1.1.1 DISASTER RISK INTERVENTIONS FOR ENHANCING RESILIENCE AMONG PASTORAL COMMUNITIES OF MANDERA COUNTY, KENYA

By

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DECLARATION

Declaration by Candidate:

"This is my original work and has not been presented for award of degree in any University."

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Signature……. Date…….

Declaration by Supervisors:

"This research project has been submitted for examination with our approval as University Supervisor."

Dr. Daniel Manguriu

Signature……. Date…….

Department of Environmental Science and Education

DEDICATION

As a gesture of gratitude to my loving parents, Mr. Michael Irungu Mwangi and Ms. Monicah Wambui Irungu, I have dedicated my study to them.

ACKNOWLEGEMENT

I appreciate Dr. Daniel Manguriu of Kenyatta University's dedication and advice during my job supervision. I would like to thank the School of Agriculture and Environmental Sciences and its personnel for their invaluable assistance during my research. My friends Fatuma Maalim and the Mandera County Environmental Department workers helped me collect data.Finally, I thank my family and friends for their unwavering moral, financial, and daily support during my study journey.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ABRBREVIATION AND ACRONYMS

ASAL	Arid and Semi-Arid Land
CMDRR	Community Managed Disaster Risk Reduction
DRR	Disaster Risk Reduction
EDRP	Emergency Drought Recovery Project
FGD	Focus Group Discussions
GHGs	Green House Gases
GoK	Government of Kenya
HoA	Horn of Africa
IGAD	Intergovernmental Authority on Developments
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-Governmental Organization
RACIDA	Rural Agency for Community Development and Assistance
SESs	Social-Ecological Systems
SNA	Social Network Analysis

ABSTRACT

Climate change is among the greatest challenges being experienced globally today and affects all aspects of sustainable development. Consequently, climate-related hazards have been recorded as the major triggers for major disasters worldwide. However, extensive research in Disaster Risk Reduction Interventions is greatly lacking. This study sought to investigate the disaster risk reduction interventions for enhancing resilience among pastoral communities of Mandera County. The specific research objectives were; determine trends variation in climatic elements of temperature and precipitation from 1989 to 2019 in Mandera County, investigate the impacts of drought hazards on livelihoods of pastoral communities residing in Mandera County from 1989 to 2019, identify the opportunities and constraints for Disaster Risk Reduction and evaluate institutional capacity in improving pastoral societies' resilience to Drought Disaster and their capacity for action. Three sampling techniques; stratified sampling, simple random and purposive sampling were used to collect primary and secondary data from both the respondents and key informants with a sample size of 157. The findings were analysed with Statistical Package of Social Sciences and Excel. The results show, at least 55.7% of the sampled respondents had basic primary level education. The months of December, January and February were the most water scarce months of the year, with 54.2% of the respondents stating that they depend on dam water as their main source of water in their households as opposed to 3.8% who depend on piped water. The findings of this study also found out that the most food insecure months were February, March and July of each year which were also the months impacted mostly by drought with a minimum of 23.8^{o}C and maximum of 38.2 ^{o}C for the years between 1989 to 2019. The analysed results were presented inform of tables, pie-chart and graphs. The hypothesis was tested by Chi-Square ($\chi 2$). The null hypothesis of drought shocks had no association $\chi 2$ =4.468, DF=6, P=0.624, with effective and affordable practices of drought mitigation and preparedness in Mandera County, and failed to be rejected This study is recommends need to strengthen their weather forecast and improve on early warning to enable local communities' to better plan their activities and prepare for any probable occurrence of future climate related disasters in Mandera County.

CHAPTER ONE: INTRODUCTION

1.2 Background to the Study

Climate change and variation is a worldwide problem whose challenges have been encountered locally and at the regional level. Climate change is being reported among the drivers that exacerbate disaster risk (Kelman, 2015; Mabhuye & Yanda, 2020). Researchers have predicted its effects to include variations in rainfall, amplified extent of extreme weather events in addition to disaster intensity, heat waves augmented inundation and flooding, reduction in fresh water resources, rise in sea level, vagaries in disease patterns, among others (AghaKouchak *et al.*, 2020). As much as the world is able to keep in check the worldwide greenhouse gas emissions, the mean sea levels is to raise between 26-54 cm by the year 2100 under conservative scenarios though most forecasts are higher (IPCC, 2019).

The Horn of Africa's dry lands are inhabited by over twenty million inhabitants, who mainly rely on pastoralism and associated activities for their livelihood. This livelihood activity has by far emerged as a preferred economic activity since it is productive and environmentally sustainable in such marginal regions (Galaty & Bonte, 2019). As economies and populations in North-Eastern region continue to develop, they are likely to play a major part as vital sources of dairy products such as meat, hides and milk (Nyariki and Amwata, 2019). However, in recent time, the dry lands of North Eastern part of Kenya have been reported among the record disaster prone globally (Mihiretu *et al.*, 2019). As much as the region is susceptible to numerous and intricate shocks compounded by prolonged poverty, drought has been reported as impacting majority of inhabitants recurrently compared to other types of disasters (Haile *et al.*, 2019). The socio-economic and ecological effects on dry land inhabitants have been recorded as being extreme. The nationwide costs and losses experienced similarly impend and destabilize the broader economic progress among other developments being experienced in several countries within this region (Nguvava *et al.*, 2019). Drought is expected to remain a persistent hazard in midst of climate variability. If Disaster is not contained and the communities' resilience built, catastrophes within these marginal lands of the region is expected to upsurge in magnitude as populaces raise (Muricho *et al.*, 2019).

