

**INFLUENCE OF DROUGHT COPING STRATEGIES ON THE SOCIAL-
ECOLOGICAL WELL-BEING OF PASTORAL COMMUNITIES IN
KAKUMA AND OROPOI LOCATIONS IN TURKANA COUNTY, KENYA**

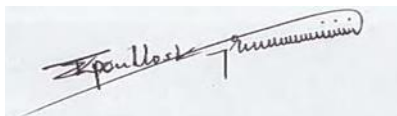
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**A Thesis Submitted in Partial Fulfilment of the Requirements for the Award of
the Degree of Master of Science in Environment and Natural Resource
Management in the Department of Environment and Natural Resource
Management of Africa Nazarene University**

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DECLARATION


This document and the research it describes are my original work and have not been presented in any other university for academic work.

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This research is submitted for examination with our approval as University supervisors.

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DEDICATION

I dedicate this work to my mother, Celine Auren Joseph, who rose above every imaginable adversity to give me the educational foundation and the prayers and support throughout my life!

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This work would not be possible without God's protection during a difficult time with the Covid-19 pandemic. His providence and wisdom gracefully guided me throughout these studies.

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ABSTRACT

The nomadic pastoralists in Turkana have developed coping mechanisms to protect themselves from the long-term effects of droughts that decimate livestock which forms their primary source of livelihood. Turkana is suffering from water scarcity disrupting routine activities like small scale farming. This study aimed to assess the effects of drought coping strategies on the socioecological wellbeing of the pastoralists in Turkana West Sub County. The study objectively sought to determine the influence of livelihood diversification; evaluate the influence of remittances to the households; determine the influence of credit access; assess the influence of collective action and investigate the influence of food relief and NGO interventions on the socioecological wellbeing of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County. The study employed the use of a descriptive research design targeting a population of 115,134 (23,048 households) respondents. The study used cluster sampling to select a sample size of 273. The study adopted questionnaires for data collection and utilised descriptive and inferential data analysis methods to analyse the collected data. The results showed that three independent variables had positive and significant influence on the socioecological wellbeing, namely credit access ($\beta = .151$, $t = 2.519$, $p < .05$), collective action ($\beta = .160$, $t = 2.667$, $p = 0.008$) and food relief and NGO/government interventions ($\beta = .722$, $t = 17.195$, $p = 0.001$). On contrary, livelihood diversification ($\beta = -.051$, $t(272) = -.846$, $p > 0.05$) and remittances to the households ($\beta = .100$, $t = 1.658$, $p > .05$) had no significant influence on socioecological wellbeing. The study concluded that credit access, collective actions and food relief and NGO/government interventions are coping strategies that could be adopted as best practices to improve the socioecological wellbeing of pastoral households in Kakuma and Oropoi locations. Identification and ranking of factors influencing the choice of drought coping strategies will have a significance in the adoption of these best practices for better drought preparedness and mitigation measures. Therefore, the study recommends that credit access be made easier for the people in these locations. People in this region should engage in more diverse livelihoods. In partnership with the national government and other stakeholders such as religious factions, the county government should promote active community collective action for better drought preparedness.

DEFINITION OF TERMS

Climate change: refers to the long-term change in terms of weather patterns (Stone & Mackie, 2013).

Drought: in this study is a term that means a period where the precipitation levels are below normal, hence protracted periods of dryness (Stone & Mackie, 2013).

Shocks: In relation to droughts means unpredicted climate-based variabilities that lead to negative productivity or destabilisation of livelihoods in general (Schoon & Lyons-Amos, 2017).

Social-ecological well-being: In this study refers to the harmonious existence between the human population and the ecological system (Schoon & Lyons-Amos, 2017).

ABBREVIATIONS AND ACRONYMS

ANOVA: Analysis of Variance

Df: Degree of freedom

DMI: Disaster Management Initiative

DRC: Democratic Republic of Congo

F: F statistic

GCM: General Circulation Model

GHGs: Greenhouse Gases

GIS: Geographical Information Systems

HSNP: Hunger Safety Net Program

IFRCRCS: International Federation of Red Cross and Red Crescent Societies

INGOs: International Non-governmental Organizations

IPCC: Intergovernmental Panel on Climate Change (IPCC)

Max.: Maximum

Min.: Minimum

NGO: Non-governmental Organizations

PFS: Pastoral Field Schools

Sig.: Significance level

St dev.: Standard deviation

T: t student value

UN: United Nations

UNHCR: United Nations High Commissioner for Refugees

UN - WFP: United Nations World Food Program

VICOBA: Village Community Banks

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This thesis is designed to study the influence of drought coping strategies on the social-ecological well-being of pastoral communities in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County, Kenya. Drought coping strategies undertaken by pastoralists in Turkana will be used as independent variables; they include (i) livelihood diversification, (ii) remittances to the household, (iii) access to credit by the households, (iv) collective action, and (v) relief and NGO intervention. The dependent variable comprised of the social ecological well-being dimensions of the households such as material well-being, relational well-being, subjective well-being and ecological resilience. The intervening variables, which can influence the direct relationship between the drought coping strategies and the household's social-ecological well-being, include government policies and political interventions.

1.2 Background of the Study

Water scarcity is a severe global concern based on its adverse effects. The existing pressure exerted on the water resources by the ever-increasing demands of an increasing population has triggered climate changes; this has caused an alarm that requires various measures to be adopted to control the situation (Zhao et al., 2019). Vegetation plays a key role as a critical indicator envisaging the state of food security globally. Therefore, loss of vegetation has been linked to food insecurity as it causes desertification that affects the people's ability to generate food. Drought results from the changes in climate due to the absence of vegetation (Gosling & Arnell, 2016).

Drought has many adverse effects on the environment. The most significant is the loss of indigenous plant species, which are vital in supporting the biomes in the ecosystem and creating the much-needed balance in regulating climate. More than 70% of the animals and plants on earth are found within forests. The increase in deforestation often threatens their survival. Trees are crucial in managing climatic conditions and water flows as they ensure that the soil is moist. Forests are vital in ensuring that rainfall and the elimination of soil erosion, which is critical in improving water flow and food security (Aabeyir et al., 2016), are abundant

Adaptation to survive the consequences of droughts has led the nomadic pastoral communities to depend more and more on the environment. This phenomenon coincides with the increased demand for food and wood as a commonly used form of cooking energy. Globally this has caused a considerable burden on the natural forests and thus made countries face severe climatic effects such as increased temperatures, desertification, and diminishing water resources. Since 1960, there has been a global increase in the demand for wood fuel, mainly in developing countries found in Asia and South America. This has prompted countries to have forest plantations to mitigate the effects of the demand for wood fuel. Forest plantations have been implemented mainly in South America, whereby there has been a severe impact on the climate due to an increase in demand for wood fuel in rural parts of the region (Aabeyir et al., 2016). In the Kakuma refugee camp and the entire Kakuma town, there is a huge demand for wood as fuel for cooking. Supplying this unrenovable resource to more than 400,000 refugees and local communities is unsustainable.

In Sub-Saharan Africa, the effects of climate change are prevalent. Human activity takes centre stage in contributing to negative climate change consequences. The shrinking of Lake Chad by 90% since 1960 (Ross, 2018) is a culmination of combined negative factors, including but not limited to climate change, the exponential increase in the population, and unplanned irrigation. With an estimated 239 million people suffering from hunger, an estimate that has significantly increased in Africa, there are various measures that the continent has adopted to ensure there is effective management of climate change and its effects. For instance, Ghana's de-vegetation rate of 2% per year distinctly stands as one of the highest in Africa. The studies projected a complete loss of Ghana's independent remnant forests by 2025, following impending pressures from deforestation (Pang et al., 2017). The continuous but steady loss of vegetation is directly linked to water scarcity, which affects the prospects of communities to feed themselves through food production, livestock growth, and development, among other livelihoods.

Climate change is evident in Turkana, as exemplified by the increasing rate of drought cycles in recent years. The far-reaching impacts of climate change on diminishing water resources, increasing cycles of heatwaves, more frequent droughts, and devastating storms, among others, have become a significant concern globally. With frequently experienced droughts lately, it is evident that climate change has significantly impacted hydrological cycles, mainly through the modification of precipitation and evapotranspiration. These changes often manifest as severe drought and devastating floods imparting more significant variability in river discharge and soil moisture (Abbas et al., 2016).

The effects of climate change on the pastoral communities living in an already vulnerable arid and semi-arid climate of Turkana are dire, influencing how they interact with their ecosystem to survive. The rapid increase in population growth in Turkana County further worsens their vulnerability to the slightest changes caused by climate variability. As Zhao et al. (2019) argued, increases in population and climate change will exacerbate existing pressures on water resources. Consequently, various studies have explored how both these factors might affect global water scarcity in the future by using population projections and simulated changes in climate from global climate models (GCMs) with water resources models (Gosling & Arnell, 2016).

The Turkana people are traditionally pastoralists, highly adapted to traditional grazing patterns moving from one rural area to another in search of water and pasture for their livestock, their primary source of livelihood. The frequent droughts have forced this community to adjust their social, ecological, and economic systems in response to threats posed by the impact of these droughts on their way of life. The African Union (2010) points out the impacts of these droughts on the nomadic communities, resulting in scarcity of water and pasture for their livestock and contributing to starvation from hunger and malnutrition from lack of nutritious diets. Considerable losses to herds are expected during droughts, significantly altering the herd structure, deteriorating the body condition of livestock, and the subsequent collapse of livestock markets.

The considerable losses to traditional livelihoods in Turkana County have invariably led to the search for alternative and substitute livelihoods. Pastoralists are increasingly abandoning the nomadic way of life, migrating to semi-urban centres searching for unskilled jobs within the county. The social and ecological well-being of the nomadic

communities in Turkana has changed for the worse, relying heavily on the environment to provide alternative livelihoods. For instance, charcoal burning, and extensive mining of quarry stones have conspicuously led to gradual de-vegetation, loss of habitat and land dereliction, respectively. According to Lund (2002), de-vegetated refers to an act of "having removed vegetation from an area". The impact of human activities on the environment is primarily regarded as the most significant contributor toward changing the landscape of the ecosystem, with desert encroachment now a reality in most parts of Africa. In Sudan and most of the Sahel region lying below the Sahara Desert, there has been a glaring advancement of the desert since the 1920s, with momentum gaining ever since the famine of 1971-1973 (Olagunju, 2015).

According to FAO (2008), the impact of climate change will directly affect all aspects of food security. Human health, livelihood assets such as livestock in nomadic pastoral economies, production, and food distribution, including the volatile economic markets and market networks, will all feel the brunt of climate change. The settlement patterns in the arid and semi-arid Turkana County are greatly influenced by several factors such as rainfall, climate, security, and infrastructure, among others. Plains and low-lying lands characterise Turkana County; these plains form part of the arid area in the County and receive the lowest amount of rainfall of about 180mm per annum. Consequently, these plains are dominated by dwarf shrubs and grassland, which provide forage for livestock during and shortly after the rainy season. However, the forage dries rapidly at the onset of the dry season (Turkana County Government, 2015).

Kakuma and its environs are home to two large refugee camps in north-western Turkana, Kenya. Since 1992, Kakuma has hosted refugees from Burundi, the

Democratic Republic of Congo (DRC), Eritrea, Ethiopia, Rwanda, Somalia, South Sudan, and Uganda. The sharp increase in the population depending on the already fragile environment for water, energy, and food needs only accelerated the loss of vegetation unprecedentedly, invariably causing an imbalance in the survival abilities of the host community. The abstraction of groundwater resources, collection of wood for fuel to support the more than 196,666 refugees, and a further 239,627 people from the host community only further diminished the environmental-based resources. These resources also support the livelihood of the local nomadic Turkana people, increasing their vulnerability and dependency on humanitarian aid and peasant jobs from the refugee camps.

Renewable energy is a widely touted alternative energy source to alleviate the environmental degradation concerns associated with de-vegetation and climate change. Renewable energy is the energy generated from natural sources and is quickly replenished in human continuance. It includes sunlight, biogas, hydropower, wind, waves, and geothermal heat. The primary concern in using the current non-renewable forms of energy has been its role and ability to greatly enhance the changes in the climate patterns globally, exacerbating the climatic challenges that the world is currently facing. Some of these effects are irreversible. Furthermore, an increase in energy prices has led many people in low-income countries to resort to the use of wood fuel, and this has led countries to explore ways of increasing the supply of renewable energy. Therefore, renewable energy is vital for managing de-vegetation and climate change effects (Hamilton et al., 2018).

The livelihoods of communities found mainly in the tropical areas of western parts of Africa tend to depend on the services provided by the ecosystem. It is the same for the nomadic pastoral communities in Turkana, whereby the environment supports the livestock, which forms the vital source of economic income and livelihood for these communities. The destruction of the vegetation has led to poor food supply due to a lack of rainfall and a steady water supply, which has affected the supply of water within the region (Hagedorn et al., 2019).

