveness, engagement, and efficiency).

The findings emphasized that developing nations will likely require increased decision-making authority, financial and human capital, leadership on critical resource issues, and conflict resolution strategies. Conversely, studies on governance frameworks for natural resource management in developed nations frequently reveal issues with policy clarity and the integration of stakeholder institutions' objectives. The study contributes to the current literature by encapsulating novel organizational capacities and governance frameworks critical for improved natural resource management.

Fundi and Kinemo (2019) conducted a study to investigate the forms of conflicts among water users and the variables contributing to their emergence in water distribution processes within small-scale irrigation systems in Tanzania. The research was carried out at the Mkindo Irrigation Scheme and utilized the Exploratory Sequential Mixed Method, incorporating both qualitative and quantitative methodologies. The findings indicated the presence of inter-micro and intra-micro water user disputes within the designated irrigation scheme. The analysis revealed the causes contributing to water user conflicts in the selected scheme, mostly aggravated by the lack of appropriate water conveyance infrastructure. The report advises improving the infrastructure for transporting water from sources to farms to enhance water allocation processes at the Mkindo Irrigation Scheme.

2.4.3 Engagement and Participation of WUAs Leadership in sustaining Water Resources

Dyer et al. (2019) in their research on the implications of climate change for the sustainability of areas of catchment concluded that climate change is anticipated to significantly affect the global hydrological cycle due to increased stakeholder involvement. Numerous climate change studies in Tanzania revealed an increase in rainfall in certain regions, while other areas experienced a decrease in rainfall and a rise in temperature, potentially resulting in extreme natural phenomena such as floods and droughts. Climate change was linked to the inadequate management of land and water resources. It was additionally discovered and advised that the multifaceted value of ecosystem services illustrated the interconnection between ecosystems and human endeavors, wherein the employment of Water User Associations (WUAs) was considered crucial.

Umeodum et al. (2021) examined the functions of community leadership involvement and participation in water supply via self-help programs in the Morogoro region. The results indicate a substantial positive correlation between community leadership and self-help activities. Effective leadership approaches encourage self-sustaining initiatives in water supply systems. The absence of accountability in the administration of community water funding, coupled with leaders' failure to exemplify self-help programs, illustrates the ineffectiveness of leadership that presently obstructs community self-help efforts. Consequently, resolving the existing water issues in rural Tanzanian communities sustainably

necessitates investments in programs that enhance community leadership, and, in certain instances, the creation of water infrastructure.

Shunglu et al. (2022) investigated the application of participatory methodologies in water projects, evaluating the extent to which power dynamics influence water management initiatives. The paper employed a qualitative methodology to identify significant problems in participatory water governance, utilizing case studies from Turkey, India, and Sri Lanka to investigate: deficiency of social trust, elite appropriation of participatory mechanisms, power disparities and inequalities at the micro-level, and an absence of inclusive engagement in decision-making. This study contends that participatory development initiatives must comprehend the socio-political power dynamics inside a community, which is an inherently complicated and contentious environment. The purported exit plan of a community initiative was crucial in determining the project's viability, which ensures community ownership. This insight can enhance the efficacy of development programs aimed at resolving water-related challenges.

2.5 Research Gap

The studied literature failed to critically analyze the function of WUA leadership in the sustainability of water resources. Shemer et al. (2023) examined the demand for freshwater resources; Zhang et al. (2023) evaluated the distinctive attributes necessary for realizing environmental and developmental impacts of freshwater; Kavand et al. (2023) analyzed the effects of water conservation policies on the reallocation of water for agricultural land resources; and Ahmet et al. (2023)

explored the relationship between national resources and governance disputes among water users. Fundi and Kinemo (2019) analyzed the categories of conflicts among water users; Dyer et al. (2019) assessed the impact of climate change on the sustainability of catchment regions, whilst Umeodum et al. (2021) explored the influence of national leadership on water supply via self-help initiatives. Furthermore, Shunglu et al. (2022) investigated the application of participatory methodologies in water projects. Consequently, there are discrepancies in findings that create a knowledge gap to be addressed. This work addresses this gap.

2.6 Conceptual Framework

A conceptual framework is an instrument employed by researchers to direct their investigation (Creswell, 2018). The researcher's perspective on the issue provides guidance for the investigation. This may represent an adaption of a model employed in a prior study, modified to align with the current investigation. Figure 2.1 presents the conceptual framework. It delineates the link between the variables that were both dependent and independent. In this study, the determining factor is the sustainability of water resources, while the independent factors encompass capacity building and training activities, the conflict resolution capabilities of Water User Associations (WUAs) leadership, and the engagement and participation of WUAs leadership in the sustainability of water resources.