Considering the unavoidable and prolonged recurring drought in the North Eastern part of Kenya, it is extensively recognized essential to assimilate Disaster Risk Reduction to all facets of growth, humanitarian strategies, policies, and plans together with programs (Tawane and Mugalavai, 2019). Regrettably, the 2011 drought calamity within this region revealed that Disaster Risk Reduction determinations to current time are evidently not adequate. Intergovernmental Authority on Developments (IGAD) Ending Drought Emergencies ingenuity offers administrations within the region with a fresh incentive to scrutinize and review policy, plans and programs from a Disaster Risk Reduction standpoint. Within this resourcefulness, IGAD made the Drought Resilience stage with the crucial aim to assemble funds, encourage information management, and frame common local goals and approaches (Yanda and Mubaya, 2011; King-Okumu *et al.*,2019).

1.3 Problem Statement

Pastoralists from Mandera County have been facing the climate change related disasters over the decades. Some of these disasters include prolonged droughts, flooding and diseases. Mandera County, for example, is afflicted by regular floods that destroy farmland and wipe out entire communities. Deaths have occurred, people have been displaced from their homes, and property valued at millions of shillings has been destroyed as a result of floods caused by torrential rainfall from the Ethiopian highlands.

Despite existence of Disaster Risk Reduction measures in Kenya, disasters have been persistent in exacting a heavy toll and consequently, the safety and well-being of societies and the country as a whole have been impacted negatively. The National Disaster Operations Centre was established in 1998 to oversee disaster management issues in Kenya. However, two decades later, there has not been a systematic evaluation instituted to establish whether the Disaster Risk Reduction system has been effective in cushioning vulnerable groups against adverse effects of the recurrent and escalating climate change induced hazards. As such, there is not much information available about the Disaster Risk Reduction measures efficacy in satisfying the purposes in Kenya since comprehensive evaluation studies are lacking. Continuing discussion has mostly been engrossed on the proposition that the Disaster Risk

Reduction structure needs to be upgraded without demonstrating how this could be achieved.

Without knowledge of the value added by Disaster Reduction system in Kenya, the accomplishment of the envisioned goal cannot be established. This is consistent with similar studies including Eltinay and Egbu (2017) who established that non-existent assessment of the usefulness of Disaster Risk Reduction may result in different concerns ranging from: lack of feedback to learn from faults, lack of feedback to recognize success, and subsequently lack of baseline to advancement of the system. Correspondingly, the Hyogo Framework for Action of 2013 to 2015 stated that evaluations of the system are fundamental to Disaster Risk Reduction effectiveness, for nonexistence of such measures, the Disaster Risk Reduction measures cannot be evaluated (Van Niekerk, 2015).

Therefore, there was urgency to conduct a study of the effectiveness of Disaster Risk Reduction system in Mandera County that combined measures with capability of evaluating the outcomes of Disaster Risk Reduction measures.

1.4 Research Objectives

This research objectives were:

1. To determine trends variation in climatic elements of temperature and precipitation from 1989 to 2019 in Mandera County.
2. To assess the impacts of drought hazards on livelihoods some of pastoral communities residing in Mandera County from 1989 to 2019.
3. To identify the opportunities and constraints for Disaster Risk Reduction in Mandera County.
4. To evaluate institutional capacity and intervention effectiveness in improving pastoral societies' resilience to Drought Disaster and their capacity for action.

1.5 Research Questions

1. How has temperature and rainfall varied in Mandera County since 1989 to 2019?

2. How has drought hazard impacted on the livelihoods of pastoral societies residing in Mandera between 1989 to 2019?
3. What are the opportunities and constraints to effective Disaster Risk Reduction in Mandera?
4. How does the institutional capacity and intervention effectiveness in improve pastoral societies' resilience to Drought Disaster and their capacity for action in Mandera?

1.6 Research Hypothesis

Ho: Drought shocks had no association with effective and affordable practices of drought mitigation and preparedness in Mandera County.

1.7 Research Justification

The demand for meat, milk and hide is high in Kenya but the pastoralists communities cannot supply enough. The climate change related disasters affect livestock's productivity as they face disasters like prolonged droughts, heat waves, new disease strains and forage growth. Even with existing intervention measures through funding still unprecedented effects of climate change continue to wreck pastoral landscapes in Mandera county. Therefore, Kenyan pastoralists are likely to continue suffering from the climate change disasters and it is important to have Mandera County pastoralists as a case study of effective disaster risk reduction intervention from this study.

1.8 Significance of the Study

For the purpose of supplementing actual scientific information on pastoral society's resistance to climate change and variability-induced disasters, the findings of this study will serve as a guide. Further, the study findings provide data and information for policy makers, regulators, authorities, and scientists in disaster risk prevention, preparedness and response. The research also provides a platform to understand local approaches and interventions practiced by pastoralists in adjusting to managing the hazards and disasters of climate change for replication elsewhere. To the related relevant projects in the region, this study will provide disaster risk reduction intervention knowledge that can be incorporated to better the livelihood of the pastoralists of Northern Kenya and specifically for Mandera County residents.