In Kenya, the impacts of climate change have manifested in intense droughts and floods in most parts of the country. These effects have had severe environmental and economic impacts. Of significant concern is the effect of climate change on water scarcity (Chepkoech et al., 2020). This effect exposes the already vulnerable nomadic pastoral groups that highly depend on water and pasture for their livestock sustenance.

Turkana County is an arid and semi-arid area with low forest cover (4.06%) and is facing imminent challenges when it comes to the supply of water and food security (Turkana County Government, 2015). The 2018 Turkana County Integrated Development Plan (CIDP) estimated that nearly 50% of the county is degraded, attributed significantly to overgrazing and de-vegetation to generate charcoal for fuel and energy. Such actions enhanced the increase in the rate of desertification, which has presented severe impacts on the food and water supply of the region. The county's current situation continues to have severe impacts on the supply of water and food, which has made the lives of the people in the region unbearable (Opiyo et al., 2016). Droughts that have become frequent have continued to drive the traditionally nomadic pastoral communities towards finding alternative survival mechanisms; these are not

limited to overexploitation of the meagre environmental-based resources but create more pressure on the social structures within the community due to overdependence. Based on this background, the study seeks to assess the influence the coping strategies of the nomadic pastoral communities in Turkana West have on their social-ecological well-being.

1.3 Statement of the Problem

Drought resulting from climate change is a global phenomenon paradoxically happening owing to human (or anthropogenic) and natural factors and its impacts felt across the board, at the global, regional, and even local levels. The Impact on water resources due to changes in climate can be substantial in causing changes in the precipitation amount and timing. Diverse water balance and climate models have been developed for climate change impact evaluation on water resources (Palm et al., 2017). Regardless of growing concern in assessing effects on water resources owing to climate change, underlying uncertainties are challenges accompanying the model of hydrological reactions to climate change that have triggered water scarcity (Garrote, 2017).

Over the years, the nomadic pastoral community in Turkana has developed coping mechanisms to cushion them from the sustained droughts that decimate their livestock and the only essential source of livelihood. This factor contributes to an imbalance in the social-ecological dimensions of this community. It changes the interaction between the people and their environment, the community dynamics and leads to vulnerability to the externalities. Waila et al., (2018) have noted that in arid and semi-arid regions such as Turkana, there are challenges with access to water due to droughts. Furthermore, (Haines et al., 2017) note that Turkana is suffering from a water shortage

that has caused problems that impair normal activities such as farming. The large pastoralist population is highly dependent on reliable rainfall patterns for grazing their livestock, and their primary source of livelihood is threatened by climatic change variability. This exposure affects the herds and significantly impacts the interaction between the people and their ecosystem (Birch & Grahn, 2007).

In Kakuma, where the refugee population are entirely dependent on the United Nations High Commissioner for Refugees (UNHCR), the UN-World Food Programme (WFP), and other International Non-governmental Organizations (INGOs) for all their social and economic needs, there is even greater risk in the pressure on natural resources due to over-exploitation of the available resources. Since 1992, firewood collected by locals and sold to agencies providing the refugees with cooking fuel has resulted in the mass devegetation and land barrenness currently facing Kakuma and most parts of the Turkana West Sub County. Consequently, the host community have lost vast grazing lands to the refugees' settlement and the depleted vegetation cover. This has increased their vulnerability to food insecurity and environmental aftershocks. The host community members rely on the government of Kenya's relief food and the humanitarian agency's assistance programs since their livelihoods have been decimated, rendering them over-dependent on humanitarian aid.

Therefore, this study established how the coping strategies adopted by the nomadic pastoralists in Turkana West Sub County had influenced their relationship with their social and ecological networks. The county government planners, the National government departments in charge of disaster management, and even the United Nations agencies can, in turn, use the negative stressors identified in resource base

planning. Informed modification of coping strategies to strike a favourable balance between the nomadic pastoral community, the social architecture, and ecological well-being will be critical in sustainable living.

1.4 Purpose of the Study

This study aimed to measure the influence of drought coping strategies on the social-ecological well-being of the nomadic pastoral communities in Kakuma and Oropoi locations in Turkana West Sub County.

1.5 Objectives of the Study

1.5.1 Main Objective

To assess the effects of drought coping strategies on the social-ecological well-being of the pastoralists in Turkana West Sub County.

1.5.2 Specific Objectives

- (i) To determine the influence of livelihood diversification on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.
- (ii) To evaluate the influence of remittances to the households on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.
- (iii) To determine the influence of credit access on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.
- (iv) To assess the influence of collective action on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.

- (v) To investigate the influence of food relief and NGO interventions on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.

1.6 Research Questions

This study sought to provide answers to the following research questions:

- (i) How does livelihood diversification influence the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County?
- (ii) What is the influence of remittances to the households on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County?
- (iii) What influence does access to credit have on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana county?
- (iv) How does the intermittent drought response initiatives likely to increase the vulnerability of the Turkana people to climatic hazards and negatively influence their social well-being?
- (v) To what extent do relief and other drought coping mechanisms affect the subjective attributes greatly valued by the Turkana people?

1.7 Significance of the Study

The continuing debates on the consequences of climate change concerning droughts, floods, and other related effects by the scientific community importantly give rainfall and temperature variability and reliability considerable attention at different scales. Climate projections suggest that variability is likely to increase in the future, and

extreme weather events might become more frequent in sub-Saharan Africa. However, the effects, risks, and uncertainty with the science around climate change and projections are daunting, challenging, and complex to understand at different levels (Opiyo et al., 2016).

The primary source of livelihood for the pastoral Turkana community is livestock keeping, which is dependent on favourable climatic conditions enabling the availability of water and pasture. However, trends of more frequent and severe droughts, and recently floods, have been reported within the region. According to IFRCRCS (2010), a prolonged drought in 2009 affected over 3.8 million people in pastoral, agro-pastoral, and marginal agricultural areas in Kenya, and floods displaced 436 households in Turkana Central in 2010. This scenario, attributed to climate variability, exacerbates the already acute food shortage due to livestock deaths. Consequently, people often die of hunger and malnutrition.

With resource base use in a volatile environment, understanding the effects of these coping strategies on the social-ecological well-being of the Turkana community is critical. This provides insights into mitigating the resulting adverse impacts of unintended consequences. It guides communities to make strategic, long-term decisions that affect their future well-being. Therefore, by studying the trends and changes in the physical environment and social welfare with a simple yet direct approach, considering how droughts exacerbate water stress, energy needs, and food insecurity within a pastoral community in an already fragile environment will provide communities and policymakers with a better perspective on the current realities. Additionally, coordination mechanisms on water resource use and conservation, energy exploitation,

and food production locally will strengthen the efforts to better manage the environment and its resources to support the population dependent on it. Therefore, the results of this study will help communities develop better coping mechanisms for the aftershocks of droughts, floods, and other disasters that occur due to the adverse effects of climate variabilities. Moreover, stakeholders including government authorities will find the results of this study useful in their planning purposes, to strengthen the social-ecological wellbeing contributors for the local communities.

1.8 Scope of the Study

The study focused on establishing the relationships between the longer-term effects of the identified coping strategies on the people's social attributes and ecological well-being in Turkana West, focusing on Kakuma and Oropoi. Due to the expansive geographical areas, limited time, and budget constraints, the study was limited to the two wards in Turkana West Sub County.

1.9 Delimitation of the Study

This study did not cover the broader climate change area but sought to determine the imbalances further created by the need to develop adaptations towards resiliency. The droughts aftershocks have met reactions in the bid for this pastoral community to survive; therefore, this study intended to reveal the degree to which the coping strategies developed by these communities affect the environmental aspect and their social well-being.

1.10 Limitations of the Study

The harsh weather conditions in the proposed area of the study presented challenges in the coverage of the study area, but prior planning eased movement within the area during good weather seasons. Insecurity in some parts of the Sub-County might have

limited data collection in comparison areas; as such, better planning with the authorities to facilitate movement was necessary. The illiteracy levels in Turkana are high, and it was likely to present a challenge in applying some research tools during data collection, such as the administration of questionnaires; interpretation using the local language applied.

1.11 Assumptions of the Study

This research study assumed that the responses generated from the field survey were a true reflection of the situation regarding the evolution of the changes to the environment and the apparent effects on the social-ecological well-being of the target community in Kakuma and Oropoi locations. The comparison areas for the study provided a clear distinction between the transitions experienced due to the adverse effects of droughts on this group of people at different scales. The study also assumed that there was sufficient data on critical variables that provide insights into the changes that have taken place over time in Kakuma and Oropoi locations.

1.12 Theoretical Framework

Two theoretical frameworks guided the study. These are symbolic interactionism and socio-ecological model. Symbolic interactionism is a sociological theory that develops from practical considerations and alludes to people's particular utilisation of dialect to make images and normal implications for deduction and correspondence with others (Denzin, 2016).

Symbolic interactionism offers four kinds of understandings of population and environmental problems. First, it seeks to understand why people engage or do not engage in activities related to population growth and other problems (e.g., the use of

contraception) and environmental problems (e.g., recycling). Understanding why people become involved or fail to participate in various activities related to population growth and environmental problems is essential (Denzin, 2016).

Second, it emphasises people's perceptions of population and environmental problems. To the extent that public attitudes play a vital role in the persistence of these problems, it is essential to know the reasons for public views on these issues so that efforts to address them may be better focused.

Next, symbolic interactionism assumes that population and environmental problems are social constructions as these problems are not considered social problems unless enough people or influential organisations in the public and private sectors recognise them as problems. Finally, symbolic interactionism emphasises that people from different social backgrounds and cultures may have different understandings of population and environmental issues (Rock, 2001).

On the other hand, the socio-ecological model will provide more perspective into the diverse existence of social organisations in groups by identifying and classifying ecological and social determinants responsible for the given diversity (Isbell, 2017). Continuous drought spells in arid and semi-arid areas, in addition to other human activities, can cause land degradation and hence desertification. (McSweeney, 2019), describes desertification as "the greatest environmental challenge of our time", and climate change is marking it worse. The Intergovernmental Panel on Climate Change (IPCC) published a special report detailing the interlinkages in land and climate interactions, droughts, and the inherent relationship between desertification, land degradation, and food security, among other related facets. An integrated response is

required to reverse the steady encroachments of desertification, in this sense basing the response action plans in arid and semi-arid areas on integrated water resources management, land management in food production, and improved livestock management.

Besides the loss of livelihoods due to droughts and other climate-related hazards, marginalisation and underdevelopment are the other catalytic agent in the non-informed destruction of the environment in Kakuma and its environs. It is true that when the refugees arrived in the Kakuma settlement in 1992, there were no established sources of energy to allow them to prepare their meals and sustain their families. On the other hand, the local host community did not have established income-generating activities rather than livestock keeping. This situation created an immediate demand for firewood for fuel and charcoal burning. Therefore, it is essential to understand that a sudden increase in population increases the demand for essential resources that only nature can provide. These being finite and factors of ecosystem imbalance kicking in, the cyclic adverse effects manifest in related and interconnected spheres.

1.13 Conceptual Framework

The conceptual framework captured in Figure 1.1 guided the study. The conceptual framework shows the relationship between the independent and dependent variables. The independent variables in the study are livelihood diversification, remittances to the households, credit access (no-collaterals), collective action and relief, and NGO interventions (non-conditional cash, food, livelihoods programs). The dependent variable is social-ecological well-being, represented by, material, relational, subjective, and ecological resilience. The intervening variable is represented by the government

policies, which can affect the relationship between drought coping strategies and socio-ecological well-being.