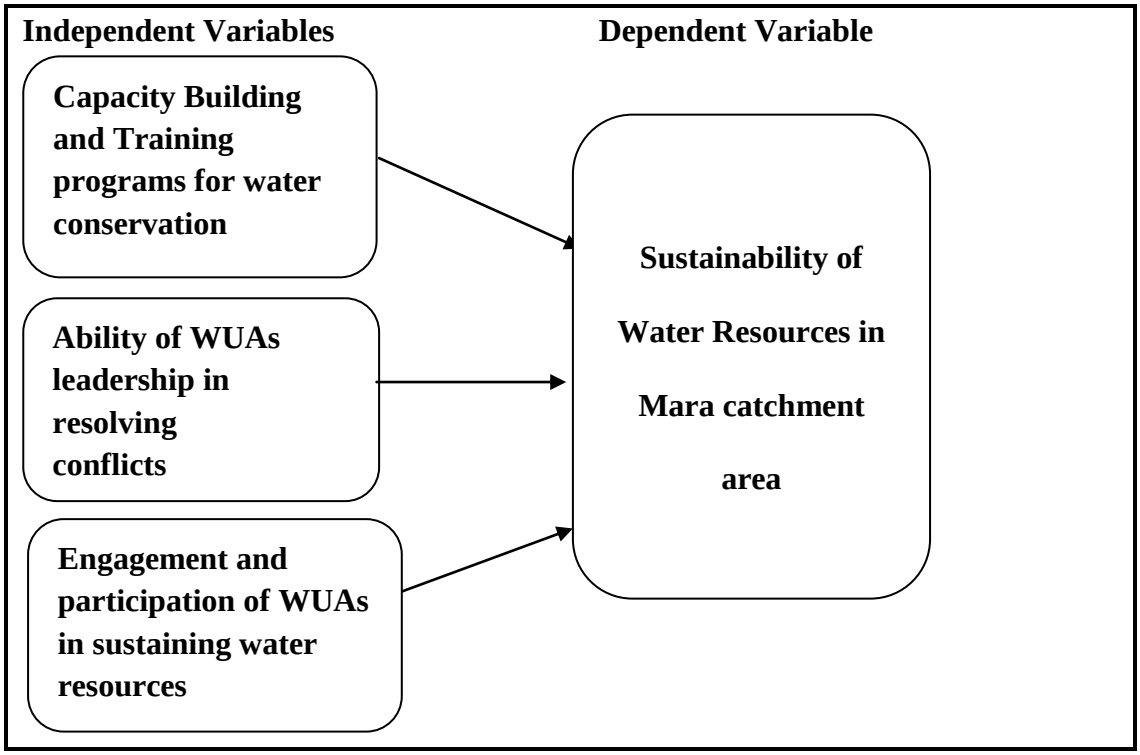

Figure 2.1: Conceptual Framework

Source: Researcher's modelling (2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Chapter Overview

This chapter outlines the methodical methods employed. It encompasses the philosophy of research, research approach, design of research and strategy, study population, sampling method, data collection, evaluation of data, cleaning of data and processing, reliability and validity, and ethical issues.

3.2 Research Philosophy

This research employed positivist philosophy. This pertains to the philosophical perspective of the natural scientist and involves engaging with a social reality that is visible in order to generate generalizations that resemble laws (Saunders et al., 2019). It is generally deductive, meticulously organized, employing extensive samples, measurement, and predominantly quantitative analytical procedures, but various types of data may be examined. The rationale for employing positivist philosophy is its focus on research environments where variables may be regulated and altered, devoid of considerations for human interests within the investigation. Furthermore, positivist philosophy was employed because to its reliance on quantitative observations that facilitate statistical analyses; yet, the conclusions of positivist studies are only descriptive, hence missing depth in addressing complex topics (Park et al., 2020).

3.3 Research Approach

The study employed a quantitative methodology. The rationale for employing the quantitative approach is its ability to produce verifiable, trustworthy outcome data

that are typically generalizable to broader populations, so enhancing knowledge and comprehension of the social environment. Furthermore, it enables me and the conducted analysis to get significant insights from extensive datasets. The leaders of the Water User Associations (WUAs) were engaged to elicit concerns relevant to the study, wherein the data were predominantly utilized to identify patterns and averages, formulate forecasts, examine causal links, and generalize findings. Creswell (2022) stated that qualitative study designs are typically linked to positivism, particularly when employing preset and rigorously structured data collection methods.

3.4 Research Design

The study employed a design based on explanation due to its efficiency in terms of time and cost, utilizing many variables for analysis to enhance research outcomes. This approach examines the reasons behind occurrences when information is scarce, enhancing comprehension of a specific subject and determining the mechanisms or rationale behind a particular happening (Eynden, 2019). The design elucidated the fundamental origins and mechanisms of observed patterns, which might be beneficial in formulating theories or guiding practical solutions. It frequently use techniques like as surveys and pilot studies to collect extensive data and contextualize observable phenomena (Longe, 2019).

3.5 Study Area

The study was performed in the Mara catchment region. The rationale for choosing the area is the presence of 10 Water User Associations (WUAs) in the Mara

watershed. Furthermore, of the 10 Water User Associations, 6 are effective and 4 are ineffective. This ineffectiveness may stem from inadequate leadership, jeopardizing the sustainability of local water resources due to a scarcity of research on the subject. Furthermore, there exists a wealth of information pertinent to the research topic, as it pertains to a catchment area within the waters of the Lake Victoria Basin Water Board, which implements water resource management and development in accordance with the Tanzania Water Resources Management Act No. 11 of 2009 and its amendment, Act No. 8 of 2022. This study aims to examine the influence of water user associations' (WUAs) leadership on the sustainability of water resources in the Mara watershed area.

3.6 Study Population

Saunders et al. (2019) define the population as the complete set of cases from which a sample is derived. This study targeted a population of 50 members from each Water consumers Association (WUA) and additional water consumers within the watershed area. Consequently, for 10 Water User Associations (WUAs), there are 500 members, as each WUA comprises leaders and water users (Mara catchment report, 2022).

3.7 Sample Size and Sampling Techniques

3.7.1 Sample Size

A sample is a subset of the amount from which it is derived. The number of samples can be determined using Yamane's formula (1967) as follows:

$n = \frac{N}{1+N(\alpha)^2}$ Where;

α is the level of significance or margin of error (5%),

n is the sample size and

N is the sample frame.

To obtain a representative sample size, it is established at a 95% confidence level (with a significance level of level) where;

$n = 500/1+500\ (0.05)^2$

$n = 500/2.25$

$n = 222$

Consequently, the sample has 222 respondents, with each Water consumers Association (WUA) contributing 6 leaders [6*10 = 60], while the remaining water consumers total 162.

3.7.2 Sampling Techniques

The study employed simple random sampling. Saunders et al. (2019) assert that random sampling is a methodology wherein elements from the research population are selected at random, with each having an equal probability of selection. This study supplied a comprehensive list of WUA leaders and using a rotational system to choose the required responders (Saunders et al., 2019). Participants selected papers marked with YES or NO, and those who chose YES were invited to respond to questions pertaining to the issue. Consequently, the sample in the study was randomly chosen among the heads of Water User Associations in the Mara watershed area. Random sampling mitigated bias in the sample selection process.

3.8 Data Collection Tools

This study utilized primary data collecting tools, specifically data gathered directly from the field via questionnaire administration.

3.8.1 Primary Data

The basic data were gathered utilizing a closed-ended questionnaire. Questionnaires were created and distributed to the leaders of Water User Associations (WUAs). Closed-ended questions utilizing a Likert-type scale were delivered, and respondents were instructed to mark their selected answers with a tick. Questionnaires are favored due to their efficiency, cost-effectiveness, and ease of administration to WUA leaders using the drop-and-pick approach.

3.9 Data Analysis

The researcher initiated a data analysis procedure following the gathering of field data, which included determining prevalent perspectives from the respondents' accounts of their experiences. The responses to the closed-ended items were designated codes and labels. Quantitative data were descriptively analyzed using frequencies and percentages via Statistical Packages for Social Science (SPSS Version 26). Subsequently, the data were subjected to multiple regression analysis. This presumes that the results of the regression analysis should reflect its R Square value, indicating that the independent variables account for the percentage of variation in the model. Furthermore, multiple regression analysis was conducted to ascertain the association among variables.