1.9 Conceptual Framework

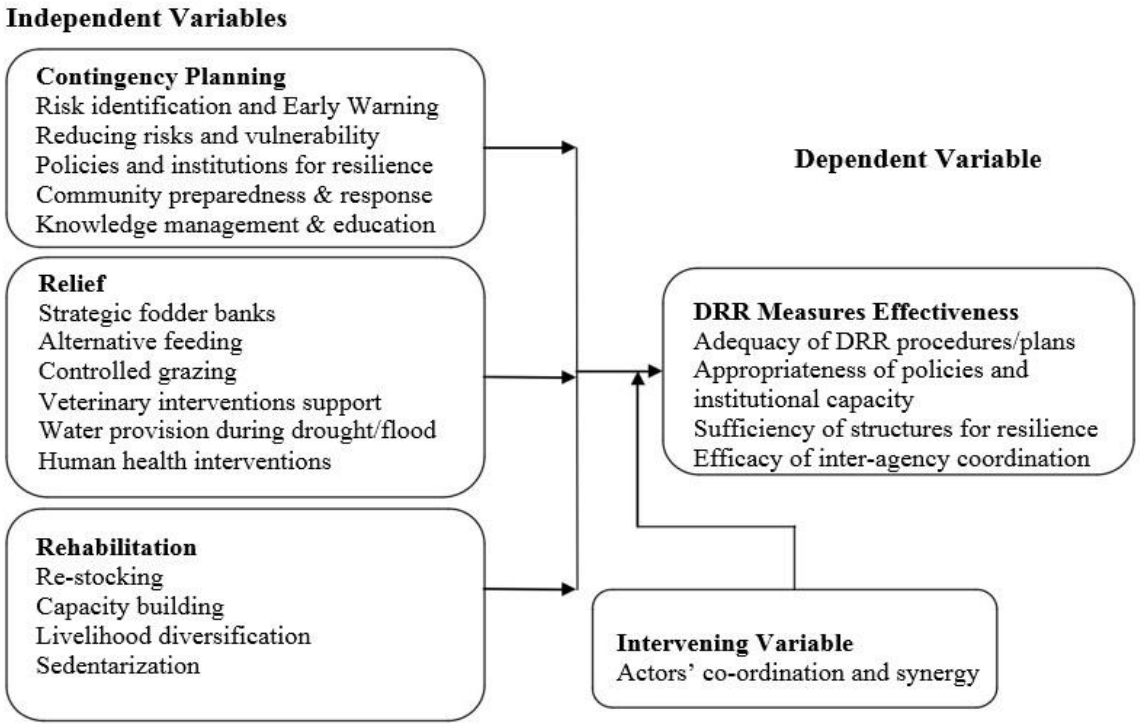

Figure 1.1 Conceptual Framework. Adopted and modified (Barton *et al.*, 2001)

Figure 1.1 shows interrelation of research various variables. The interaction of these variables starts from the independent variable which consisted of contingency planning where risk identification, early warning indicators, community preparedness and reducing vulnerability among others. Relief in terms of strategic fodder banks, controlled grazing, alternative feeding and water provision during drought, and finally rehabilitation that included capacity building, re-stocking and livelihood diversification that interacted with intervening variable of actor's co-ordination and synergy that ensured the end point of the DRR measures as dependent variables. When a system is encountered with amplified hazards, it may retain current levels of risk through the aforementioned adaptation. The proposed study adopted and modified a framework by Barton *et al.*, 2001, that provided guidance for this study.

1.10 Definition of Terms

Effectiveness: Effectiveness, within the realm of Disaster Risk Reduction will adopt the definition "How well the DRR system works and the performance of relevant institutions in improving pastoral societies' resilience to Drought Disaster."

Climate Change: The changes in the climate system enhances through natural forcing or anthropogenic (IPCC, 2019).

Disaster Risk Reduction: Elements considered to minimize vulnerabilities and disasters in societies. (UNISDR, 2004; Kelman, 2018).

CHAPTER TWO: LITERATURE REVIEW

2.1 Building Disaster Resilience

Africa is likely to be affected more harshly as compared to other regions by anticipated climate change effects. This is brought about by greater susceptibility of Africa's economic state including livestock keeping, production of crops and service sector to climatic change, geographical exposure and financial difficulties (Descheemaeker *et al.,*2018). In the horn of Africa, many of the hostile effects are already being experienced.Given its vulnerability to adverse weather conditions, the community's adopting pastoralism as a means of living is likely to bear the most liability (Galie et al., 2019). Climate change and variability are linked to decreased precipitation, shifting rainfall patterns, and increased drought occurrences in the East African region (Williams et al. 2012). These occurrences are projected to accelerate the spread of disease outbreaks, as well as have a significant influence on food security, water resources, natural resource output, sea-level rise, and desertification (Aklilu and Wekesa, 2002; Nkuba et al., 2019). It is clear that the means of support for impoverished and marginalised groups, mostly in Africa, are going to undergo significant change as their environment and access to resources from which they draw their provisions deteriorate. This is due to existing difficulties in anticipating the current and foreseeable effects of climate change and fluctuations in various streams (Assan and Kumar, 2009; Cuni-Sanchez et al., 2019).The disaster profile of Kenya is predominantly droughts, floods, fire, technological accidents, diseases and epidemic and lately terrorism from neighbouring Somalia that interrupt people's livelihoods, bring about destruction and damage the infrastructure, divert planned resource use, and interfere with economic activities and hamper development (GoK, 2009). Of the disasters highlighted above, drought is the leading disaster in Kenya that is recurrent. Intense droughts were experienced in the following years: between 1991-92, 1995-96, 1998-2000, 2004-2005, and 2008-2011 (Ayugi *et al.,* 2020). Each of the aforementioned events led to unprecedented losses in crop production/yields, severe famine and displacement of population in Kenya. Shifts in climate variables are expected to exacerbate the circumstances that are already being experienced thereby leading to imminent water shortage resulting in more severe droughts (Gladys, 2017).