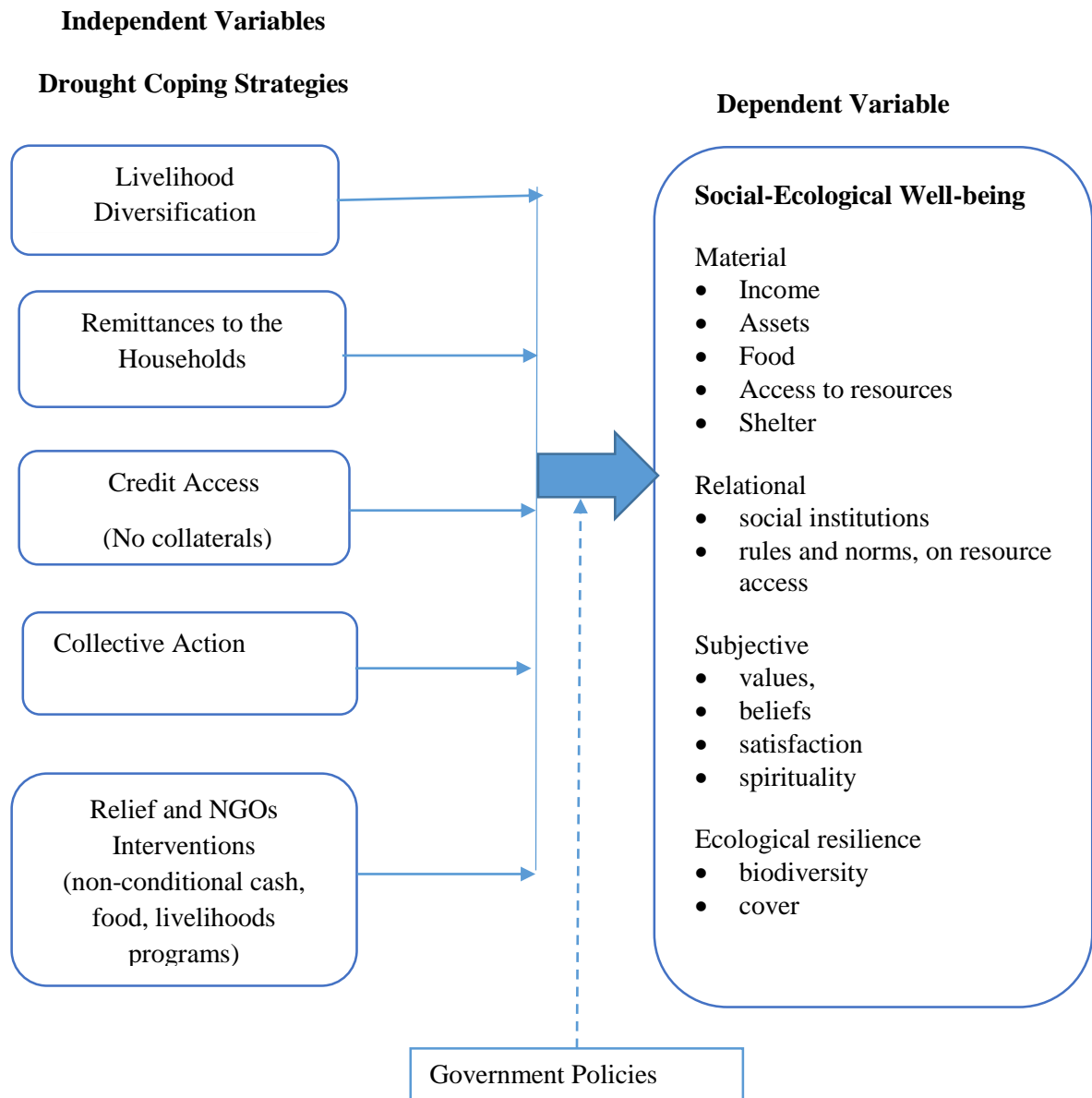


Figure 1. 1: Conceptual framework showing the influence of drought coping mechanisms on the socio-ecological well-being of households in Kakuma and Oropoi

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This study sought to investigate the influence of drought coping strategies on the social-ecological well-being of the nomadic pastoral communities in Kakuma and Oropoi locations in Turkana West Sub-County. In this section, the study logically examines the implications of the identified research variables on revealing the unknown effects of drought coping strategies on the social-ecological well-being of the nomadic pastoralist in Turkana West Sub County, specific to Kakuma and Oropoi locations.

2.2 Socio-ecological Wellbeing of the Households

Michalos (2014) defines socio-ecological well-being as a social-ecological system state in which ecological resilience is sustained while human needs are met, and the quality of life of individuals is maintained. In their study, Quick et al., (2015) indicated that the socio-ecological model is a graphic that illustrates the effect of the health and well-being of individuals at the household level based on the various influences that tend to interact at the macro-level micro-level environments.

In their study, (Schoon & Lyons-Amos, 2017) noted that socio-ecological well-being is used to help understand how individuals within a social ecology tend to define each other based on the various influences within the environment as climate, among others. This study sought to measure the influence of drought coping strategies (by identifying and ranking factors) on the social-ecological wellbeing of the nomadic pastoral communities in Kakuma and Oropoi critically looking at the socio-ecological well-being of the community from a perspective of mixed variables.

2.2.1 Measurement of Socio-ecological Wellbeing

This study assesses various aspects of socio-ecological well-being. The first aspect is the material well-being of the households. Material well-being is defined in terms of satisfaction with a range of economic concerns such as the government's handling of the economy, taxes, the cost of necessities, household income, pay and fringe benefits from one's job, financial security, the standard of living, and agreement within the family regarding how money should be spent (Sirgy, 2018).

The study's second element of socio-ecological well-being is relational household well-being. Relational household well-being is relationships between families, significant others, or between families and the community (White, 2017). The third aspect is subjective well-being. It refers to how people experience and evaluate specific domains and activities in their lives (Stone & Mackie, 2013). The last aspect of the sociological well-being under this study is ecological resilience. According to (Spears et al., 2015), Ecological resilience is the capacity of a system to absorb disturbance and reorganise while changing to retain essentially the same function, structure, identity, and feedback.

Households demonstrating positive socio-ecological well-being attributes should fall within the category of those that do not overly rely on their physical environment and non-renewable natural resources for survival. Socio-ecological well-being in this study will refer to a positive balance in the drought coping strategies of the affected population, their support networks, and the physical environment.

2.3 Causes of Drought

Understanding the trends in which the droughts occur, early warning systems, and predictability of climate change futures is essential for planning purposes, especially for arid and semi-arid areas where slight pressure on resources worsens the vulnerability of the households' economies. The vulnerability of such economies is high, and therefore to attain sustainability, socioeconomic development must make use of climate information available to minimise the negative impacts. Studies must aim to minimise the uncertainty in climate projection to provide the necessary climate information, by advocating for contextualisation and practicality of the interventions. Currently, the General Circulation Model (GCM) forced by the different projected Greenhouse Gases (GHGs) provide an understanding of climate projections. The GCMs are applied as a guiding tool for the expected change; this is because of the uncertainty in the projected greenhouse gases used to force these models and parameterise some processes such as deep convection and moisture (D'Amato et al., 2015).

It is critical to understand the interaction between the consequences of drought coping mechanisms and the physical environment on which the pastoralist communities in Turkana west depend for their living. These consequences are either intended or unintended. How drought coping strategies have affected the interaction between the Turkana pastoralists and their physical environment requires determination. It will be prudent to compare the physical changes over time and identify possible stresses levied on the environment by heavy dependence as exhibited by human action. These actions can be in the form of changes in land use, in which grazing lands vegetation is cleared to provide firewood for cooking, and abandonment of traditional land care practices.

Ruthrof et al, (2016) as cited in (Aponte et al., 2016) indicated that measured increases in dead wood mass and increased near-ground solar radiation associated with die-off could lead to fire spread of up to 30%. This phenomenon explains why forest fires are becoming rampant, destroying the ecosystems to a greater contributing to soil erosion, contributing to the greenhouse effect, flooding, and susceptibility to landslides among other effects.

Olanrewaju et al. (2018) conducted a study that assessed the perception a community in Ibadan, Nigeria, had about deforestation and climate change. The study collected the deforestation data published by the government. The study's findings indicated that 77% of the people knew the role of climate change and its causes. The findings further indicated that 95% of the respondents noted that deforestation led to the emergence of climate change. They also indicated a need for the government to ensure that there are measures to counter the massive deforestation in the region. The study recommended that alternative energy sources be adopted to avoid over-reliance on wood fuel which is a significant cause of devegetation and the consequent droughts and floods.

Worku et al. (2018) conducted a study that assessed the household level regarding tree planting and the conservation of the environment in Ethiopia and the overall impact on food and water security. The study noted that wood fuel was the primary energy source among the communities, based on the considerable consumption levels recorded. This was deduced to be a direct threat to the water catchments in the country. The study also indicated that the droughts faced in Ethiopia were based on the increase in devegetation in response to the wood fuel demand. The study concluded that there was a need for the

government to ensure that people are encouraged to avoid the devegetation of the natural forests to protect the water catchment areas in the country.

Zegeye, (2017) investigated the significant drivers and consequences of deforestation in Ethiopia: implications for forest conservation. The study indicated that the forests in Ethiopia had a positive impact on the country's water supply and thus prompting the need for effective measures to have them protected. However, the study noted an imminent threat to the natural forests in Ethiopia due to the increase in activities leading to deforestation and devegetation. This has been key to reducing agricultural activities and thus causing food insecurity in the country. Additionally, the devegetation in the region had caused soil erosion that had reduced the fertility of the agricultural lands and thus made it hard for the farms to have higher yields than they had reported before the massive deforestation, which threatened the food supply in the country.

Reis and Dotal, (2019) determined the effect of deforestation on sustainable water supply in a semi-arid mountainous watershed by using a storm water management model. According to the result, runoff amount increases from 1.505 cm³ /sec to 2.509 cm³ /sec with an increased ratio of 66.71%, 1.881 cm³ /sec with an increased ratio of 24.98%, and 1.658 cm³ /sec with an increase the ratio of 10.17% during 10 mm/day rainfall event in the conversion of forest to urban, agriculture and rangeland scenarios, respectively. Moreover, the rainfall intensity had more effect on runoff than devegetation in the study area. The study clearly showed that devegetation could lead to decreased groundwater recharge, and consequently, a decrease in the low flow, which is essential for ecosystem sustainability.

2.4 Drought Coping Strategies

2.4.1 Livelihood Diversification as a Drought Coping Mechanism

Diversifying livelihood as a coping strategy entail weaning the pastoralists away from overdependence on only the herds as their economic backbone. Diversification of livelihood is an effective adaptation strategy practised by most households around the peri-urban centres along rivers in regions that have experienced drought (Opiyo et al., 2016). According to Thao et al., (2019). their study indicated that, based on the persistent drought, the people of Central Highlands in Vietnam had devised livelihood diversification strategies. The strategies included planting crops that were drought resistant to ensure a supply of food during the period of drought.

McCabe et al., (2010) assessed the adoption of cultivation to remain pastoralists: the diversification of Maasai livelihoods in northern Tanzania. The study noted that some households adopted cultivation based on their choices as part of their alternative livelihood. For instance, some adopted farming to reduce the risks associated with droughts, and thus diversification was deemed part of handling drought challenges faced by the pastoralists.

Eze, (2018) assessed drought occurrences and their implications on the households in Yobe state, Nigeria. The study indicated that with drought, there was the need to ensure the adoption of various coping methods based on the diversification of the people's livelihoods. The study indicated that farming was one of the strategies adopted. The farming activities practised modern technologies capable of improving crop yields. This was determined to be critical in shielding people from the consequences of drought.

Quandt et al., (2017) examined the role of agroforestry in building livelihood resilience to floods and drought in semi-arid Kenya. The study noted that the practice of agroforestry was vital in combatting drought and floods. Agroforestry was vital in enhancing the environmental resilience of the people, and this was both directly and indirectly part of the adaptation strategies adopted by the smallholder farmers.

In Turkana County, livestock numbers have dwindled over the years, with fewer people holding on to the traditional livelihoods. The discovery of oil in the county provided jobs for most locals who have adopted different livelihoods from keeping livestock. Therefore, the improved value chain provides the few livestock keepers with the enabling environment to sell their livestock when in need, as there are modern slaughterhouses to take care of the growing population.

2.4.2 Remittances to the Household as a Drought Coping Mechanism

Loss of livelihoods for many pastoralists' households has forced them to depend on handouts for survival; this has created immense pressure in families' social networks where cash remittances to relatives for survival is now a common trait. Lack of opportunities and the less developed banking and lending structures further exacerbate the vulnerability of the have-nots. There are no collaterals for borrowing even where there are banking institutions, these lock this group of people in the community from access to credits.

Macro and microeconomic evidence suggest a positive role of remittances in preparing households against natural disasters and coping with the loss afterwards. Analysis of cross-country macroeconomic data shows that remittances increase in the aftermath of natural disasters in countries with a more significant number of migrants abroad. A

household survey data in Bangladesh shows that per capita consumption was higher in remittance-receiving households than in others after the 1998 flood (Ncube et al., 2018).

Ethiopian households that receive international remittances seem to rely more on cash reserves and less on selling household assets or livestock to cope with drought. In Burkina Faso and Ghana, international remittance-receiving households, especially those receiving remittances from high-income developed countries, tend to have housing built of concrete rather than mud and greater access to communication equipment, suggesting that they are better prepared against natural disasters (Ncube et al., 2018).

In disasters, remittances can play an essential part in how people survive and recover based on case studies done in case studies in Haiti, Pakistan, Somaliland, Sudan, Indonesia, and Sri Lanka. However, humanitarian actors often fail to consider remittances in assessments and responsive design. This neglect of remittances in humanitarian planning reflects a broader tendency to undervalue the capacities of crisis-affected populations: affected people are frequently portrayed as helpless and vulnerable, when in fact, people's efforts are often crucial to their survival (Savage & Harvey, 2007).