The subsequent regression model was employed;

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

Let Y represent the dependent variable, which is the sustainability of water supplies. β_0 = y-intercept (constant); $\beta 1$ = regression coefficient for capacity-building and training programs; $\beta 2$ = regression coefficient for the conflict resolution capability of WUA leadership; $\beta 3$ = regression coefficient for the engagement and participation of WUA leaders in the sustainability of water resources; X1 = capacity-building and training programs; X2 = conflict resolution capability of WUA leadership; X3 = engagement and participation of WUA leaders in the sustainability of water resources; ε denotes the error term.

3.10 Assumptions of Multiple Regression

Multiple regression analysis is predicated on certain assumptions regarding the gathered data (Pallant, 2005). The assumptions include linearity, normalcy, autocorrelation, multicollinearity, and multiple linear regression analysis.

i) Linearity Assumption

This assumption necessitates that the relationship between the independent and dependent variables is assumed to be linear. The Pearson correlation was employed to verify this assertion.

ii) Normality Assumption

This assumption requires that the errors of the independent variables be regularly distributed. Skewness as well as kurtosis were utilized to assess normalcy.

Furthermore, all variable errors are presumed to be normally distributed according to the Skewness-Kurtosis guideline of ± 2.58.

iii) Autocorrelations Assumption

Autocorrelations indicate that errors among independent variables remain uncorrelated (Osborne and Waters, 2002). The Durbin-Watson statistic was employed to verify this assertion. Field (2009) asserts that the Durbin-Watson statistic ensures minimal self-correlation when its coefficient ranges from 1.5 to 2.5.

iv) Multicollinearity Assumption

The Variance Inflation Factor (VIF) and Tolerance Rate were calculated to evaluate this assumption. The Variance Inflation Factor (VIF) and tolerance adhere to the guideline indicating little collinearity among independent variables. Stevens (2009) suggests that a low Variance Inflation Factor (VIF) and a high tolerance indicate the presence of minimal multicollinearity. The tolerance rate coefficient varies from 0 to 1, whereas the Variance Inflation Factor (VIF) spans from 1 to 10.

v) Multiple Linear Regression Analysis

This assumption posits that the results of the regression examination should reflect the R Square value, indicating that the independent variables account for the proportion of variation in the model. The results should demonstrate that the model is statistically significant at ($p < 0.05$).

3.11 Validity and Reliability of Data

3.11.1 Validity

The researcher evaluated the instruments for content validity, defined as the extent to which the data obtained through a specific instrument comprehensively represent particular domains of indicators or the substance of a specific concept (Creswell, 2022). Expert consultation was requested to offer feedback on the tools. The feedback and recommendations were integrated into the final version of the study instruments. A pilot research was done to evaluate the tools, executed on a lower scale than the primary study. Pilot testing facilitated the identification and resolution of potential problems in a study or project prior to its full execution. It facilitates the assessment and enhancement of multiple facets, including content, design, validity, and reliability.

3.11.2 Reliability

Cronbach's Alpha was employed to assess the reliability of the questionnaires. Kothari (2019) asserts that a Cronbach’s Alpha over 0.7 is desirable, with the variables assessed encompassing capacity building and training, the conflict resolution capabilities of WUA leadership, and the engagement as well as participation of WUA leaders. A Cronbach’s Alpha was assessed, with a score beyond 0.7 being acceptable (Saunders et al., 2020).

3.12 Ethical Consideration

This was deemed necessary to inform participants about tasks to be completed. Permission was requested from the directors of postgraduate courses at the Open

University of Tanzania and thereafter presented to the Regional Administration Secretary of the Mara catchment area administration. Furthermore, at each stage of data collection, consent was obtained, and explanations were provided regarding the goal, requesting the respondents' assistance in conducting the study. The researcher obtained explicit agreement from participants while guaranteeing confidentiality regarding the inquiries made. Anonymity and secrecy are crucial measures for safeguarding participants against potential damage (Saunders et al., 2023). No respondent was prohibited from withdrawing if they so desired. Consequently, the specific challenges encompassed;

3.12.1 Clearance

Prior to embarking on field data collecting, the researcher secured authorization from relevant authorities, including the Open University, governmental organizations, and the Mara Catchment Water Office, where the study was formally conducted.

3.12.2 Consent, Assent and Voluntary Participation

Approval was requested for participants to fill out the consent form for data collecting participation. Participants' autonomy to engage in or disengage from the conversation session was noted (Saunders et al., 2017). Participants provided verbal consent, affirming their willingness to take part in the study after being sought for informed consent. Participation in the study was voluntary, and individuals had the liberty to decline answering certain questions. There were no correct or incorrect answers to the posed questions. Participants were informed that they may withdraw from the interview at any stage without the necessity of providing justification for

their decision. Additionally, the participants were permitted to snap photographs during the data collecting.

3.12.3 Prevention from Harm or Risk

This study did not intentionally hurt participants, and individuals at risk of any kind of harm, including victimization or mental distress, were notified in advance of their right to withdraw from participation, in accordance with Creswell's (2018) recommendations.

3.12.4 Privacy and Confidentiality

In this study, the labeling of data storage, tapes, and transcripts jeopardized confidentiality and anonymity of the participants' submitted data. Furthermore, anonymity and confidentiality were preserved throughout the study by omitting personal identifiers during the gathering of data (Kothari, 2019). The researcher guaranteed that all acquired information remained totally secret and solely for the study's purposes.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.1 Chapter Overview

This chapter presents the findings and debates regarding the impact of leadership within water user associations on the sustainability of the water supply in the Mara watershed area. It begins with the reply rate, demographic data, followed by the objectives.

4.2 Results and Discussions of Findings

4.2.1 Response Rate

This study involved the distribution of 222 questionnaires to leaders of Water User Associations and water users. Of the 222 distributed surveys, 218 were returned, resulting in a 98.2% response rate. Only four questionnaires were not collected, resulting in 1.8%. Consequently, the study covered 218 respondents.

4.2.2 Demographic Information

The demographic information encompassed gender, age, job experience, employment status, and educational attainment. Table 4.1 encapsulates the findings.