The persistent drought of 2008 to 2011 was an illustration of some of the overwhelming and persistent socio-economic significances resulting from such occurrences. The livestock sector was reported to have experienced the worst effects, bringing about a loss of about KSh. 699 billion. KSH. 56 billion of the loss were damages resulting from veterinary care costs, feeds, water and production failure in addition to KSH. 643 billion in losses owing to animal deaths (Mureithi *et al.*, 2016). The drought had intense impacts on many societies leading to destruction of livelihoods and increasing vulnerability Communities practicing pastoralism are among the most vulnerable to climate change and variability owing to their comparatively low adaptive capacity, greatly risk-prone and reduced resilient production environments (Morton, 2007; Ayal *et al.*, 2017).

2.2 Global Disaster Risk Reduction Framework

In order to reduce disaster risk, the global community has developed policies like the Hyogo Action Framework (2005-2015) and the Sendai Emergency Preparedness Structure (2001-2010). (2015 - 2030).

2.2.1 Hyogo Framework (2005–2015)

International community developed framework for implementation of policies and initiatives to reduce disaster risk vulnerabilities after intense studies on catastrophe causes and preventions (Van Niekerk, 2015). The Hyogo Framework for Action (2005–2015), developed in the wake of the 2005 World Summit Reduction, can help companies reduce risk (ibid). The Hyogo Framework-approved Catastrophic Risk Reduction model aids governments and their partners in targeting predefined thresholds and assets to implement an all-inclusive intersectoral approach to reducing disaster impacts on societies (Mercer, 2010; Marolla, 2016). The Hyogo framework includes disasters like earthquakes, monsoons, and hurricanes (Berkes et al., 2003; Macherera and Chimbari, 2016). The African Union endorsed the Hyogo Framework as part of its Africa Regional Masterplan for Disaster Prevention and the Affiliated Action Agenda. As a result, one of the program's primary objectives is to lessen the social and economic harm that disasters cause to Africans and their economies, in order to help the continent meet the Millennium Development Goals and other targets.

A better understanding of disaster risk reduction as a key indicator of long-term prosperity is also a goal (Kelman, 2015).

2.2.2 Sendai Framework (2015 - 2030)

The Hyogo Action Framework was completed by the Sendai Disaster Risk Reduction Framework. 187 nations met in Sendai, Japan, in March 2015 to agree on a framework (UNISDR, 2015). From 2015 to 2030, the Framework will be overseen by the UN Office for the Reduction of Disaster Risk (UNISDR). The main objective of this construction is to prevent or lessen the probability of fresh disasters. Firstly, the Framework aims to improve disaster risk management at all levels (national, regional and global), as well as to invest in disaster prevention for a resilient society (Aitsi-Selmi et al., 2015). A second component of the Sendai framework is EWS (EWS). When an EWS collects data, it can be used to keep tabs on and protect against risks. The EWS keeps track of people's resources and safety, notifies them of emergencies, and offers remedies (Schipper *et al.*, 2016). To put it another way, EWS refers to the systems and procedures that provide a head start on risk identification. EWS is a component of the Risk Management Framework. Figure 2.1 shows the UNISDR Early Warning System's organizational structure (2002).

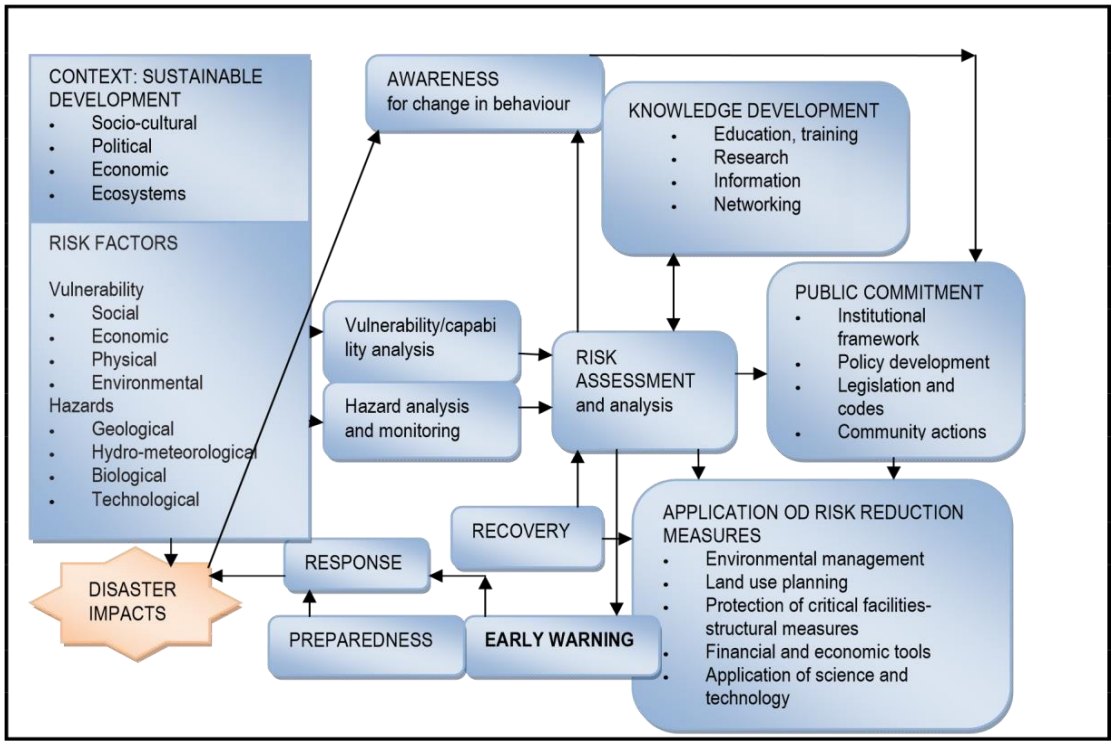

Figure 2.1 DRR Framework (UNISDR, 2002)