2.4.3 Access to Credit by the Households as a Drought Coping Mechanism

Twongyirwe et al., (2019) examined the perceived effects of drought on household food security in South-western Uganda and coping responses and determinants. The study's findings showed that 68.6% of the respondents perceived food insecurity as a problem in their household. Access to credit for crop cultivation increased the likelihood ($p < 0.05$) that farmers would be more aware and concerned about household food

security status. Farmers were more likely to use the credit as a buffer against food insecurity. Whilst drought was widely perceived (by 95.6%: 133) as a problem contributing to food insecurity, the coping responses were wide-ranging.

Ndlovu, (2019) noted that accessing credit lines from financial institutions was encouraged as it deferred the adverse results of drought. Most households in communal areas considered borrowing as a last resort. The fear of collateral in communal farming areas and short loan repayment periods contributed to the few borrowers. The challenge with the initiative was that of the limited number of applicants considered against those in dire need of financial support to sustain drought mitigation costs.

Ikoloski et al. (2018) indicated that savings are the most widely used coping mechanism but have a limited role for poor and rural households. For those households that can undertake strategies to cope with a given shock, relying on their savings and access to credit or borrowing are the most reported coping strategies undertaken. Most of these households rely on savings, not credit or borrowing.

Evaluation studies on the Oxfam Great Britain led Disaster Management Initiative (DMI) livestock project provided evidence that the DMI Livestock project had a modest but positive effect on the resilience of households of members of the PFS and VICOBA groups (Oxfam GB, 2013). These groups benefit from off-take and livestock restocking programs designed to take advantage of the early warning systems to sell and buy livestock at the opportune time.

2.4.4 Collective Action as a Drought Coping Mechanism

Collective action is used for several decisions concerning natural resources management. It requires networks and flows of information among individuals and groups demonstrating that the creation of farmer associations had created better opportunities to adapt, learn and plan to cope with drought, heavy rains, and increased climate variability. Moreover, ordinarily formal institutions contact households via farmers' groups to provide support (Pak-uthai, 2019).

Tortajada et al., (2017) noted that effective responses require collective actions determined by the modes of governance to fight drought. Polycentric systems are considered adequate to build resilience and foster adaptive capacity. They include more efficient responses to abrupt or incremental change because of the diversity of partners, more active participation processes, more open decision-making, and inclusion of a plurality of views, knowledge, and experience as they provide an increased range of options.

Choudhury & Sindhi, (2017) have indicated that traditional instances of collective action in adapting to drought by small and marginal farmers and rural communities in vulnerable ecosystems exist but have not been emphasised in mainstream drought management. Additionally, different forms of collective action by microcredit groups, self-help groups (SHGs), farmers' field schools (FFSs), area/user groups (in watershed projects), farmers' interest groups (FIGs), farmers' clubs, farmers' cooperatives, producer companies, can achieve the desired development objective with mainstream and alternative development support (Choudhury & Sindhi, 2017).

Jiri & Mafongoya, (2018), in their study, noted that communal pooling as part of collective action refers to adaptation responses involving joint ownership of assets and resources; sharing of wealth, labour, or incomes from activities across households; and mobilisation and use of resources that are held collectively during times of scarcity. It pools risks across households. This practice is most effective when the benefits from assets owned by different households and the livelihood benefit streams are uncorrelated.

2.4.5 Famine Relief and NGO Intervention as a Drought Coping Mechanism

Disaster relief interventions, mainly in food aid and fodder, have reduced food deficits and supported livestock survival. Such interventions are essential in addressing communities' immediate needs, but they are costly. Besides, these interventions are reactive and aim only to support affected communities to cope with the disaster and return to their pre-disaster conditions, without enabling adaptability or considering lessons learned from previous experience (Kamara et al., 2019).

The absence of a long-term comprehensive drought management strategy in southern Africa causes drought management efforts to rely on delivering relief aid post-disaster rather than proactive resilience building. As droughts and other climate change-related disasters increase in frequency and intensity in the region, there is a need to build resilience through early drought warnings (Nhamo et al., 2019).

Many international and aid agencies and multilateral organisations work very closely on drought alongside the government's structure at every level starting from the early part of the field assessment to the mobilisation and distribution of relief food for the drought victims. These International NGOs include OXFAM International

(GB/Canada/USA), Save the Children International, CARE International, and Catholic Relief Services (CRS), while the multilateral and bilateral organisations include UNOCHA, UN World Food Program (UN/WFP), USAID, EU, and UNICEF (Mera, 2018).

2.5 Drought Coping Strategies and Socioecological Wellbeing

Drought response initiatives play a crucial role in helping vulnerable communities respond positively to the adverse effects of droughts. However, it is also essential to understand the significance of the stresses caused by droughts on the social well-being of these people. Key among those are changes likely to happen to the rules and norms in resource sharing. This change is critical as it touches on the underbelly of potential community problems, affecting their cohesion and ability to pull together for collective action. Additionally, it is an agent for conflict where critical decisions affect communities in a way that leads to resentment and departure from the norms and rules of their traditional governance systems.

The Kenyan government Hunger Safety Net Program (HSNP) helps support the most vulnerable community members in various parts of Turkana with regular, unconditional cash to respond to drought and its consequences. The HSNP evaluation report shows that, even with the regular disbursement of cash transfers into the broader beneficiary network, there is a small but tangible impact on poverty, which means a meaningful improvement in the subjective well-being of HSNP recipients was recorded (Merttens et al., 2017).

Drought mitigation action and responses seem to be reacting towards droughts rather than building on the early warning systems and predicted weather patterns. The nature

of droughts occurrences in recent years, on the other hand, depict unclear prior preparedness plans. Dependency results in eroded dignity. It reduces its subjects to extreme vulnerability whereby social interactions become strenuous. Family ties are further stressed by the demand to meet the needs of those in positions to earn a living. Drought mitigation initiatives designed to empower communities to step up from receiving relief to working for their upkeep are viewed as the best way to prepare communities for climate change's adverse effects such as drought (Merttens et al., 2017).

Socially, droughts have both social and health effects, including mental health problems for the affected. When households lose all and their only form of livelihood, problems crop up in family structures, and conflict is often witnessed as people become overprotective of whatever is left from drought decimation.

2.6 Summary of Review of Literature and Research Gaps

The reviewed literature has provided insight into the level of available information on the effects of droughts and the varied coping strategies adopted globally. The far-reaching impact of drought nonetheless takes a toll on the relationship between people, their physical environment and social security concerning livelihoods. Furthermore, the effects have an extended impact on other key and enabling resources such as water, energy availability, and food security in fragile arid and semi-arid ecosystems across the world.

Much readily available information is the adaptation and coping strategies employed by the affected communities such as the Turkana when disaster strikes, but less is known about the influence these exact coping mechanisms have on social and

ecological aspects of the lives of people within Kakuma and Oropoi. Hence, creating a literature gap. Thus, this study will therefore provide more insights on how drought coping strategies affect the social ecological wellbeing of the pastoralist's communities within Kakuma and Oropoi.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides an in-depth description of the research design, research site, and the target population. Additionally, it describes the determination of study sample through sampling procedure and study sample size, data collection measures through identifying data instruments, and provides details on conducting of pilot test on research instruments. Furthermore, it will also outline instrument reliability and validity, data processing, and analysis. This chapter also highlights the legal and ethical considerations that will be adhered to in the research.

3.2 Research Design

The study employed the use of a descriptive research design. The suitability of the descriptive research design method lies in its ability to allow the researcher to observe and describe phenomena in their natural existence. A research design guides the research in collecting, analysing, and interpreting observed facts (Kothari, 2014). According to Mugenda (2008), the descriptive research design collects information by interviewing or administering questionnaires to a population to obtain information about people's attitudes, opinions, or habits on social issues. Some reasons have prompted the use of the descriptive research design. The design was selected as it provides the framework for collecting data based on objectives that require a description and data collected using questionnaires. Secondly, the design allowed studying the phenomena within its natural and unchanged environment (Kothari, 2014).

3.3 Research Site

The study was conducted in Turkana West Sub County (Figure 3.1), focusing on Kakuma and Oropoi locations. The research site was selected based on its ability to provide relevant answers to the research questions. Kakuma is host to a refugee camp since 1992 (UNHCR, 2018). Over time, the increase in the refugee population and the local community has increased pressure on natural resources. Consequently, Oropoi, an adjacent location to Kakuma, remains unexploited, and it provided an ideal comparative area of study for the research.

A research site is the selected physical boundaries where the population of the study is obtained (Orodho & Kombo, 2004). The research site details the study's area and the research population in that area. The study area was Turkana West Sub County in Turkana County in Kenya's former Rift Valley Province. The map of the study area is captured in Figure 3.1.

The site was selected based on the significance it has to the study. The region is one of the arid areas of Kenya with few rains that cause drought (Mkutu et al., 2019). Drought coping strategies contribute to the studied variables, hence the site selection justification.

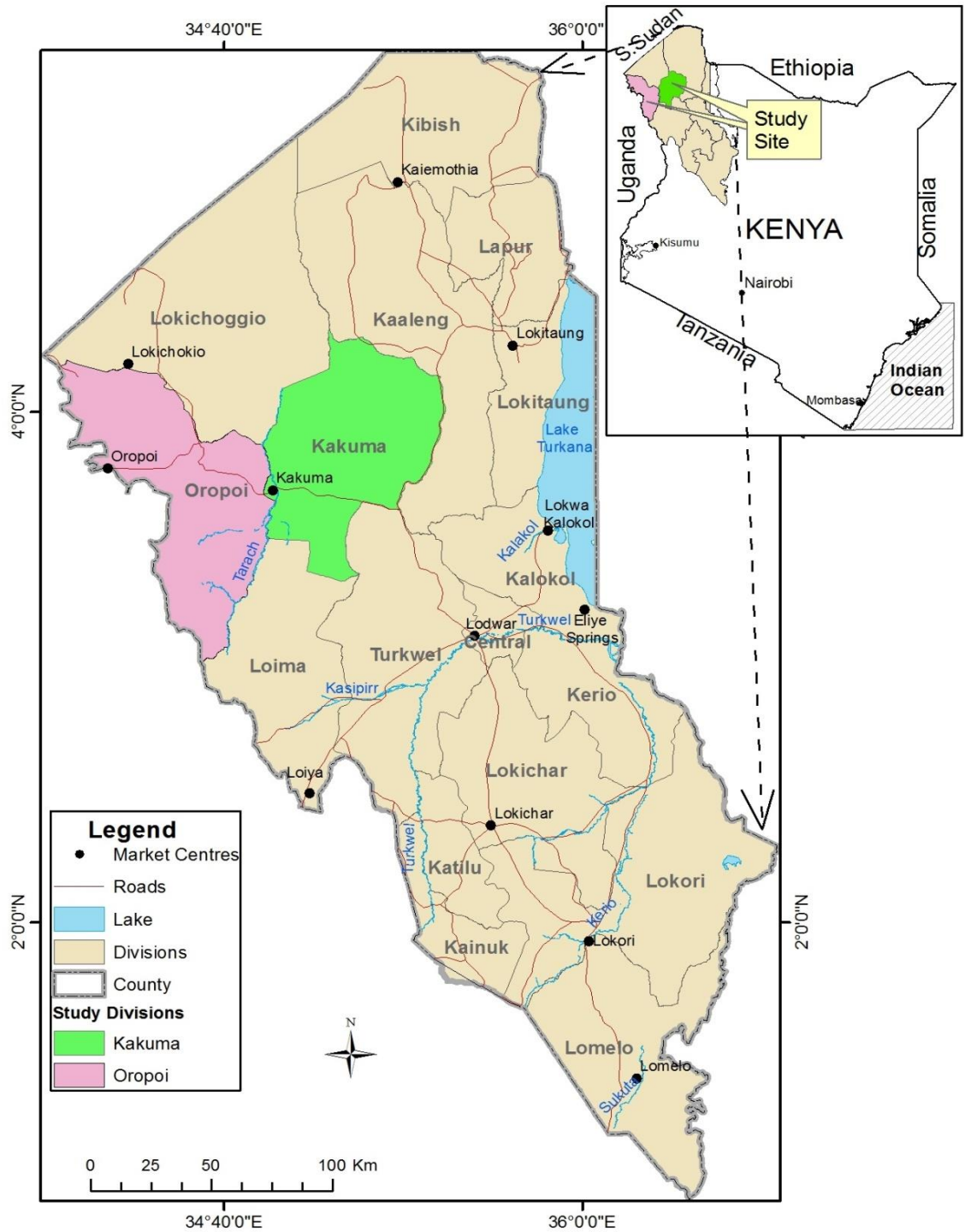


Figure 3.1: Location of Kakuma and Oropoi in Turkana West Sub County

Source: Godfrey Mawaa, 2022

3.4 Target Population

According to Kenya Census 2019, Kakuma had a population of 97,114 (19,444 households), and Oropoi had a population of 18,020 (3,604 households) when the study was being conducted. This gives 115,134 (23,048 households) as the total population targeted by the study. The target population study is provided in Table 3.1.

Table 3. 1: Target Population

Area	Target Population	Percent
Kakuma	97,114	84.3
Oropoi	18,020	15.7
Total	115,134	100

According to Kothari (2014), the population targeted in this study includes events, people, and objects where the results will be generalised. The study would be void if it would not have a target population since there would be no one to give data for research purposes.