Table 4.1: Demographic Information

Category	Frequency	Percentage %
Gender		
Male	120	55.1
Female	98	44.9
Age (in yrs)		
20-25	12	05.5
26-30	28	12.8
31-35	22	10.1
36-40	68	31.2
Above 41	88	40.4
Employment status		
Permanent	60	27.5
Casual	158	72.5
Level of Education		
Primary	48	22.0
Secondary	64	29.4
Diploma	84	38.5
Degree	22	10.1

Source: Field Data, 2024

Table 4.1 indicates that the gender distribution was nearly balanced, with males comprising 55.1% and females 44.9%. This implies that there has been increasing women participation in sustaining water resources from the fact that, females are the ones who fetch water for domestic use, therefore engaging them as leaders was important. The age distribution indicated that individuals aged 20 to 25 years constituted 5.5%; those aged 26 to 30 years represented 12.8%; individuals aged 31 to 35 years accounted for 10.1%; those aged 36 to 40 years included 31.2%; and individuals over 41 years made up 40.4%.

Employment status encompassed both permanent and casual employment. Those employed permanently were 27.5% and those casually/temporarily were 72.5%. The distribution of educational attainment revealed that 22% possessed primary

education, 29.4% held secondary education, 38.5% obtained a diploma, and 10.1% earned a degree. Nearly half (51.4%) of the respondents possessed just primary and secondary education, which contributed to inefficiencies in operating Water User Associations (WUAs), whereas those with diplomas and degrees (48.6%) demonstrated greater efficiency. Therefore, education played a vital role in sustaining water resources. The aforementioned affirmations align with the perspective of Lai et al. (2019), who assert that education significantly contributes to the sustainability of water resources in diverse regions, as educated individuals may be readily trained to handle relevant programs.

4.2.3 Capacity building and Training Programs done by Wuas Leaders in sustaining Water Resources

The first objective examined the capacity building and training programs done by WUAs leaders in sustaining water resources in Mara catchment area. Questionnaires were administered to WUAs leaders and water users. The results are presented in Table 4.2.

Table 4.2: Capacity Building and Training Programs done by WUAs Leaders

Statement	% strongly agree	% Agree	% not sure	% disagree	% strongly disagree
Conducting educational campaigns among water users	90	10	0	0	0
Conducting trainings on improvement in water catchment and harvesting technologies through changing irrigation technology	85	0	15	0	0
Carrying infrastructure development training	80	0	0	20	0
Investing novel water technology through training to WUAs with the collaboration of Mara basin management	75	0	0	25	0

Source: Field Data, 2024

Table 4.2 indicates that 90% of respondents strongly concurred, while 10% agreed that training and capacity-building programs in the Mara catchment area encompassed educational campaigns aimed at informing water users on conserving water resources for optimal utilization in the region. This implies that, when these training were provided; water users were able to pay for the user fees in time and participate in various activities that sustained water resources. This is in line with Natalija et al (2022) who asserted that, when water users are provided with knowledge on water conservation areas; they are in the position to sustain these resources and vice versa.

Similarly, the results in Table 4.2 reveal that 85% of respondents strongly agreed that capacity building and training programs to both leaders and water users in Mara catchment area included conducting trainings on improvement in water catchment

and harvesting technologies through changing irrigation technology. This implies that improving water catchment and harvesting technologies were vital trainings that enabled water users alter their mind sets while utilizing new methods and technologies such as planting trees etc. that contributed towards sustaining water resources found in Mara catchment area. The affirmation above is in line with Kabogo et al (2019) who were in opinion that, trainings that involve water users in adopting new methods and technologies that sustain water resources have been vital and acceptable in various areas. Here water users have been able to participate in water conservation activities such as planning trees, utilizing updated technologies in irrigation activities and accommodating queer methods that lead to water management techniques. Moreover, 15% of respondents were not sure on the matter. Figure 4.1 shows the training that was undertaken.

Figure 4.1: Training on improving Water Catchment Area

Source: Field Data, 2024

Furthermore, the results in Table 4.2 reveal that 80% of respondents strongly agreed that capacity building and training programs in Mara catchment area included carrying infrastructure development training to water users where improvement in water use resulted into more yields to farmers. This implies that infrastructures that involved those used for cultivating paddy and others were improved; renovated and constricted something that increased the cultivated area towards increasing productivity and water use among users.

The statement above concurs with Shunglu et al (2022) who reported that infrastructure development that involves the participation of stakeholders has the possibility of being owned by the users while being kept for a long time from the fact that, ownership prevails. However, 20% of respondents disagreed that some areas that contain water users could not benefit from such development from the fact that, training has yet to be done. This necessitates a need to go further and serve other users for their benefits. This is in line with Dyer et al (2019) who pinpointed that, training needs to be provided to all stakeholders in order to avoid unnecessary complaints that do not contribute to the sustainability of projects. These trainings aided in avoidance of costs and conflicts through capacity building activities.

Finally, the results in Table 4.2 reveal that 75% of respondents strongly agreed that capacity building and training programs in Mara catchment area include provision of knowledge towards investing in novel water technology through training WUAs with the collaboration of Mara basin management. This implies that water use technology would enable users of water to manage their resources towards sustainable water use

for their generation and other generations. This concurs with Zhang et al (2023) who reported that, the newly novel technology in sustaining water resources needs to be taught, has it has proved to aid users of water to manage their activities and avoid day to day water conflicts among users. Moreover, 25% of respondents disagreed that although this kind of novel technology has been provided by WUAs leaders to water users, its implementation needs more attention and knowledge on the better use.

Generally, the results show that capacity building and training programs have been beneficial among water users to the extent of managing water resources. This has been vivid through conducting educational campaigns among water users; conducting trainings that focus on improving water catchment and harvesting technologies that change irrigation technology used today. More so, capacity building and training programs helped in carrying water infrastructure development and investing novel trainings to WUAs leaders with collaboration of Mara basin management. Therefore, capacity building and training programs have resulted into avoidance of costs and conflicts that have been occurring.

4.2.4 Ability of WUAs Leadership in resolving Conflicts over Water Issues in sustaining Water Resources

The second objective assessed the ability of WUAs leaders in resolving conflicts over water issues in sustaining water resources in Mara catchment area. Questionnaires were administered to WUAs leaders and water users. The results are presented in Table 4.3.