2.3 Disaster Management Institutions in Kenya

The In order to legitimize disaster control systems and reduce risk vulnerabilities, the Kenyan government has established a National Disaster Management Policy (GoK, 2009). Uncoordinated, reactive rather than proactive government and non-governmental organizations (NGOs) operate in Kenya. Traditional disaster management follows a similar pattern. NEMA is part of the Ministry of Environment, and the Department of Relief and Rehabilitation, National Aids Control Council, and the Northerner State Development and Other Arid Countries, as well as the State Department of Special Programs, make up the National Disaster Operating Center. The Ministry of Agriculture, Local Government and Regional Development; Environment and Natural Resources; Labour and Human Resources Development; Industry; Health; Roads and Public Works; Transport; Information and Communications; Tourism; Energy; and Finance, among others. Kenya's disaster management is aided by IGAD, UN agencies, bilateral partners, and international non-governmental organizations (NGOs) (GoK, 2009).

2.4 Knowledge Gaps

The existing scholarly works, from studies on Disaster Management in Kenya show isolations such as: the mechanisms available for assessing hazard and vulnerability; institutional arrangements in place for Disaster Risk Reduction including laws, regulations and administrative procedures; Human capacity including knowledge and skills; or adequacy of infrastructure and monetary resources to support Disaster Risk Reduction. A holistic approach to hazard, exposure, and vulnerability has been missing from these piecemeal approaches. These studies have neither been comprehensive nor exhaustive and have therefore remained limited in their impact as they have simply resulted in slight modifications of the Disaster Risk Reduction system. The all-inclusive approach in this study is considered the most applicable approach of recognizing characteristics of the Disaster Risk Reduction system that require reinforcement.

This study provides a broader viewpoint and allows for a thorough valuation of all the Disaster Risk Reduction system's constituents and their interactions. The application of this approach in evaluating the Disaster Risk Reduction system is likely to fill the existing gaps.

CHAPTER THREE: METHODOLOGY

3.1 Study Area

Mandera County; Kenya (Figure 3.1) is situated in Kenya's northeast section. It borders northward Ethiopia, eastward Somalia and southwest southward Wajir County. The County is located in 200 11' North and 40017' North and 390 47' East and 410 4.8'E.

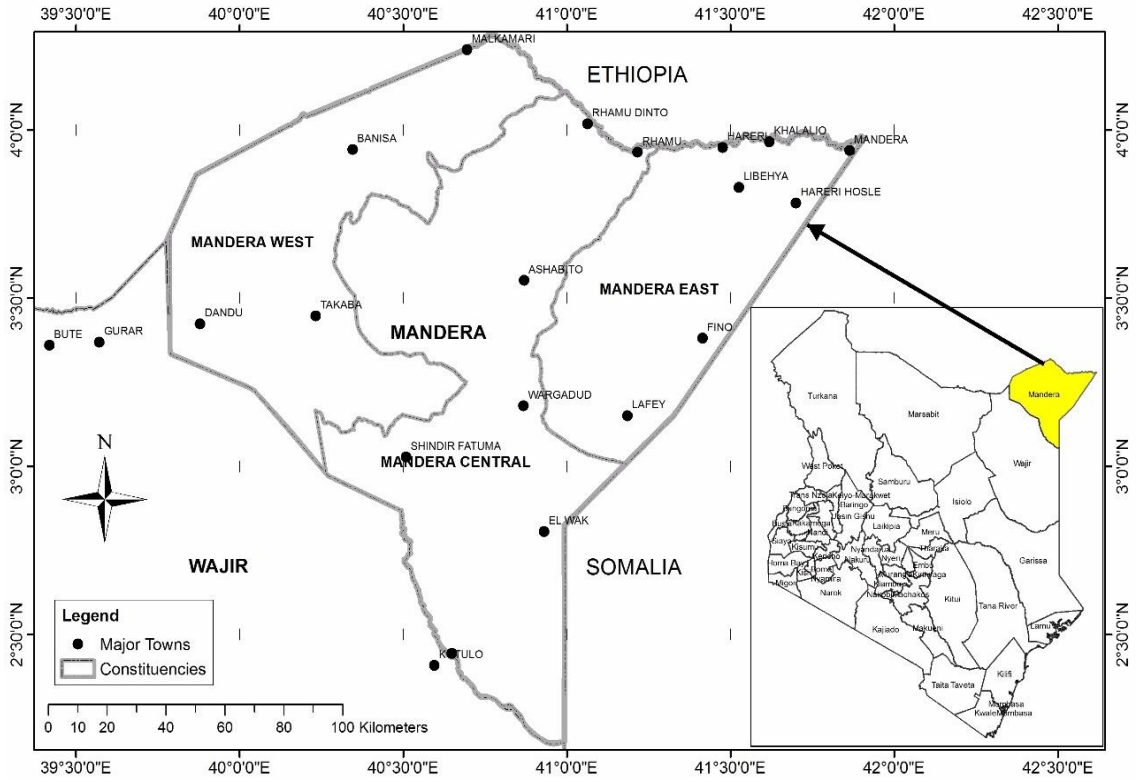

Figure 3.1 Map of Mandera County

About 125,763 houses and 33 individuals per square kilometer were recorded in the 2019 Kenya Census. The county borders Somalia and Ethiopia and is 25,939 square kilometers in size. Mandera East, Mandera North, Mandera West, Lafey, Banisa, and Kutulo are the seven sub-counties that make up Mandera County (KNBS, 2019).