The population was selected based on the characteristics that are desirable for the study. Participants were selected if they lived in the study area for more than six months, and this is to ensure those selected knew what was being investigated, as pastoralists hardly stay in one area for extended periods. The study excluded children, patients, and people with mental illnesses not capable of providing views to the study.

3.5 Study Sample

3.5.1 Sampling Procedure

The study used cluster sampling. Specifically, two-stage cluster sampling was used during the survey. The first stage involved the selection of clusters from the sampling

frame (villages from the 2 locations) based on the probability proportional to size (PPS) method. Clusters were selected by random sampling (villages) from which stage 2 sampling was done. Households to be visited were selected by simple random sampling. In Kakuma, 229 households were earmarked for the study, while 44 households were identified in Oropoi. The population in Turkana west was sparsely spread as such other probability sampling methods may cause inconvenience to cover the far and broad elements within the selected locations.

3.5.2 Study Sample Size

The sampling frame covered the targeted 115,134 people in the two locations engaged in small-scale farming and pastoralism (KNBS, 2019). The required sample size was calculated using the Probability Proportional to Population (PPS) formula described by Hansen and Hurwits (1943):

$$n = \frac{N}{1 + N * e^2}$$

Where:

n = The required sample size, given by the following:

N = The population within the study area [115,134]

e = Margin of error [0.0605]

$n = 273$

3.6 Data Collection

3.6.1 Data Collection Instruments

Data for the study was collected using questionnaires. The questionnaire is captured in Appendix A. The questionnaire was divided into two sections. The first section is the background of the respondents, and the second section captures the questions of the study. The questionnaire contained both structured questions with the adoption of

closed-ended questions. Structured questions relied on closed-ended categories pre-selected by the researcher. Structured questions reduce the amount of thinking a respondent needed to complete the task.

A questionnaire is a research tool that gathers data over a large sample (Bryman, 2016). The questionnaire had two sections: the respondents' background and the research questions. Several advantages are associated with the use of questionnaires as a research instrument. A questionnaire allows for much data to be collected within the shortest time. The instrument also ensures that the respondents are anonymous (Kothari, 2004).

3.6.2 Pilot Testing of Research Instruments

Pilot testing is the pre-testing of a component such as a questionnaire (Garg and Kothari, 2014). The researcher carried out a pilot study. Participants in the pilot did not participate in the main study, and the data collected from the pilot was not used in the final study. Pilot study participants were selected from Kakuma town comprising of 10 respondents. Results from the pilot study helped shape the final questionnaire in terms of the questions, content validity, and duration of administration.

3.6.3 Instrument Reliability

The reliability of the instruments was tested using the Cronbach alpha test. Kombo and Tromp (2006) indicate that reliability is based on measured consistency. Hence, a tool's reliability lies in the consistency of its results when the test is done repeatedly. A pilot study was conducted to assess the reliability. The reliability of the study was 0.764. The reliability measures were based on Cronbach's alpha coefficient as captured in Table 3.2.

Table 3. 2: Reliability Measures

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Source: Kombo and Tromp (2006).

3.6.4 Instrument Validity

According to Garg and Kothari (2014), validity determines whether the research instrument truly measures what it is intended to measure or how truthful the research results are. In the context of the study, the researcher used content validity. Content validity is a subjective decision of whether measures of a particular concept will appear to measure what is intended to measure. In this regard, the researcher ensured that the instrument used measures the elements in a relevant and representative manner. Additionally, the instrument was validated by experts from the ANU.

3.6.5 Data Collection Procedure

The researcher informed the local authorities of the study data for the facilitation process should there be a need. The researcher obtained a clearance letter from ANU and NACOSTI. A day was set when the researcher visited the participants and administered the questionnaire. All ethical aspects were adhered to. Assistance was offered in areas that respondents did not understand, such as if they could not read well.

3.7 Data Analysis

Data analysis was done using the Statistical Package for the Social Sciences (SPSS version 26.0). The analysis employed descriptive statistics (frequency distributions, means, median and mode, and standard deviation). Kothari, (2004) defines data analysis as the synthesis and standardised arrangement of data in research. Thus, it involves employing collected data to test a hypothesis in the research. The research area map was developed using geographical information system (GIS) mapping.

3.8 Legal and Ethical Considerations

The privacy and anonymity of the study participants were upheld. This was done by ensuring that they did not give their details in the questionnaires. The researcher sought approval to execute the research from the National Council of Science and Technology (NACOSTI); an introductory letter from ANU was obtained and presented to the participants before data collection. The researcher also obtained consent from the prospective respondents and further sought their cooperation. The acquired information from this research was handled with the highest level of covertness.

Table 3. 3: Statistical Analysis

Objectives	Variables	Methods of Data Analysis
(i) To determine the influence of livelihood diversification on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.	Independent: livelihood diversification Dependent: socioecological well-being	Descriptive statistics, regression analysis
(ii) To evaluate the influence of remittances to the households on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County	Independent: Household remittances Dependent: socioecological well-being	Descriptive statistics, regression analysis
(iii) To determine the influence of credit access on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.	Independent: credit access Dependent: socioecological well-being	Descriptive statistics, regression analysis
(iv) To assess the influence of collective action on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.	Independent: collective action Dependent: socioecological well-being	Descriptive statistics, regression analysis
(v) To investigate the influence of food relief and NGO interventions on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County	Independent: food relief and NGO interventions Dependent: socioecological well-being	Descriptive statistics, regression analysis

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents results and their interpretation of the effects of drought coping strategies on the social-ecological wellbeing of the pastoralists in Turkana West Sub County. The chapter is divided into the following sections: (i) Demographic information, (ii) Livelihood diversity as a drought coping mechanism (iii) Remittances to households as a drought coping mechanism (iv) Credit access as a drought coping mechanism (v) Collective action as a drought coping mechanism (vi) Relief and NGO interventions as a drought coping mechanism (vii) Socio-ecological wellbeing of the households.

4.2 Socio-economic Characteristics of the Respondents

The study targeted participants with varied backgrounds. The key demographic data captured from the participants are gender, age, a formal level of education and the number of years spent within the region. All the targeted sample sizes of 273 respondents answered the survey. This represents a 100% response rate. The maximum completion rate was achieved due to the researcher's involvement in personally leading the distribution of questionnaires and making sustained follow-ups with the research assistants.

4.2.1 Gender

In this study, the household head gender was taken into account and the results are presented in Table 4.1.

Table 4. 1 Sex of the Study Respondents

Sex	Frequency	Percent
Male	173	63.4
Female	100	36.6
Total	273	100

The study shows that majority of the respondents were male compared to females. Majority of the households are headed by male as compared to the female headed households. The Turkana community is largely patriarchal; this explains why very few households are headed by females. Older women, who may have lost their husbands due to old age, raids or other natural factors automatically assume home leadership roles.

Table 4. 2: Chi-square Test for Equality of Categories for the Gender

	Observed N	Expected N	Residual	Statistics
Male	173	136.5	36.5	$\chi^2 = 83.813$
Female	100	136.5	-36.5	df=5
Total	273			p<.001

The chi-square test results from Table 4.2 revealed statistically significant differences among the different categories of gender. This means that the male category has a significantly higher percentage than the female category.

4.2.2 Age Distribution of the Respondents

The respondents provided their ages. This was categorised into six groups as follows. 18-25, 26-33, 34-41, 42-49, 50-57 and above 58 years old and above. The descriptive statistics and frequency distribution of the respondents' age are provided in Table 4.3

Table 4. 3: Age Distribution

Age categories	Frequency	Percent
Below 25	96	35.2
26-33	56	20.9
34-41	27	9.5
42-49	33	12.1
50-57	39	14.3
58 and above	22	8.1
Total	273	100.0

Mean age $35 \pm .88$, median 33, mode 33, std. dev 14.5, minimum 18, maximum 77

Based on the results in Table 4.3, a high percentage of respondents were concentrated in the age group below 25 years. Most household heads fall in this category as most people between the age of 18 to 25 start their families at an early age in the study area. It is likely that the majority of them are natives of Kakuma and Oropoi and would be instrumental in providing relevant information for this study.

Table 4. 4: Chi-square Test for Equality of Categories for the Age Groups

Age group	Observed N	Expected N	Residual	Statistics
Below 25	96	45.5	50.5	$\chi^2 = 83.813$ df=5 p<.001
26 to 33	57	45.5	11.5	
34 to 41	26	45.5	-19.5	
42 to 49	33	45.5	-12.5	
50 to 57	39	45.5	-6.5	
58 and above	22	45.5	-23.5	
Total	273			

As indicated in Table 4.4, the chi-square test revealed statistically significant differences among the different categories of age. The category of age below 25 years was significantly higher than the other categories, indicating that most of the household heads range from the age of 25 years and below.

4.2.3 Level of Formal Education

The study sought to find out the level of education of the study participants. Findings have been presented in Table 4.5.

Table 4. 5: Percentage of Respondents by Level of Formal Education

Level of Education	Frequency	Percent
No formal education	71	26.0
Primary	44	16.1
Secondary	91	33.3
College	58	21.2
University	9	3.3
Total	273	100

Results from Table 4.5 revealed that most respondents have a secondary formal education level, followed by no formal education level, college, primary and University. Most respondents are educated given the availability of academic institutions in the area and the rapid growth of the two localities over the last 30 years. This is key as they are most likely aware of the changes in the socio-ecological dynamics in the study area.

Table 4. 6: Chi-square Test for Equality of Categories for the Education Levels

	Observed N	Expected N	Residual	Statistics
None	71	54.6	16.4	$\chi^2 = 69.546$ df=4 p<.001
Primary	44	54.6	-10.6	
Secondary	91	54.6	36.4	
College	58	54.6	3.4	
University	9	54.6	-45.6	
Total	273			

The results from Table 4.6 showed that based on the chi-square test, there is a significant difference among categories of formal education attained by respondents.

4.2.4 Years Lived in the Study Area

The respondents stated the years they have lived in Kakuma or Oropoi Locations. The study used a rating scale of 1 to 3, where 1 was 6 months -1 year, 2 was 1-2 years, and 3 was over 2 years. The study findings are presented in Table 4.4.

Table 4. 7: Years Lived in Kakuma or Oropoi Locations

Years Lived	Frequency	Percent
0-1 year	58	21.3
1 -2 years	52	19.1
2 -3 years	64	23.4
3 years and over	99	36.3
Total	273	100

Mean $3 \pm .147$, median 2, mode 1, std. dev 2.4, minimum 0.5, maximum 11

Results from Table 4.7 revealed that most of the respondents lived in the study area for 3 years and above. Approximately 80% of the respondents lived in the study area for 1 year and over. This means that they are in advantageous position to give a reliable account on the relationship between their coping mechanisms to drought and their socioecological well-being.

4.2.5 Size of Household

The study participants were asked to indicate the size of their households. The findings of the study are presented in Table 4.8.

Table 4. 8: Distribution of Respondents by Household Size

Size	Frequency	Percent
1-4 people	67	24.5
5-10 people	122	44.7
Over 10 people	84	30.8
Total	273	100

Mean $8 \pm .249$ median 7, mode 7, std. dev 4.11, minimum 1, maximum 18

The study findings indicate that majority of respondents live in households with 5 to 10 people. This implies that households with higher number of people would need more resources for survival in an environment where opportunities are limited, and other external factors are causing stress on the socioecological well-being.

4.2.6 Size of Land Owned

The study sought to determine the size of the land the respondents owned. The size of the land owned by the study participants was in terms of ha. Findings are presented in Table 4.9 below.

Table 4. 9: Percentage of Respondents by their Land Size

Land size groups	Frequency	Percent
None	41	15.0
1-3 Ha	93	34.1
4-8 Ha	52	19.0
4-8 Ha	87	31.9
Total	273	100

Mean $13.9 \pm .946$ median 7, mode 3, std. dev 14.4, minimum 1, maximum 49

Results from Table 4.6 show that the land size for most of the respondents is from 1 to 3 hectares. The land administration in the entire Turkana County falls under the Community Land Act, protecting community range lands and natural resources. The

land sizes provided in this study describe the occupied areas where villages have allotment letters and are ancestral lands for the majority.

4.3 Socio-Ecological Wellbeing

In this study, the dependent variable was the socio-ecological well-being of households in Kakuma and Oropoi locations in Kenya. This variable was quantified as an index that was found by making an average of its four dimensions namely material well-being, relational well-being, subjective well-being, and ecological resilience. Each dimension consisted of statements that the household heads rated on a 6-point scale as follows: 1-None, 2-Very Low, 3-Low, 4-Medium, 5-high, 6-Very high

The material well-being was computed based on the material most owned in the study area. The study area is in the pastoral region, the material well-being index was computed based on the level of benefit of livestock units owned by the household in the past 6 years from 2015 to 2021. Based on the change in livestock units of the household from 2015 to 2021, each household was classified as referred to the benefits levels ranging from 0 (none) to 5(Very high).