Table 4.3: Ability of WUA s Leaders in Resolving Conflicts over Water Issues

Statement	% strongly agree	% agree	% not sure	% disagree	% strongly disagree
Solving conflicts between farmers and farmers in the catchment areas proved the ability of WUAs leaders	95	5	0	0	0
There have been physical fighting over water sources that were resolved by WUAs leaders	85	0	15	0	0
The prevalent of acts of vandalism on water users in catchment areas have been resolved by WUAs leaders	75	25	0	0	0
Provision of employment and reduced poverty among people around the catchment has been a mechanism to resolve conflicts	80	0	0	20	0
Use of by-laws to manage conflicts has been a mechanism to resolve conflicts	85	0	0	15	0
Mediation measures have been used by WUAs as mechanisms to resolve conflicts	80	20	0	0	0
Using formal water distribution arrangements to all users has been a mechanism to resolve conflicts	90	0	10	0	0

Source: Field Data, 2024

Table 4.3 indicates that 95% of those polled strongly concurred, whereas 5% agreed that the heads of WUAs shown their capability in resolving conflicts among farmers within the catchment areas. This implies that the frequent conflicts that arise between farmers and farmers in catchment areas were resolved by WUAs leaders through various means such as allocating each area to appropriate people and assigning the tasks to manage water usage etc. It was found that, when various water users were allocated with a specific area, demarcations were put to enable each user understand the area owned for the purpose of avoiding day to day conflicts. The statement above concurs with Fundi and Kinemo (2019) who reported that, in many catchment areas

conflicts have been evolving when demarcations have been absent or the leaders do not put measures to resolve conflicts.

Additionally, the results in Table 4.3 reveal that 85% of respondents strongly agreed that WUAs showed their ability to resolve conflicts in the catchment areas as there have been physical fighting over water sources among users of water. This implies that, WUAs leaders' ability to solve frequent fightings that emanate from users of water proved their role in sustaining water resources to the extent of enabling user, adhere to by laws and other regulations that abide them in using water. Such solutions have enabled user of water utilize it well for their day to day living and irrigation activities. The statement above concurs with Shemer et al (2023) who were in opinion that when users of water become challenged with others on the better use of water, leaders are there to solve the challenges thereof. Moreover, 15% of respondents were not sure of the matters as it sometimes happen that conflicts emerge and get unsolved something that accelerate other heavy conflicts.

Table 4.3 indicates that 75% of those polled strongly agreed, while 25% agreed that the issues of vandalism by water users in watershed regions have been addressed. WUAs leaders something that enabled the availability of few areas for maintenance, This implies that the knowledge provided necessitated the proper use of water resources as well enhancing their sustainability. The statement above concurs with the report by Kavand et al (2023) that asserted that when projects are accompanied by fewer destructive attempts by users, their sustainability becomes realised and vice versa.

Furthermore, the results in Table 4.3 reveal that 80% of respondents strongly agreed that WUAs leaders showed their ability to conserve water resources by providing employment among youths that reduced poverty among people around the catchment as a mechanism to resolve the anticipated conflicts. This effort of providing employment to young people around the catchment areas included, involving them in planting trees, allowing water channels to be opened on time and according to the agreed hours and by so doing, conflicts among water users were resolved altogether, Moreover, 20% of respondents disagreed on the matter that although some youths were employed in some areas, their management has been a challenge as some seemed to have little knowledge to handle the responsibilities given to them. The statement above concurs with the argument by Kucher et al (2023) who found that in many cases, unemployment has been an outcome of conflicts among users of water. Once strategies are put and implemented to accommodate some in income generating activities, conflicts become fewer and fewer.

Nonetheless, the results in Table 4.3 reveal that 85% of respondents strongly agreed that WUAs ability to resolve conflicts was realized through the use of by-laws to manage conflicts as mechanisms to resolve conflicts. It was found that, when normal means could not resolve conflicts, WUAs leaders had no alternative than using the by-laws enacted. This necessitated a thorough utilization of water resources in the catchment and in some instances, the culprits were taken to court. This is in line with Duran-Sanchez et al (2020) who insisted on the utilization of by-laws when normal means do not apply. Moreover, 15% of respondents disagreed on the matter from the fact that in some instances, the usage of by-laws could apply to a certain group of

people while leaving others (especially those aligned with leaders) unattended. The findings in Table 4.3 indicate that 80% of respondents strongly concurred, whereas 20% agreed that mediation procedures have been employed by WUA officials as mechanisms for dispute resolution. The mediation measures included calling parties in conflicts to resolve matters after being heard or using a few WUAs leaders to solve the conflicts (especially those minor ones) that could not result into destruction of water resources infrastructure. The statement above is in line with Richards and Syallow (2019) who reported that, mediation has been a good mechanism where parties after realizing their dispute, do not prolong the conflict. Therefore, the mechanism becomes a good means of resolving minor disputes in the area.

Finally, the results in Table 4.3 reveal that 90% of respondents strongly agreed that using formal water distribution arrangements to all users has been a mechanism to resolve conflicts something that show the ability of WUAs leaders to manage conflicting issues in the area. The distribution arrangement has been practiced by the headship of WUAs leaders that solved many conflicts in the catchment area as the demand for water has been higher due to irrigation and domestic use of water. This is in line with Lai et al (2019) who stated that when water usage become higher, the conflicts for its use are obvious. However, when there are knowledgeable leaders, the conflicts may be solved without much efforts and time. Moreover, 10% of respondents were not sure of the matter from the fact that, in many cases arrangements resulted into allegations to those who manage these arrangements. Figure 4.2 shows steps taken to mediate issues.

Figure 4.1: Mediation measures taken

Source: Field Data, 2024

Generally, the results show that WUAs leaders were able to emulate their ability to solve conflicts through resolving farmer to farmer conflicts in the area, managing physical fightings over water user, and avoidance of vandalism on water use in the catchment area. More so, WUAs leaders proved their ability to manage water resources through employment provision among youths something that reduced poverty around the catchment area. Similarly, WUAs leasers utilized by-laws, mediation measures and utilization of formal water distribution arrangements to all water users as mechanisms to resolve almost 34 conflicts in Mara catchment area with success.

4.2.5 Engagement and Participation of WUAs Leadership in sustaining Water Resources

The third objective examined the engagement and participation of WUAs leadership in sustaining water resources in Mara catchment area. Questionnaires were

administered to WUAs leaders and water users. The results are presented in Table 4.4.