3.1.1 Physiographic and Natural Conditions

From 400m in the south at Elwak to 970m on the Ethiopian border, the County of Mandera is described as having low rocky hills on the plain. The rest of the terrain is flat, with savannah-like flora. Solitary hills with exotic Prosopis juliflora shrubs are ideal for

this. The flat lowlands have poor drainage, causing flash floods. There are no lakes, marshes, or dams, however earth pans are common in the county.

The Daua River flows east along the Ethiopian border for 150 km to Malkamari, Dimtu, Rhamu, and Township at Border Point One Somalia (BP1). The Daua River Basin is 60,106 km2 in size and spans three nations. The basin covers 9,119 km2 in Mandera County. The watershed is located in the southern Ethiopian highlands, between 41.8840 – 38.4650 °C east and 3.9970 – 6.4560 °C north (Aburo, 2017).

3.1.2 Climate

Temperatures in July are high at a minimum of 24 ^{0}C and in February at 42 ^{0}C. Altitude variation is caused by temperature fluctuations across the county in locations near Banisa, where the temperatures are low due to the neighbouring mountains of Ethiopia. Recovery is scarce and irregular, with a yearly average of 191.7mm. The lengthy rains in April and May are 69.1 mm in average, whereas in October and November the short rains are 122 mm in average. Most sections of the county have extended sunshine hours in a day. This produces significant evaporation rates and causes most plant to wither before it matures. The county's continual sunshine provides enormous potential to use solar power (Tawane and Mugalavai, 2019).

3.2 Research Design

A descriptive research survey design was used by the study. Qualitative inquiry focused on drought risk questions of 'how' and 'why' whereas quantitative perspective addressed aspects of "how many' or 'how often'. The study utilized a descriptive research design to describe the features of a certain person or groups (Kothari, 2009). The descriptive survey design was designed to formulate goals, develop tools for data collection, selection of samples, data collection, processing, analysis and reporting results.

3.1 Target Population

The poorest people who depend on pastoralism are the target population whereas pastoralists are the analytical unit. Target population is the elements of concern (Orodho, 2005). According to 2019 census, Mandera County's population is 867,457 spreads over an area of 25,939 km^2. Mandera is predominantly inhabited by ethnic

Somalis (MCIDP 2013 - 2017). The main clans are the Garreh, Degodia and Murule. There are a small number of people from other Kenyan communities, mostly professionals working in various fields. The research was carried out in three regions; Banisa, Mandera West and Mandera East.

3.2 Sampling Procedure

In this study, three layers based on three existent Mandera County villages were sampled using stratified sampling methods: Takaba, Tarama and Bulla Mpya in Mandera East. The selection of participants in the study was based on application of systematic random sampling technique. Here every household targeted had an equal chance to be sampled if it portrayed target respondent. Sampling is a strategy for selecting a demographic group to participate in the Ogula study (2005). A purposeful sampling of a village elder and head/sub-chef was used for the interview in each selected community. Table 3.3 provides a complete sample size summary.

The sample size was based on Mugenda and Mugenda (2003) that suggested for a sample size of between 10 – 30% of the targeted population for a descriptive study. For population below 1000, Mugenda and Mugenda (2003) suggested 30%, while above 1000 suggested 10% respectively.

The target household population for the three selected villages were 1,569.

The calculation was as outlined:

$$n = \frac{10}{100} N$$

Where: N is the target household population and n is the sample size

$$n = \frac{10}{100} X\ 1{,}569$$

$$= 156.9$$

Which is approximately 157 Households, which formed the target sample size.

Table 3.1 Sample Size

Constituency	Ward	Village	Household population	% Household (125,497)	Target Village Household population	Target Sample size
Banisa	Banisa	Tarama	19,327	15.4	499	50
Mandera West	Takaba	Takaba	19,828	15.8	514	51
Mandera East	Township	Bulla Mpya	21,836	17.4	558	56
Total			60,991	48.6	1,569	157

3.3 Data Collection Instruments

The study employed a combination of data collection methods: Household survey, key informant; village heads, Chiefs/sub-chiefs, Government and Non-government Institutions in Mandera County. Interviews and secondary data gathering specifically climate data from Kenya Meteorological Department.

3.4 Data Collection Procedures

Prior to field data collection, the School of Environmental Sciences, Kenyatta University and the National Commission of Science and Technology (NACOSTI) obtained permission (Appendix V) to aided the data collection procedure. Research assistants were chosen for fluency in English, Kiswahili and Somali from the area of study. The research assistants received one day research ethics training, data collection and the use of data collection tools. The training also included the importance of each item in the research questionnaire. The researcher was onsite throughout the data gathering period. The respondent was the head of the home and, in the event of his absence, the most appropriate respondent was sought. Cohen et al. (2009) have strictly addressed a variety of ethical difficulties in this work. These include confidentiality, anonymity, disappointment avoidance, betrayal and privacy. The participants consented to take part in this study, and that decision was honoured if the respondents chose not to engage in the study. In order to avoid the participants from shying away and retaining information, confidentiality and anonymity were guaranteed. All responders were told that the information and data obtained were only for academic purposes.

3.7.1 Structured Questionnaire

The questionnaire in Appendix 1 has been administered in Somali at the residencies of the respondent. The study focused on opinions, feelings and attitudes regarding disaster risk reduction measures to improve resilience in the Rural pastoral Areas of Mandera County, Kenya. This information can best be gathered by using surveys (Mugenda and Mugenda, 1999). In order to identify the drought consequences, causes, vulnerability, opportunities and restrictions on their copying tactics, institutional presence and capacity in Mandera County, a systematic questionnaire was administered.