The relational well-being was computed by making an average of values of levels of benefit and cost for seven measurements such as collaboration in decision making, community relations, collective actions (groups), enforcements, sustainable markets, learning/training, and state institutions. The subjective well-being was computed by making an average of values of levels of benefit and cost (0 to 5 levels) for three measurements such as place identity, equity, and adaptability.

The ecological resilience was calculated by averaging the values of levels of benefits and cost (0 to 5 levels) of three measurements namely natural capital, disturbances, and scale. Table 4.10 shows descriptive statistics for those four major dimensions of socio-ecological well-being.

Table 4. 10: Descriptive Statistics for the Indicators Used to Compute the Socioecological Well-being Index

Dimension	Mean	Median	Mode	Standard	
				Deviation	Range
Material Well-being	4.2	5	5	1.2	5
Relational Well-being	2.4	2	2.3	0.3	2.0
Subjective Well-being	2.3	2	2.3	0.4	2
Ecological resilience	2.6	3	2.7	0.3	2
Socio-ecological Well-being	2.9	3	3.2	0.3	1

The results from Table 4.10 revealed that the Material wellbeing index for households living in the study area is high. While for other dimensions such as relational, subjective, and ecological dimensions it is medium. In general, the Socio-ecological wellbeing index of households was found to be medium.

The socio-ecological wellbeing index was then categorized into 4 groups, as follows: 1-2 low, 2.01-3 Medium, 3.01-4 high, and 4.01-5 very high. The descriptive statistics and the frequency distribution for the subjective wellbeing index categories are shown in Table 4.11.

Table 4. 11: Socio-ecological Wellbeing Index Distribution for the Respondents

Groups	Frequency	Percent
1 to 2	4	1.47
2 to 3	148	54.21
3 to 4	121	44.32
Total	273	100

The chi-square test for the equity of categories for the Socio-ecological wellbeing index groups was presented in Table 4.12.

Table 4. 12: Chi-square Test for Equality of Categories for the Socio-ecological Wellbeing Index Groups

	Observed N	Expected N	Residual	Statistics
1 to 2	4	91.0	-7.0	$\chi^2 = 128.769$
2 to 3	148	91.0	57.0	df=2
3 to 4	121	91.0	30.0	p<.001
Total	273			

The chi-square test revealed that there are statistically significant differences among the different categories of respondents' socio-ecological wellbeing indexes. Category 2 to 3 was significantly higher than the other categories, indicating that most of the households had a medium level of socio-ecological wellbeing index.

4.4 Livelihood Diversity of the Households

In this study, respondents were asked to indicate and rank the livelihood diversities used as part of drought coping mechanisms in Kakuma and Oropoi in terms of importance using a rating scale of 1 to 4 (none, low, medium, and high importance). The mean scores for each livelihood are shown in Table 4.13.

Table 4. 13: Livelihood Diversity Index

Livelihoods	Mean	Median	Mode	Std. Dev.	Minimum	Maximum
Livestock	3.9	4	5	1.3	1	4
Business	3.6	4	5	1.6	1	4
Crop farming	3.2	3	3	1.1	1	4
Informal employment	2.1	2	1	1.2	1	4
Mean Livelihood diversification	3.2	3	3	0.7	2	5

Based on results from Table 4.13, it has been revealed that livestock is scored higher as a first activity practised as part of the drought coping mechanism. The results also show that livestock livelihood adoption is higher compared with other livelihoods, followed by business, crop farming and in the end informal employment.

4.4.1 Influence of Livelihood Diversification on Socioecological Well being

To analyse the influence of the number of livelihoods undertaken by a household on the socio-ecological wellbeing was of great importance. Table 4.14 shows the results of such a relationship.

Table 4. 14: Regression Model Summary for livelihoods diversification and the Socioecological Wellbeing Index

R	R Square	Adjusted R Square	Std. Error of the Estimate
.051 ^a	.003	-.001	.327

The R square value found means that the independent variable livelihood diversities explained about 0.3 % of the variation in the dependent variable socio-ecological Wellbeing Index. F test for the regression model is shown in the ANOVA Table 4.15.

Table 4. 15: ANOVA Table for the Regression Testing the Fit of the Model

	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>p</i>
Regression	.076	1	.076	.716	.398 ^b
Residual	28.934	271	.107		
Total	29.010	272			

Independent variable:

Dependent Variable: Socio Ecological Well Being

The overall regression model was found non-significant ($F(1, 272) = 0.716, p > .05$).

The regression coefficients of the model showing the beta, t statistics, and collinearity statistics are shown in Table 4.16.

Table 4. 16: Regression Coefficients for the Number of Livelihood Practices

	Unstandardized Coefficients		Standardized Coefficients		<i>t</i>	<i>p</i>	Collinearity Statistics
	B	Std. Error	Beta				
(Constant)	2.949	.099			29.809	.001	
Number of livelihoods	-.025	.029	-.051		-.846	.398	1.000

a. Dependent Variable: Socio Ecological Well Being

The regression analysis shows that the number of livelihoods has a non-significant effect on the socio-ecological wellbeing index in Kakuma and Oropoi locations ($\beta = -.051, t(272) = -.846, p > 0.05$).

4.5 Influence of Remittances to the Households on Socioecological Wellbeing

The second objective of the study was to evaluate the influence of remittances to the households on the socio-ecological wellbeing of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County. The remittances considered in

the study included all financial support and incentives received by the households via their relatives monthly/regular support, households with family members registered in the cash programs such as National Safety Net program (HSNP).

4.5.1 Remittances to the Households

Respondents were asked to indicate the level of agreement on the importance of remittances used as drought coping mechanisms in Kakuma or Oropoi. The variable was operationalized as an index comprising four statements. Respondents were required to indicate their level of agreement with the statements using a rating scale of 0 to 5, where 0 is none and 1 corresponded to a strong disagreement with the statement while 5 was a strong agreement. The descriptive statistics for the four remittances statements are shown in Table 4.17.

Table 4.17: Descriptive Statistics for the Variable to Households

Statements	Mean	Median	Std. Dev.
Remittances have increased the financial security of households during the drought season	3.4	3	1.4
Remittances have increased the financial security of households during the drought season	3.3	4	1.1
Remittances have ensured that we can buy food during the drought season	3.8	4	1.4
Remittances have allowed households to replace livestock that has been killed by drought	3.3	3	1.0
Mean Remittances Score	3.4	4	0.6

From Table 4.17, the mean score for remittances to households as a drought coping mechanism is 3.4. This indicates most of the respondents felt that there is a moderate use of remittances by households as a drought coping mechanism. The statement that

Remittances have ensured that people were able to buy food during drought season was scored higher compared to other statements.

4.5.2 Influence of Remittances on the Household

The study was done to test if there is an influence of remittances, as a coping mechanism, on socio-ecological wellbeing. Table 4.18 shows the results of such influence.

Table 4. 18: Regression Model Summary for Remittances and the Socioecological Wellbeing Index

R	R Square	Adjusted R Square	Std. Error of the Estimate
.100 ^a	.010	.006	.326

a. Predictors: (Constant), Mean Remittances

The results from Table 4.18 showed that the remittances explained about 1.0% of the variation in socioecological wellbeing. The results from ANOVA Table are presented in Table 4.19.

Table 4. 19: ANOVA Table for the Regression Testing the Fit of the Model

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.291	1	.291	2.750	.098 ^b
Residual	28.719	271	.106		
Total	29.010	272			

a. Dependent Variable: Socio Ecological Well Being

b. Predictors: (Constant), remittances

The results from Table 4.19 revealed that the influence of remittances on socioecological wellbeing is non-significant ($F(1, 272) = 2.750, p > .05$). The

regression coefficients of the model showing the beta, t statistics, and collinearity statistics are shown in Table 4.20.

Table 4. 20: Regression Coefficients for the Remittances

	Unstandardized		Standardized		Collinearity	
	Coefficients		Coefficients	<i>t</i>	<i>p</i>	Statistics
	Std.					
	B	Error	Beta			Tolerance
(Constant)	2.684	.112		24.003	.001	
Remittances	.053	.032	.100	1.658	.098	1.000

a. Dependent Variable: Socio Ecological Well Being

The regression analysis shows that the remittances do not have a significant influence on socioecological wellbeing ($\beta = .100$, $t = 1.658$, $p > .05$).

4.6 Influence of Credit Access to the Households on Socioecological Wellbeing

The third objective of this study was to determine the influence of credit access on the socio-ecological wellbeing of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.

4.6.1 Credit Access to Households

In this study, respondents were asked to provide their perceptions on the agreement of the four statements regarding credit access as a coping mechanism for the drought. Using the rank scales from 0 to 5 they were asked to choose the best option for each statement. Then the access to the credit index was measured by making an average of the four statements values. Table 4.21 highlights descriptive statistics for those four statements.

Table 4. 21: Descriptive Statistics for Agreements on Credit Access Statements

Statements	Mean	Std. Dev.
We can access credit without collateral during a drought	3.12	1.417
We access credit easily during drought	3.17	1.154
There is financial help in the form of credit from the government during a drought	2.78	1.274
Access to credit enables us to return to normal life during and after drought	2.12	1.165
Mean Credit access	2.80	.634

Table 4.21 showed that most respondents agreed that during the drought period access to credit was medium and helped them to return to normal life. Table 4.22 shows the results of the regression for credit access to socio-ecological wellbeing.

4.6.2 Influence of Credit Access on the Households

The study was also done to test if there is an influence of credit access, as a coping mechanism, on socio-ecological wellbeing. Table 4.18 shows the results of such influence.

Table 4. 22: Regression Model Summary for Credit Access and the Socioecological Wellbeing Index

R	R Square	Adjusted R Square	Std. Error of the Estimate
.151 ^a	.023	.019	.323

a. Predictors: (Constant), Mean Credit access

From Table 4.22, results showed that the Access to credit variable explained about 2.3 % of the variation in the Socioecological Wellbeing Index. Table 4.23 highlights the results for the analysis of variance for testing if the model best fit.

Table 4. 23: ANOVA Table for the Regression Testing the Fit of the Model

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.664	1	.664	6.345	.012 ^b
Residual	28.346	271	.105		
Total	29.010	272			

a. Dependent Variable: Socio Ecological Well Being

b. Predictors: (Constant), Mean Credit access

Table 4.23 revealed that the influence of credit access on socio-ecological wellbeing is statistically significant ($F(1, 272) = 6.345, p=.012$). Table 4.24 shows the results of regression coefficients.

Table 4. 24: Regression Coefficients for the Credit Access as a Coping Strategy for the Drought

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	t	p	Tolerance
(Constant)	2.649	.089		29.861	.001	
Credit Access	.078	.031	.151	2.519	.012	1.000

Based on results from Table 4.24, the credit access has a positive significant influence on socio-ecological wellbeing ($\beta = .151, t = 2.519, p < .05$).

4.7 Influence of Collective Action on Socioecological Wellbeing

The fourth objective of this study was to assess the influence of collective action on the socio-ecological wellbeing of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.

4.7.1 Collective Action by the Households

To analyse the collective action, respondents were requested to indicate the role of collective action as a drought coping mechanism in Kakuma or Oropoi Locations. The variable was operationalized as an index comprising four statements. Respondents were required to indicate their level of agreement with the statements using a rating scale of 1 to 5. Where 1 corresponded to a strong disagreement with the statement and 5 to a firm agreement. The descriptive statistics for the four statements are shown in Table 4.25.

Table 4.25: Descriptive Statistics for Agreements on Collective Action Statements

Collective actions	Mean	Std. Dev
Collective action is being used to ensure that there is effective water conservation during the drought	3.4	1.4
The national and county governments are part of the collective action after the drought	3.5	1.3
The community collectively comes up with local drought coping strategies during drought	2.8	1.5
There is a positive reception of the collective actions by the community during the drought	3.1	1.4
Mean Collective action	2.7	0.5

Table 4.25 revealed that most people agreed that the collective action was benefited moderately to ensure the management of drought.

4.7.2 Influence of Collective Action on Socioecological Wellbeing

One of the objectives of the study was also to test if there is an influence of collective action, as a coping mechanism, on socio-ecological wellbeing. Table 4.26 shows the results of such influence.

Table 4. 26: Regression Model Summary for Collective Action and the Socioecological Wellbeing Index

R	R Square	Adjusted R Square	Std. Error of the Estimate
.160 ^a	.026	.022	.323

a. Predictors: (Constant), Collective action

Looking at Table 4.26, results showed that the variation in socio-ecological wellbeing was explained by the collective action variable by 2.6 %. Table 4.27 highlights the results for the analysis of variance for testing if the model best fit.