Table 4.4: Engagement and Participation of Wuas Leadership in Sustaining Water Resources

Statement	**% strongly agree**	**% Agree**	**% not sure**	**% disagree**	**% strongly disagree**
WUAs leaders have engaged on understanding of climate change and its impacts towards sustaining water resources	80	0	0	20	0
Participation of WUAs leaders in knowledge provision to water users	85	15	0	0	0
Engaging in participatory processes in water conservation	90	10	0	0	0
Engaging on accountability activities in managing water resources by WUAs	75	25	0	0	0

Source: Field Data, 2024

The results in Table 4.4 reveal that 80% of respondents strongly agreed that WUA s leaders tried their level best to engage on understanding of climate change and its impact towards sustaining water resources. This shows the commitment by WUAs leaders on the thirst for knowledge that would help in managing the water resources in Mara catchment area. The statement above concurs with Kabogo et al (2019) who reported the need for players in water resources management to understand the climate change that affect the day to day water bodies something that help in conserving them. Moreover, 20% of respondents were in disagreement that although climate change has been affecting the catchment areas, there are measures taken to rescue the situation and the parties utilizing water for their day to day use.

Furthermore, the findings in Table 4.4 indicate that 85% of those polled strongly concurred, while 15% believed that WUA leaders were actively engaged in providing knowledge to water users, hence promoting the effective utilization of water resources in the watershed region. This indicates that the involvement and participation of WUA leaders facilitated their comprehension of the obstacles to their job, hence augmenting their conservation efforts. The statement above concurs with Kucher et al (2023) who stated that water users need to gain knowledge on matters pertaining their day to day domestic and irrigation activities to aid them in conservation matters towards sustainability of water resources.

Table 4.4 indicates that 90% of respondents strongly agreed and 10% agreed that WUA leaders engaged in participatory procedures for water conservation, which facilitated their leadership in promoting efficient water usage among users. This implies that participatory processes that involved each player was of important as each player was able to understand and take appropriate measures to conserve the water resources. The statement above concurs with Dyer et al (2019) who reported that participatory processes have been vital in managing catchment areas to the extent of assuming each player with the task to do.

Table 4.4 indicates that 75% of respondents highly agreed, whereas 25% believed that WUA leaders participated in accountability activities related to water resource management, which enhanced water users' understanding and resource sustainability. The statement above concurs with Natalija et al (2022) who insisted on the need for each player in water resources sustainability to work hand in hand towards better

future use of water. By so doing WUAs leaders have been able to effectively conserve aquatic life, water quality biodiversity, prevention of water lands, and effective optimization of water distribution among water users in Mara catchment area. Generally, the results show that engagement and participation of WUAs leaders have been fruitful as WUAs leaders were able to understand issues on climate change and its impacts. More so, WUAs leaders participated in knowledge provision to water users, engaged in participatory processes in water conservation and involved in accountability activities something that resulted into proper management of water resources.

4.2.6 Regression Analysis

Assumptions of Multiple Regression

Pallant (2005) asserted that multiple regression study relies on certain assumptions regarding the acquired data. The assumptions include: linearity, normality, autocorrelation, multicollinearity, and multiple linear regression analysis.

Linearity Assumption

This assumption requires that a connection between both dependent and independent variables to be linear. Consequently, Pearson correlation is employed to validate this hypothesis, revealing that the long-term preservation of water resources exhibits a substantial positive linear association with the independent variables ($p < 1.000$) [1-Tailed]. The correlation between the variables exhibits a weak positive or negative value: training and capacity-building programs (+ve), $r(218) = 0.649$; the ability of WUA leaders to resolve conflicts (-ve), $r(218) = -0.054$; and the engagement and

participation of WUA leaders in sustaining water resources (-ve), r(218) = -0.048, as illustrated in Table 4.5.

Table 4.5: Linearity Assumption

Correlations

		Sustainability of Water Resources	Capacity building and training programs	Ability of WUAs leaders in resolving conflicts	Engagement and participation of WUAs leaders in sustaining water resources
Pearson Correlation	Sustainability of Water Resources	1.000	.649	-.054	-.048
	Capacity building and training programs	.649	1.000	-.051	-.076
	Ability of WUAs leaders in resolving conflicts	-.054	-.051	1.000	-.057
	Engagement and participation of WUAs leaders in sustaining water resources	-.048	-.076	-.057	1.000
Sig. (1-tailed)	Sustainability of Water Resources	.	.000	.213	.241
	Capacity building and training programs	.000	.	.229	.131
	Ability of WUAs leaders in resolving conflicts	.213	.229	.	.199
	Engagement and participation of WUAs leaders in sustaining water resources	.241	.131	.199	.
N	Sustainability of Water Resources	218	218	218	218
	Capacity building and training programs	218	218	218	218
	Ability of WUAs leaders in resolving conflicts	218	218	218	218
	Engagement and participation of WUAs leaders in sustaining water resources	218	218	218	218

Source: Field Data, 2024

Normality Assumption

This assumption requires that the errors of the independent variables be regularly distributed. Skewness and kurtosis are utilized to assess normalcy. Furthermore, the errors of all variables are presumed to be normally distributed according to the Skewness-Kurtosis guideline of ± 2.58. The examination is illustrated in Table 4.6.

Table 4.6: Skewness and Kurtosis Coefficients

Variable	N Statistic	Skewness Statistic	Std. Error	Kurtosis Statistic	Std. Error
Capacity building and training programs	218	0.500	.100	0.100	.015
Ability of WUAs leaders in resolving conflicts	218	0.320	.100	0.102	.020
Engagement and participation of WUAs leaders in sustaining water resources	218	0.311	.100	0.112	.011

Source: Field Data, 2024

Table 4.7: Model Summary

Model Summary										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.650[a]	.422	.414	.550	.422	52.106	3	.214	.000	.442

a. Predictors: (Constant), capacity building and training programs; ability of WUAs leaders in resolving conflicts; engagement and participation of WUAs leaders in sustaining water resources

b. Dependent Variable: sustainability of water resources

Source: Field Data, 2024

Autocorrelations Assumption

Osborne and Waters (2002) assert that autocorrelations indicate that errors among independent variables remain uncorrelated. Consequently, the Durbin-Watson statistic is employed to verify this assumption. Field (2009) asserts that the Durbin-Watson statistic ensures minimal autocorrelations when its coefficient ranges from 1.5 to 2.5. Table 4.7 presents the results.

Multicollinearity Assumption

The Variance Inflation Factor (VIF) and Tolerance Rate were calculated to evaluate this assumption. VIF and tolerance adhere to the rule of thumb, indicating little collinearity across independent variables. Stevens (2009) posited that a low Variance Inflation Factor (VIF) and a high tolerance indicate minimal multicollinearity. The tolerance rate coefficient varies from 0 to 1, whereas the Variance Inflation Factor (VIF) spans from 1 to 10. Table 4.8 presents the findings.