The questionnaire consisted of five sections; section A captured the demographic data such as Respondent biodata; Section B contained questions on drought impacts, causes and vulnerability of pastoral communities; Section C interrogates copying opportunities and constraints for drought disaster risk reduction in Mandera County. Section D reviewed Institutional presence and capacity in improving pastoral communities' resilience to DRR and lastly Section E administered situational analysis of DRR in the study area.

3.7.2 Interview Guide

Key informants were interviewed in depth. The primary informants were taken into account when evaluating disaster risk reduction activities in the research region. An interview guide (Appendix II) for village elders and chiefs/sub-chiefs was produced, as was an Appendix III for institutions.

3.4.3 Secondary Data

The information was gathered from secondary data sources such as resource centres, libraries, and the internet. The study's climate data came from the Kenya Meteorological Department. The researchers studied 30 years of rainfall and temperature data obtained in the study area since 1989. Precipitation, maximum temperature, and minimum temperature were calculated month-to-month using five-year groupings as a guide. The fluctuations in the trend line were obtained using meteorological data. Instrument Validity and Reliability

This testing sought to assess the household survey's reliability and validity. The pilot experiment was designed to gather informed permission from local governments, residents, and Mandera County officials.

3.8.1 Pilot Testing

To undertake pilot testing, a sample with similar features of 10% of the entire sample was employed for the study. Sixteen Mandera East household respondents were selected randomly to complete out this critical test questionnaire and were not part of the final sample. The coherence and relevancy of the instruments was measured by evaluating answers to questions to establish whether all respondents had the meaning of the questions. Pilot tests indicated ambiguous questions and unclear questionnaire instructions that were corrected well before main study.

A research tool is valid when it assesses what is to be measured and the data collected correctly and honestly reflects the respondent's point of view. Just how much the purpose of the research can be understood and extrapolated for diverse populations is valid (Cohen, 1988). The project supervisors used the survey questions to determine whether they were valid and to find out their contribution after the research instruments were fully built.

3.8.2 Research Reliability

According to Mugenda & Mugenda (2003), a research tool's credibility is determined by the consistency of its results. The Cronbach 0.7520 Alpha index describes the questionnaire as an acceptable tool. Zikmund & Barin defined reliable reliability as 0.7 or higher (2014). A reliability score of 0.7 is deemed dependable (Field et al., 2009). Using quantitative data, mistakes in orthographing and blank spaces were examined for precision, consistency, and wrong responses. In order to reduce catastrophe risk, descriptive statistics were employed to analyse data and evaluate treatments within Mandera County Pastoral Communities. Tables, bar graphs, and pie charts summarized and portrayed the information. Thematic content analysis was used to analyze qualitative data from key informant interviews and open-ended questionnaire sections using SPSS software. The study used data to correlate dependent and independent factors.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter includes the findings, interpretations, and debate based on the research tools utilized. First, data on temperature and precipitation changes in Mandera County were analyzed since 1989. We then looked at pastoralist communities' options and restrictions for reducing catastrophe risk. Finally, institutional capacity was examined in enhancing pastoral cultures' resilience to drought and action capability.

4.2 Questionnaire Return Rate

Table 4.1 Response Rate

Village	Target Village Household population	Target Sample size	Return Sample size	Return Rate (%)
Tarama	499	50	41	82.0
Takaba	514	51	43	84.3
Bulla Mpya	558	56	47	83.9
Total	1,569	157	131	83.4

There were 157 home surveys. Tarama (41) 82.0 percent, Takaba (43) 84.3 percent, and Bulla Mpya (47) (83.9 percent). As stated by Mugenda & Mugenda (2003), return rates of 40% or less are acceptable, as are return rates of 50-60%. It was great to have 131 (83,4%) returns for the household survey.

4.3 Demographic Information

4.3.1 Household Respondents' Gender

The rate of response rate on gender of household is summarized in Table 4.2.

Table 4.2.Gender of Respondents

Village	Gender					
	Male		Female		Total	
	F	%	F	%	F	%
Bulla Mpya	29	61.7	18	38.3	47	83.9
Takaba	29	67.4	14	32.6	43	84.3
Tarama	24	58.5	17	41.5	41	82.0
Total	82	62.6	49	37.4	131	100.0

The number of overall household respondents by gender comprised of 62.6% (n=82) male and 37.4% (n=49) female. The findings collected was a representative based on one-third gender rule. However, culturally household heads in Mandera are male only in rare occasions where a female heads the household. Therefore, this informed our gender sample outcome. This gender parity confirmed that we could rely on in assessing Disaster Risk Reduction Interventions for enhancing Resilience among Pastoral Communities of Mandera County.

4.3.2 Age of Respondents

The age bracket of the respondents was as summarized in Figure 4.1.Most the respondents aged 40 – 49 Years 31.3% (n=41) followed by 30 -39 years 26.7% (n=35) and a tie of 16.0% (n=16) of 20 - 29 years and 50 – 59 years old. Among the list were over 60 years 3.1% (n=4). From the findings of the study, most of the respondents were aged enough and perceived to have information and experience of droughts in Mandera County. The results also show the population in Mandera to be youthful compared to the male that is reducing past the age of 50 years.

4.3.3 Distribution of Household Marital Status

The study attempted to find out how respondents were distributed according to marital status. This finding comes handy in explaining the drought impact vulnerability. The results were as presented in Figure 4.2.