Table 4. 27: ANOVA Table for the Regression Testing the Fit of the Model

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.742	1	.742	7.113	.008 ^b
Residual	28.268	271	.104		
Total	29.010	272			

a. Dependent Variable: Socio Ecological Well Being

b. Predictors: (Constant), Collective action

Table 4.27 showed that the influence of collective action on socio-ecological wellbeing is statistically significant ($F(1, 272) = 7.113, p < .05$). Table 4.28 shows the results of regression coefficients.

Table 4. 28: Regression Coefficients for the Collective Action as Coping Strategy to The Drought

	Unstandardized		Standardized		Collinearity	
	Coefficients		Coefficients		Statistics	
	B	Std. Error	Beta	<i>t</i>	<i>Sig.</i>	Tolerance
(Constant)	2.572	.112		22.944	.000	
Collective action	.109	.041	.160	2.667	.008	1.000

a. Dependent Variable: Socio Ecological Well Being

Results from Table 4.28 revealed that collective action has a positive significant influence on socio-ecological wellbeing ($\beta = .160$, $t = 2.667$, $p = 0.008$).

4.8 Influence of Relief and NGO Interventions on Socioecological Wellbeing

The fifth objective of the study was to investigate the influence of food relief and NGO interventions on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.

4.8.1 Relief and NGO/government Interventions

The respondents provided a picture of the role of relief and NGO/government interventions as a drought coping mechanism in Kakuma or Oropoi Locations. The variable was operationalized as an index comprising four statements. Respondents were required to indicate their level of agreement with the statements using a rating scale of 1 to 5. Where 1 corresponded to a firm disagreement with the statement and 5 to a firm agreement. The descriptive statistics for agreements on NGO/government interventions statements are shown in Table 4.30.

Table 4.29: Descriptive Statistics For Agreements On Relief And NGO/government Interventions Statements

	Mean	Std. Dev
We often get relief food during drought season	3.9	1.2
We often get relief medicine during drought season	3.6	1.1
We often get drought-resistant plants to farm, during drought	4.0	1.2
Local and international NGOs often offer help during drought	3.6	1.1
Extent of NGO/government Interventions score	2.4	0.5

Table 4.30 revealed that the provision of relief and NGO interventions were low.

4.8.2 Influence of Relief and NGO/government Interventions

Relief and NGO/governments Interventions were analysed to determine whether there was an influence relating to humanitarian relief interventions on socio-ecological wellbeing. Table 4.31 shows the results of such influence.

Table 4. 30: Regression Model Summary for Relief and NGO/government Interventions and the Socioecological Wellbeing Index

R	R Square	Adjusted R Square	Std. Error of the Estimate
.722 ^a	.522	.520	.226

a. Predictors: (Constant), NGO/government Interventions

The results from Table 4.31 showed that the relief and NGO intervention variable explained about 52.2 % of the variation in the socio-ecological wellbeing variable. Table 4.32 highlights the results for the analysis of variance for testing if the model best fit.

Table 4. 31: ANOVA Table for the Regression Testing the Fit of the Model

	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>Sig.</i>
Regression	15.137	1	15.137	295.671	.000 ^b
Residual	13.874	271	.051		
Total	29.010	272			

a. Dependent Variable: Socio Ecological Well Being

b. Predictors: (Constant), NGO/government Interventions

Table 4.32 showed that the influence of the relief and NGO interventions on socio-ecological wellbeing is statistically significant ($F(1, 272) = 295.671, p=0.001$). Table 4.33 shows the results of regression coefficients.

Table 4. 32: Regression Coefficients for the Relief and NGO/government Interventions

	Unstandardized		Standardized		Collinearity	
	Coefficients		Coefficients		Statistics	
	B	Std. Error	Beta	<i>t</i>	<i>Sig.</i>	Tolerance
(Constant)	1.693	.070		24.323	.000	
NGO/government Interventions	.481	.028	.722	17.195	.000	1.000

a. Dependent Variable: Socio Ecological Well Being

Results from Table 4.33 revealed that the relief and NGO interventions have a positive significant influence on socio-ecological wellbeing ($\beta = .722, t = 17.195, p = 0.001$).

4.9 Comparative Analysis on Socio Ecological Well Being of Kakuma and Oropoi

The comparative analysis on the socio-ecological well-being of the respondents in Kakuma and Oropoi was critical to provide similarities and differences on how the drought coping mechanisms adopted affected their socio-ecological well-being,

respectively. The four socio-ecological indicators were analysed to provide the distinction. Table 4.34 shows the results of the t-test analysis of the two groups.

Table 4. 34: Mean Comparison Between Social ecological well-being of Kakuma and Oropoi

	Levene's Test		t-test for Equality of Means			
	<i>F</i>	<i>p</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>Mean Difference</i>
Equal variances assumed	29.046	.000	2.701	271	.007	.123
Equal variances not assumed			2.552	186.533	.012	.123

The average social ecological well-being of Oropoi pastoralists ($M = 480$, $SD = 34.5$) compared to the one of Kakuma pastoralists ($M=2.76$, $SD=.428$) demonstrated significantly differences, ($t(273) = 2.7$, $p = .007$).

This may be explained by the fact that Kakuma hosts one of the largest refugee camps in Kenya, where most of the natural resources have been stretched thin whereas in Oropoi, little disruptions in relation to their natural environment was observed

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the research findings, summary, conclusions, recommendations, and areas of further research.

5.2 Summary of Findings

This research aimed to assess the influence of drought coping strategies on the socio-ecological wellbeing of the Turkana people in Turkana West Sub-county. This was achieved by focussing on four main objectives, designed to provide answers to how the existing drought coping strategies practised in Kakuma and Oropoi locations influenced the respondents' socio-ecological wellbeing. These study objectives were: to determine the influence of livelihood diversification on the socio-ecological well-being of the households, to evaluate the influence of remittances to the households on their socio-ecological well-being, to determine the influence of credit access on the socio-ecological well-being of the households, to assess the influence of collective action on the socio-ecological well-being of the households and to investigate the influence of food relief and NGO interventions on the socio-ecological well-being of the households in Kakuma and Oropoi locations in Turkana West sub-county, Turkana County.

To attain these objectives, carefully designed structured questionnaires were used to collect primary data from the households in the study area. The questionnaire was subdivided into three key sections: demographic information, social-ecological wellbeing of the households comprising four dimensions (material wellbeing, relational wellbeing, subjective wellbeing, and ecological resilience) and the drought coping strategies comprising five key practices (livelihood diversification, remittances to the

households, credit access, collective action, and relief & NGO/government interventions.

The results depict that livelihood diversification and remittances to the households did not have a significant influence on the socio-ecological wellbeing of the households. Moreover, credit access to the households, collective action by the households and relief & NGO/government interventions as coping mechanisms showed to have a significant and positive influence on the socio-ecological wellbeing of the households in the study area.

5.3 Discussions

This section provides detailed discussions on the results of the study concerning the stated objectives in section 1.5 of this thesis.

5.3.1 Influence of Livelihood Diversification on Socioecological Wellbeing of the Households in Kakuma and Oropoi

The study sought to determine the influence of livelihood diversification on the socio-ecological well-being of the households. Livelihood diversities used as drought coping mechanisms revealed the perceived level of importance each of the livelihoods practised had on the households. The study findings revealed that livelihood diversification was moderately practised, with livestock keeping and business activities the most adopted means of livelihood by most of the households.

However, the number of livelihoods diversification practised in the study area overall was found not to have a significant influence on the socio-ecological wellbeing of the households. The study's findings agree with the findings of McCabe et al., (2010), which noted that some of the households adopted livestock and small businesses based

on the choices they had as part of their alternative livelihood. For instance, some adopted the use of small businesses do not face the risks associated with droughts, and thus the diversification.

This study's findings concur with the findings of Eze (2018), who indicated that with drought, there was the need to ensure the adoption of various coping methods based on the diversification of the people's livelihoods. To build better resilience in the pastoral communities, strengthening livestock production by the introduction of modern livestock keeping practices, veterinary services and availability of markets will be critical. This will enhance livestock keeping not only as the main livelihood of the pastoral communities but also give them the opportunity to use earnings to diversify into practicing other complementary livelihoods.

5.3.2 Influence of Remittances to Households on the Socioecological Wellbeing of the Households in Kakuma and Oropoi

Most of the households in Kakuma and Oropoi were found to moderately benefit from the remittances to their households as part of the drought coping mechanisms. More importantly, this was underscored by the higher acceptance by a majority of the respondents that, this strategy ensured that households could purchase food during the drought seasons. Furthermore, the study found that the moderate use of remittances by households during drought somehow increased their financial security, cushioning them from severe drought effects.

Remittances to the households moderately facilitated the destocking and restocking of livestock which helped the households to bounce back quickly when faced with the adverse effects of droughts.

The study's findings agree with a study conducted by Savage and Harvey (2007). The study noted that remittances could play an essential part in how people survive and recover from disasters. However, humanitarian actors often fail to consider remittances in assessments and responsive design. This neglect of remittances in humanitarian planning reflects a broader tendency to undervalue the capacities of crisis-affected populations: affected people are frequently portrayed as helpless and vulnerable when people's efforts are often crucial to their survival.

Furthermore, the study concurs with the findings of Sodokin and Nyatefe (2021), who found out that migrant remittances are not only necessary to support the most vulnerable households in their daily lives. Migrant remittances also constitute a response mechanism to disasters. The migrant remittances also improved access to food across seasons; acquisition of new knowledge, skills, and resources, creating, extending, and consolidating of social networks across regions; or providing a safety net in times of extreme weather events. Therefore, remittances receiving households perceive climate impact, vulnerability, and resilience differently. However, the relationship between remittances and household vulnerability and resilience to climate impacts remains unclear and limited.

Regarding this study, the remittances to the households were found to be non-significant to the socio-ecological wellbeing of the households in Kakuma and Oropoi locations.

5.3.3 Influence of Credit Access on the Socioecological Wellbeing of the Households in Kakuma and Oropoi

The study revealed that most of the respondents agreed that access to credit facilities during the drought seasons was at a medium level, allowing them to live normally. The influence of credit access on the households in the study area was revealed to be statistically significant and have a positive influence on the socio-ecological wellbeing of the households.

The study's findings agree with Twongyirwe et al. (2019) findings that showed that most of the people in similar conditions perceive food insecurity as a problem in their households. To counter that, access to credit helped in increasing their confidence in addressing food insecurity by availing them options to increase their food production efforts. People are more likely to use credit facilities to improve their food security situation and this acts a buffer against food insecurity.

Ndlovu (2019) noted that accessing credit lines from financial institutions was encouraged as it deferred the adverse results of drought. Most households in communal areas considered borrowing as a last resort. Due to the absence of collateral in communal farming areas and short loan repayment periods, the fear contributed to the few borrowers. The challenge with the credit facilities and accessibility was that of the limited number of applicants considered against those in dire need of financial support to sustain drought mitigation costs.

5.3.4 Influence of Collective Action on the Socioecological Wellbeing

The role of collective action on the socio-ecological wellbeing of the communities cannot be underplayed. In the study area, most people agreed that collective action was moderately benefiting them in drought management. This is critical in the conservation

of water resources for use during dry seasons, especially with both national and county governments playing a role in ensuring communities practice collective action for drought resilience. The study found that the influence of collective action on socioecological wellbeing was statistically significant and had a positive influence.

The study's findings agree with a study done by Tortajada et al. (2017) that noted that effective responses require collective actions determined by the modes of governance to fight drought. Polycentric systems are considered adequate to build resilience and foster adaptive capacity. They include more efficient responses to abrupt or incremental change because of the diversity of partners, more active participation processes, more open decision-making, and inclusion of a plurality of views, knowledge, and experience as they provide an increased range of options.

Jiri and Mafongoya (2018), in their study noted that communal pooling as part of collective action refers to adaptation responses involving joint ownership of assets and resources; sharing of wealth, labour, or incomes from activities across households; and mobilization and use of resources that are held collectively during times of scarcity. It pools risks across households. This practice is most effective when the benefits from assets owned by different households and the livelihood benefit streams are uncorrelated.

5.3.5 Influence of Relief and NGO Interventions on the Socioecological Wellbeing of Households in Kakuma and Oropoi

The study revealed that relief and NGO interventions were generally low in coverage, this is attributed to the large surface area of the locations in the study area which makes it hard for the humanitarian actors to cover. Moreover, most of the households indicated receiving aid in the form of food distribution, medicinal supplies during the drought

season, drought-resistant seeds, and other agricultural implements during drought. In finding the influence of relief and NGO/government interventions on the socio-ecological wellbeing of the households, it was found that there was statistically significant. The outcomes of the study also determined that relief and NGO/government interventions had a positive influence on the socio-ecological wellbeing of the households in Kakuma and Oropoi locations.

Some of the interventions established in the study have also been captured by Kamara et al., (2019). They noted that disaster relief interventions, mainly in food aid and fodder, have reduced food deficits and supported livestock survival. Such interventions are essential in addressing communities' immediate needs, but they are costly. Besides, these interventions are reactive and aim only to support affected communities to cope with the disaster and return to their pre-disaster conditions, without enabling adaptability or considering lessons learned from previous experience.