Table 4.8: Multicollinearity Assumption

Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	(Constant)		
	Capacity building and training programs	.991	1.009
	Ability of WUAs leaders in resolving conflicts	.994	1.006
	Engagement and participation of WUAs leaders in sustaining water resources	.990	1.010

Source: Field Data, 2024

Table 4.9: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig
1	.650[a]	.422	.414	.550	0.000

Source: Field Data, 2024

The sustainability of water resources was identified as a satisfactory variable in elucidating the capacity for building and instructing programs, the conflict resolution abilities of WUA leaders, and their engagement and participation in the preservation of water resources. This is corroborated by a coefficient of determination, commonly referred to as R-squared, of 0.414. The sustainability of water resources accounts for 41.4% of the fluctuations in the Mara watershed region.

The results indicate that the model used to elucidate the relationship among the variables was satisfactory; changes in the dependent variable can be attributed to the development of capacity and training programs, the conflict resolution abilities of WUA leaders, and the engagement and participation of WUA leaders in the sustainability of water resources. The remaining 58.6% can be attributed to variables outside the parameters of this study. This aligns with Malebeto and Maziku (2022), who indicated that alterations in the sustainability of water resources result from capacity-building and training initiatives, the conflict-resolution capabilities of WUA leaders, and their engagement in the maintenance of water resources. The Analysis of Variance (ANOVA) results are shown in Table 4.10.

Table 4.10: ANOVA Results

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	47.287	3	15.762	52.106	.000[b]
	Residual	64.736	214	. 303		
	Total	112.023	217			

a. Dependent Variable: Sustainability of water resources

b. Predictors: (Constant), capacity building and training programs; ability of WUAs leaders in resolving conflicts; engagement and participation of WUAs leaders in sustaining water resources

Source: Field Data, 2024

The results further validate that the regression model is significant, as indicated by the F-Calculated (3, 218) = 47.287, which exceeds the F-Critical (3, 218) = 64.736 at a 95% confidence level. The results further validate that the model of regression of beneficiaries' wellbeing is significant, with p = 0.000 < 0.05. Moreover, the regression coefficients are shown in Table 4.11 as hereunder;

Table 4.11: Regressions Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.080	.157		.509	.000
	Capacity building and training programs	1.028	.083	.648	12.420	.000
	Ability of WUAs leaders in resolving conflicts	-.034	.084	-.021	-.409	.000
	Engagement and participation of WUAs in sustaining water resources	.070	.050	.000	.008	.002

Source: Field Data, 2024

The regression coefficients in Table 4.11 indicate that all variables were important predictors ($p<0.05$) of the model. This indicates that a one-unit increase in training and capacity-building programs accounts for a 102.8% increase in the sustainability of water resources. An enhancement of one unit in the dispute resolution capabilities of WUA leaders indicates a 3.4% increase in the sustainability of water resources. A one-unit increase in the engagement and participation of WUA leaders in the sustainability of water resources accounts for a 7% increase in electrification impacts.

The following regression model was used

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

$$Y = .080 + 1.028\ \boldsymbol{\beta_1} - 0.034\ \boldsymbol{\beta_2} + \mathbf{0.070}\ \boldsymbol{\beta_3} + \boldsymbol{\varepsilon}$$

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Chapter Overview

This chapter provides a summary, conclusion, and suggestions derived from the study's findings. The sequence begins with the summary, followed by the conclusion, recommendations, and concludes with subsequent investigations.

5.2 Summary of Findings

This study evaluated the influence of water user associations' (WUAs) leadership on the long-term preservation of water resources in the Mara watershed area. Specifically, it examined the capacity building and training programs done by WUAs leaders in sustaining water resources, assessed the ability of WUAs leadership in resolving conflicts over water issues in sustaining water resources; and examined the engagement and participation of WUAs leadership in sustaining water resources in Mara catchment area. Positivist ideology and explanatory research methodology were employed utilizing a quantitative technique. A sample size of 218 respondents was acquired using simple random sampling among leaders of Water User Associations and water customers, with data collected via questionnaires.

Quantitative data were analyzed descriptively. Additionally, linear regression analysis was conducted to examine the association among variables. The findings indicated that training and capacity development programs were advantageous for water users in managing water resources. Consequently, training and capacity building initiatives have led to the mitigation of costs and disputes that have arisen.

The findings indicated that WUA leaders successfully replicated their conflict resolution skills by addressing disputes among farmers, handling physical altercations over water usage, and preventing vandalism related to water use in the catchment region.

Furthermore, the findings revealed that engagement and participation of WUAs leaders have been fruitful as WUAs leaders were able to understand issues on climate change and its impacts, participated in knowledge provision to water users, engaged in participatory processes in water conservation and involved in accountability activities something that resulted into proper management of water resources.

5.3 Conclusion

It can be concluded that capacity building and training programs were beneficial to water users that involved conducting educational campaigns; improving water catchment and harvesting technologies that changed irrigation technology used today. This aided in carrying water infrastructure development and investing more in novel trainings with collaboration of Mara basin management. Also, WUAs leaders manage to show their ability to solve conflicts on farmer to farmer basis, managing physical fightings over water users and avoidance of vandalism on water use in the catchment area. Similarly, engagement and participation of WUAs leaders were fruitful as WUAs leaders were able to understand issues regarding climate change and its impacts something that enabled accountability that resulted into proper management of water resources.

5.4 Recommendations

The subsequent recommendations are put forward based on conclusion as follows;

- With regard to capacity building and training programs; it is recommended that more knowledge needs to be provided to water user for the purpose of sustaining water resources.
- With regard to the ability of WUAs leaders in resolving conflicts over water issues in sustaining water resources; it is recommended that WUAs leaders need to be capacitated more on conflict resolution for the purpose of avoiding day to day water resource vandalism.
- With regard to engagement and participation of WUAs leaders in sustaining water resources in Mara catchment area; it is recommended that Mara basin management needs to improve and support WUAs leaders' engagement and participation towards sustaining water resources in the area.

5.5 Recommendation for Further Studies

This study evaluated the influence of water user associations' (WUAs) leadership on the long-term preservation of water resources in the Mara watershed area. It is suggested that additional research be conducted on the following concerns. Analyze the obstacles faced by WUA leaders in improving their daily operations due to the fluctuating water user fees in various catchment areas in Tanzania.