Akwango et al., (2017) have also noted that despite the role played by the relief food during natural disasters like drought, one would have expected a considerable change as of today following several interventions aimed at security food security. However, Akwango et al., (2017) study has shown that several of these interventions have not led to food security in the region as most of the households continue to whirl in food deficits.

5.3 Conclusions

The following conclusions are derived from the study:

- (a) Livelihood diversity as a drought coping mechanism is moderately used and has no significant impact on the socio-economic wellbeing of the households within

Kakuma or Oropoi locations. Some of the livelihood diversities adopted moderately include business and livestock rearing. It is important to wean the communities entirely dependent on one livelihood such as livestock to adopt other practical and non-climate dependent livelihoods such as small-scale trading.

- (b) Remittances to households as a drought coping mechanism are used moderately by people in Kakuma or Oropoi. Despite the moderate use, remittances were not significant and did not positively influence the socio-ecological wellbeing of the households. However, some of the useful contributions made by remittances include increasing the financial security of households during drought season, remittances have allowed families to purchase farm inputs for agriculture, remittances have ensured that people can buy food during drought season, and remittances have allowed households to replace livestock that has been killed by drought. Remittances are not dependable to support households with diverse needs, it is advisable to seek alternative poverty alleviation measures that are more geared towards sustainability and independence of the populations.
- (c) Credit access as a drought coping mechanism is a strategy used moderately when coping with drought and its effects within Kakuma or Oropoi. The moderate use is significant and has a positive impact on the socio-economic wellbeing of the households. However, there are challenges faced, such as ease of access to unsecured loans basis during drought and modest financial help in the form of credit from the government during drought. Financial education is key if credit access was to be a viable means to consistently cushion the most

vulnerable from the aftershocks of drought. It is important to impart knowledge in relation to financial aid provided.

- (d) Collective action as a drought coping mechanism is applied moderately. It is significant and has a positive influence on the socio-ecological wellbeing of the households within Kakuma or Oropoi. Further improvements in collective action to ensure that there is effective water conservation during drought and that the county and national governments are actively participating in developing resilience strategies are critical to strengthening this coping mechanism and increasing its influence on the socio-ecological wellbeing of the households in Kakuma and Oropoi.
- (e) Relief and NGO interventions as a drought coping mechanism have significant influence and a positive contribution to the socio-economic wellbeing of the households within Kakuma or Oropoi. Food relief creates over reliance and can cause more harm than good in communities. It is therefore important to promote self-sufficiency where communities can work for payments.

5.4 Recommendations

The study has made the following recommendations based on the findings.

- (a) Credit access should be made easier for the people of Kakuma or Oropoi locations. Strengthening the relationship between the pastoralists and the lenders will be critical for the business environment, where even households without collateral can access loan facilities to improve their livelihoods. The most significant assets held by the members of this community are animals that are adversely affected by the drought. The national and county government should ensure that credit and financial help is readily available to drought victims in Kakuma or Oropoi.

- (b) There should be more livelihood diversity that people of Kakuma or Oropoi are engaged in. Looking for informal employment, and the use of drought-resistant crops should not be the only option. The communities should be encouraged to embrace education as it creates unlimited opportunities, such as developing effective measures and technologies to curb the effects of drought.
- (c) The national government and other stakeholders such as religious factions, and the county government should ensure an active community collective action during drought. This is key in making sure that the whole community is rallied towards a common goal and thus making it easier to mitigate the effects of the drought, such as encouraging the entire community to ensure that they adopt drought-resistant crops on their farms.

5.5 Areas for further study

This study recommends the following area of further research:

- (i) Factors that affect the implementation of collective action in Kakuma or Oropoi to mitigate the effects of drought.
- (ii) Challenges faced by relief and NGO interventions in Kakuma or Oropoi as drought coping mechanisms.

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APPENDICES

Appendix A: Questionnaire

Thank you for taking part in this study. The aim of this research is to **assess the effects of drought coping strategies on the social-ecological wellbeing of the Turkana people in Turkana West Sub County.**

Please be as honest as possible.

Your response will only be used for academic purposes only and not for any other use.

The responses will be treated with utmost confidentiality.

Section I: Demographic Information

1. What is your gender

Male Female

2. What is your age?

_____ - years

3. What is your level of education?

None Primary

Secondary College

University

4. How long have you lived here? Number of years _____

5. Size of your household _____ -

6. Size of land owned _____ - or communal land _____

7. Land ownership

SECTION II: Social Ecological Wellbeing of the Households (SEWB)

To (1) identify value-based statements about the future that would be critical to attain the best possible state of well-being in the future, e.g., “more pasture/grazing”; (2) categorize each statement into one of the four dimensions of SEWB; and (3) rank the importance of each statement by pastoralists using 4-point scale.

First dimension: Material Wellbeing

What do the households have in terms of material wealth (income, assets, food, shelter, access to resources)?

1. Provide the numbers of the different type of animals owned by the household

Type of Animal	Numbers 2021	Numbers 2015	Numbers 2010	Numbers Increased / decreased	Reason for change in numbers
Cattle					
Sheep					
Goats					
Camels					
Donkeys					
Poultry					

2. Provide production figures for the different crops grown by the household

Type of crop	Production in kg				Reason for change in Amount
	Amount 2021	Amount 2015	Amount 2010	Amount Increased / decreased	
Maize					
Wheat					
Sorghum					
Tomatoes					
Onions					
French beans					
Sorghum					
Beans					

3. Source and amount of farm and non-farm income generated by the household

Sources of income	Amount 2021	Amount 2020	Amount 2019	amounts Increased / decreased	Reason for change in numbers
Animal sales					
Crop sales					
Business					
Remittances					
Poultry					

4. Assets owned by the household

Assets owned	Yes /No	Number	Condition
Land size (ha)			
Radio			
TV			
Solar panel			
Vehicle			
House			
Toilet			
Generator			

5. Infrastructure available to the household

Infrastructure	Yes /No	Number	Condition
Access to health facility			
Roads to market			
Administration office			
Church			
Social hall			
Water tanks			
Electricity			

6. Household access to resources

Name resources accessible to the household and rate their level of access by the households.

Resources	Yes /No	Frequency of access (none, very low, low, medium, high, and very high)	Provision of climate information
Fisheries			
Forestry			
Pasture (grazing/browsing)			
Water for animals			
Water for irrigation			
Credit			
Trees (<i>Acacia tortilis</i>)			

Second dimension: Relational wellbeing

Relational well-being refers to what people can do with what they have and how their interactions with institutions, rules, and individuals influence the pursuit of well-being.

How do social relations affect the wellbeing? What people can do with what they have.

7. Social institutions Benefits and costs

	Yes / No	Community (households) perceptions	
		Level of benefits (none, very low, low, medium, high, and very high)	Level of Costs (none, very low, low, medium, high, and very high)
Social institutions			
Collaboration in decision making: <i>Opportunities for community participation in decision making</i>			
Community relations <i>Enhanced land-based community relations in the use of the land</i>			
Collective action (groups) <i>Membership and participation in groups</i>			

Enforcements <i>how well will the policies be enforced with present challenges</i>			
Sustainable markets <i>Potential for connection to markets</i>			
Learning/Training <i>Existing knowledge and anticipated relearning</i>			
State institutions (chief)			

Third dimension: Subjective wellbeing

Subjective well-being refers to how people feel about what they have and what they do

	Yes / No	Community (households) perceptions	
		Level of benefits (None, very low, low, medium, high, and very high)	Level of Costs (None, very low, low, medium, high, and very high)
Place identity <i>Culture, heritage, sense of pride for the community land</i>			
Equity <i>Win-win situation between costs and benefits among stakeholders</i>			
Adaptability <i>Restrictions and ability to access resources in situations such as climate change</i>			

Fourth dimension: Ecological resilience

Ecological resilience refers to the ability of an ecological system to absorb disturbances and reorganize while retaining its structure and function.

Attributes of resilience (i.e., things that help the environment buffer or cope with those threats related to ecological factors).

Specific disturbances (i.e., threats) to the environment

Ecological attributes	Yes / No	Community (households) perceptions	
		Level of benefits (None= 0, very low=1, low=2, medium=3, high = 4 and very high=5)	Level of Costs (None, very low, low, medium, high, and very high)
Natural capital <i>Ability to protect naturalness, Ability to protect biodiversity, Ability to protect productivity</i>			
Disturbances <i>Potential to restrict disturbances Such as vegetation</i>			
Scale <i>Conservation of land resources in terms of space Ability to react to changing environment in terms of time or temporal Biodiversity (coping for environment)</i>			

SECTION III

1. Livelihood diversification

Identify the different livelihood types undertaken by the household

Livelihood	Yes / No	Ranking in terms of importance (None, low, medium, high importance)
Livestock		
Business		
Crop farming		
Fishing		

Informal employment		
Tourism		

2. Remittances to the household

To what extent do you agree with the statements on remittances to households as a drought coping mechanism?

Use a ranked scale of 0-5 (0=none, 1=very low, 2=low, 3=medium, 4=high, and 5=very high)

Statements on remittances	0	1	2	3	4	5
Remittances have increased the financial security of households during drought season						
Remittances have allowed families to purchase farm inputs for agriculture						
Remittances have ensured that we are able to buy food during drought season						
Remittances have allowed households to replace livestock that have been killed by drought						

3. Credit Access

Access to credit by the pastoralists as a coping mechanism

To what extent do you agree with the statements on credit access as a drought coping mechanism?

Use a ranked scale of 0-5 (0=none, 1=very low, 2=low, 3=medium, 4=high, and 5=very high)

Statements	0	1	2	3	4	5
We are able to access credit without collateral during drought						
We access credit easily during drought						
There is financial help in the form of credit from the government during drought						
Access to credit enables us to return to normal life during and after drought						

4. Collective Action

To what extent do you agree with the statements on collective action as a drought coping mechanism?

Use a ranked scale of 0-5 (0=none, 1=very low, 2=low, 3=medium, 4=high, and 5=very high)

Statements	0	1	2	3	4	5
Collective action is being used to ensure that there is effective water conservation during drought						

The national and county governments are part of the collective action after drought						
The community collectively comes up with local drought coping strategies during drought						
There is a positive reception of the collective actions by the community during drought						

5. NGO/Government Interventions

To what extent do you agree with the statements on relief and NGO interventions as a drought coping mechanism?

Use a ranked scale of 0-5 (0=none, 1=very low, 2=low, 3=medium, 4=high, and 5=very high)

Statements	0	1	2	3	4	5
We often get relief food during drought season						
We often get relief medicine during drought season						
We often get drought resistant plants to farm, during drought						
Local and international NGOs often offer help during drought						

Appendix B: Photographs from the Field Data Collection Exercise

1. Goats watering from a traditional scoop well on a dry river bed in Oropoi



2. Goats watering Photo 2 in Oropoi



3. Dryland farming using traditional methods in Kakuma



4. Irrigated crop fields in Kakuma



5. Crops growing on irrigation outside the greenhouse in Kakuma



6. Growing of spinach in a greenhouse environment in Kakuma



7. Vegetable growing using traditional methodologies in Kakuma

**Appendix C: Descriptive Statistics for the Measurements Used to Compute the
Socio-Ecological Well-being Index**

Dimension	Mean	Median	Mode	Standard Deviation	Range
Material Well-being	4.2	5	5	1.2	5
Relational Well-being	2.4	2	2.3	0.3	2
Collaboration in decision making	2.2	2	2	0.6	3
Community relations	2.9	3	3	0.8	3
Collective actions(groups)	2.3	3	2.5	0.9	3
Enforcements	2.4	3	2	0.7	3
Sustainable markets	2.1	2	2	0.8	3
Learning/training	2.2	2	2	0.8	3
State institutions	2.5	3	3	0.8	3
Subjective Well-being	2.3	2	2.3	0.4	2
Place identity	2.6	3	2.5	0.7	3
Equity	2.0	2	1.5	0.7	3
Adaptability	2.3	3	2.5	0.7	3
Ecological resilience	2.6	3	2.7	0.3	2
Natural capital	2.5	3	2.6	0.5	3
Disturbances	2.5	3	2.5	0.7	4
Scale	3.0	3	3.5	0.8	4
Socio-ecological Well-being	2.9	3	3.2	0.3	1

Appendix D: ANU Research Authorization Letter



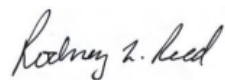
17th August 2021

RE: TO WHOM IT MAY CONCERN

Godfrey Mawa (19J01DMEV005) is a bonafide student at Africa Nazarene University. He has finished his course work and has defended his thesis proposal entitled: -



“Influence of drought coping strategies on the socio-ecological wellbeing of pastoral households”.

Any assistance accorded to him to facilitate data collection and finish his thesis is highly welcomed.



Prof. Rodney Reed
DVC Academic & Student Affairs

Appendix E: NACOSTI Research License


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