5.6 Limitations and Delimitations of the Study

Notwithstanding the prospective advantages of this investigation, some limitations were identified. The study encountered temporal and resource limitations, as

evaluating the impact of water user associations' (WUAs) leadership on the sustainability of water resources in the Mara watershed area necessitates considerable time and resources. To mitigate the limits of time and resources, various solutions were implemented. The researcher initially identified the principal water users and leaders of Water User Associations (WUAs) who would participate in the study. By concentrating on these respondents, the researcher optimized resource allocation and executed a focused inquiry that addressed the study's most critical elements. Secondly, rather of analyzing all leaders of Water User Associations (WUAs) and water users, the researcher employed sampling techniques to choose representative samples for analysis to obtain the necessary results. Furthermore, the findings are not applicable to catchments outside the Mara catchment region.

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APPENDICES

Appendix 1: Questionnaire

Gender: Male ( ), Female ( )

Age: 20 to 25 ( ), 26 to 30 ( ), 31 to 35 ( ), 36 to 40 ( ), over 41 ( )

Working experience, 1-5 ( ) 6-10 ( ), 11-15 ( ), over 16 ( )

Employment status: Permanent ( ), Casual ( )

Education level; Primary ( ), Secondary ( ), Diploma ( ), Degree ( )

For each of the following aspects shown below rate your level of agreement using the following Likert type scale provided:

Agreement: 1= strongly agree, 2= Agree, 3= Not sure, 4= Disagree, 5= strongly disagree

Na.	Capacity building and training program	Level of agreement				
1.	Conducting educational campaigns	1	2	3	4	5
2.	Improvement in water catchment and harvesting technologies through changing irrigation technology	1	2	3	4	5
3.	Carrying infrastructure development training	1	2	3	4	5
4.	Carrying updated irrigation and agricultural practices	1	2	3	4	5
5.	Investing novel water technology through the collaboration of Mara basin management	1	2	3	4	5
6	Carrying transboundary water cooperation training	1	2	3	4	5
7	Avoidance of costs in conflicts through capacity building activities	1	2	3	4	5
	Ability of WUAs leadership in Resolving conflicts	Level of agreement				
1	There have been conflicts between farmers and farmers in catchment areas to be resolved by leaders	1	2	3	4	5
2	Physical fighting over water sources are resolved by leaders	1	2	3	4	5
3	Acts of vandalism on water users in catchment areas have been prevalent	1	2	3	4	5

4	Reduced use of water in catchment areas has been a source of conflicts	1	2	3	4	5
5	Provision of employment and reduced poverty among people around the catchment has been a mechanism to resolve conflicts	1	2	3	4	5
6	Creation of a shared basin identity for users has been a mechanism to resolve conflicts	1	2	3	4	5
7	Use of by-laws to manage conflicts has been a mechanism to resolve conflicts	1	2	3	4	5
8	Adherence to laws and regulations have been a mechanism to resolve conflicts	1	2	3	4	5
9	Mediation measures have been mechanisms to resolve conflicts	1	2	3	4	5
10	Reduced habitat degradation and biodiversity loss has been a mechanism to resolve conflicts	1	2	3	4	5
11	A need to have appropriate playing ground for different users to develop sustainable conflict management strategies over water use in the area has been essential	1	2	3	4	5
12	Using formal water distribution arrangements to all users has been a mechanism to resolve conflicts	1	2	3	4	5
13	Participating in water management especially on water conservation	1	2	3	4	5
	Engagement and participation of WUAs leadership in sustaining water resources	Level of agreement				
1	Engaging on understanding of Climate change and its impacts	1	2	3	4	5
2	Participation of WUAs leaders in knowledge provision to water users	1	2	3	4	5
3	Engaging in participatory processes in water conservation	1	2	3	4	5
4	Engaging on accountability activities in managing water resources by WUAs	1	2	3	4	5
5	Power heterogeneity and imbalances at micro-level	1	2	3	4	5
6	Lack of inclusive participation in decision making	1	2	3	4	5
	Sustainability of Water resources					
1	Effective conservation of aquatic life	1	2	3	4	5
2	Effective conservation of biodiversity	1	2	3	4	5
3	Effective prevention of water-lands	1	2	3	4	5
4	Effective conservation of water quality	1	2	3	4	5
5	Effective optimizing water distribution among users	1	2	3	4	5

Appendix 4: Letter for Data Collection from OUT

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

THE OPEN UNIVERSITY OF TANZANIA

Ref. No OUT/PG202101576 **12th July, 2024**

Mara Catchment Water Officer,

P.O Box 390,

MARA,

Dear, Officer ,

RE: RESEARCH CLEARANCE FOR MR. OGAMA MANGASA REG NO: PG202101576

2. The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

3. To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. Ogama Mangasa , Reg.No:PG202101576),** pursuing **Masters of Arts in Governance and Leadership (MAGL)** We here by grant this clearance to conduct a research titled **"Assessment of**

the Role of Water Users Associations Leadership on the Sustainability of Water Resource in Mara Catchment ". He will collect his data at your office from July 15th, 2024 to 30 th August 2024.

4. In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

THE OPEN UNIVERSITY OF TANZANIA

Prof.Gwahula Raphael Kimamala

For: VICE CHANCELLOR

Kinondoni Biafra, Kawawa Road; P.O 23409; Dar es Salaam; Tel: +255 22 2668 445;
E-Mail:vc@out.ac.tz|| Website:www.out.ac.tz

Appendix 5: Response Letter from Mara Catchment Water Officer to OUT

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER

LAKE VICTORIA BASIN WATER BOARD LVBWB

MARA CATCHMENT

In reply please quote :

Ref. No. LVB/MACA/CG/Vol.IV/170 13th Julay 2024

THE OPEN UNIVERSITY OF TANZANIA
VICE CHANCELLOR,
P.O.BOX 23409,
DAR ES SALAAM.

RE: RESEARCH CLEARANCE FOR MR. OGOMA MANGASA, REGISTRATION NUMBER: Pg 202101576

Thank you for your letter dated 12th July, 2024 with ref No. OUT/PG202101576 granting research clearance to Mr. Ogoma Mangasa from the Open University of Tanzania. We acknowledge receipt of the clearance for his research titled "***Assessment of the Role of Water User Associations Leadership on the Sustainability of Water Resources in Mara Catchment Area, Tanzania".***

We hereby confirm our readiness to cooperate and facilitate Mr. Mangasa's research activities at our Office from 15th July, 2024 to 30th August, 2024.

Yours sincerely,

Mwita Mataro
Water Officer
Mara Catchment

Water Officer
Mara Catchment