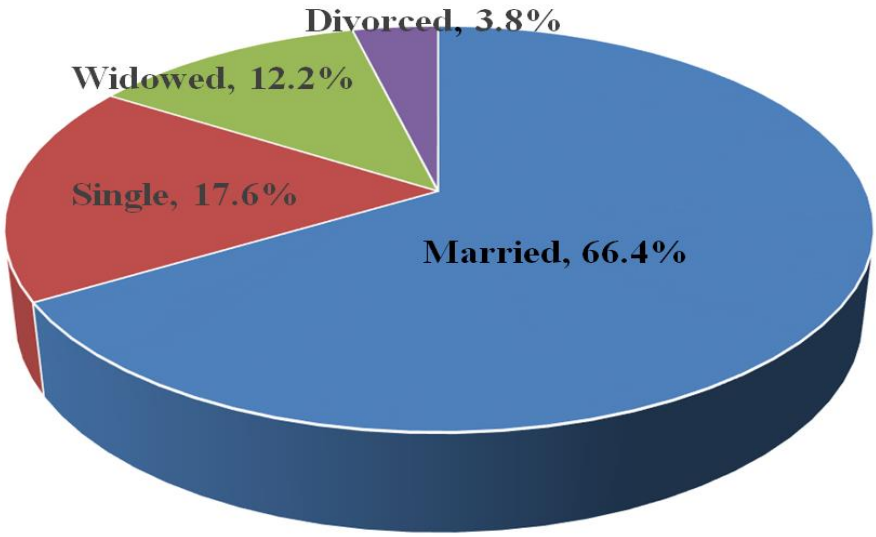

Figure 4.1 Respondents' Marital Status

Majority of household respondents 66.4% were married, 17.6% were single, 12.2% were widowed and 3.8% were divorced. From the population dynamics, majority of households heads were in marriage. Therefore, the respondents embraced family life unlike being single or divorcees.

4.3.4 Respondents Family Set-up

The household family set-up was very important in the study as it shade light on population growth hence pressure on natural resources such as water (Table 4.3).

In all the three villages it is evident that majority 84.0% of the family set-ups were polygamous. This gave lead to possible population growth that may have pressure on natural resources that include water, food and even pasture for their livestock.

Table 4.3 Respondents' Family Set-up

	Polygamous		Monogamous		Total	
Village	F	%	F	%	F	%
Bulla Mpya	42	89.4	5	10.6	47	83.9
Takaba	40	93.0	3	7.0	43	84.3
Tarama	28	68.3	13	31.7	41	82.0
Total	110	84.0	21	16.0	131	100.0

4.3.5 Respondents Education Level

The interviewees were asked to specify their education range from university to university. The highest degree of education achieved by the respondents was described in Figure 4.3. It clearly demonstrates that the highest education of 55.7 percent in elementary schools followed by high schools, 18.3 percent, 11.5 percent, tertiary school, 10.7 percent, and finally college, 3.8 percent. The results of the survey show that most of the interviewees received basic primary education. Most participants believe that their low education can be ascribed to the way they live because they move from one place to place in search of food, water and grazing for their animals.

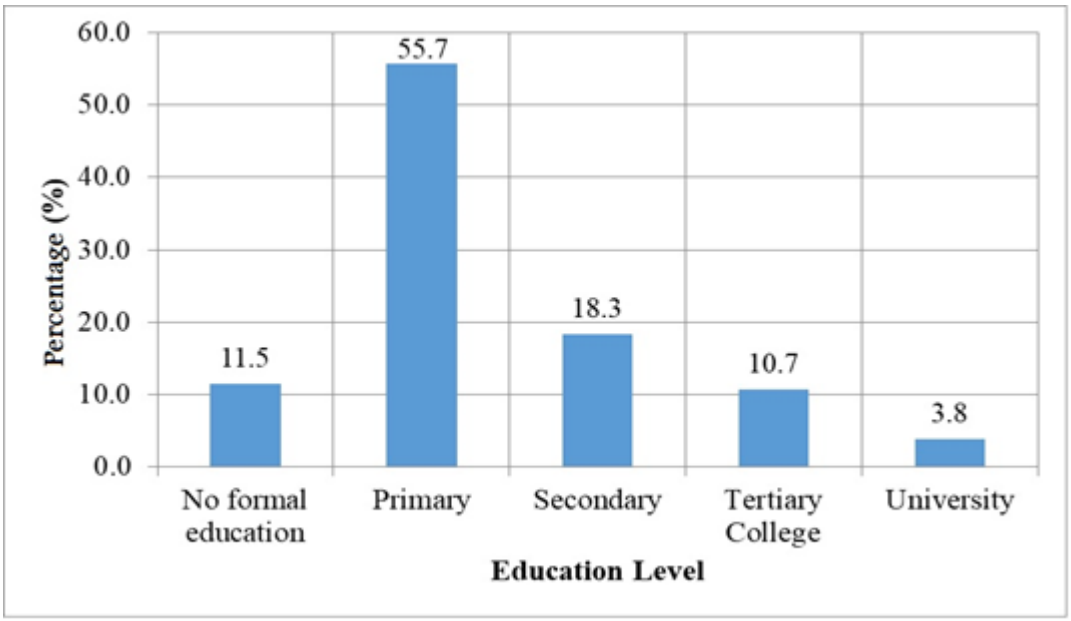

Figure 4.2 Respondents' Education Level

The education levels of respondents in the study are particularly essential, as information about the potential hazards to drought and awareness about their

sensitivity to drought disasters vary from household (Sam et al., 2021). It could also contribute to their understanding in disaster risk reduction techniques

Distribution of Respondents on Household Size

Knowing the number of households was extremely essential because this may determine their activities to create revenue (Figure 4.4).

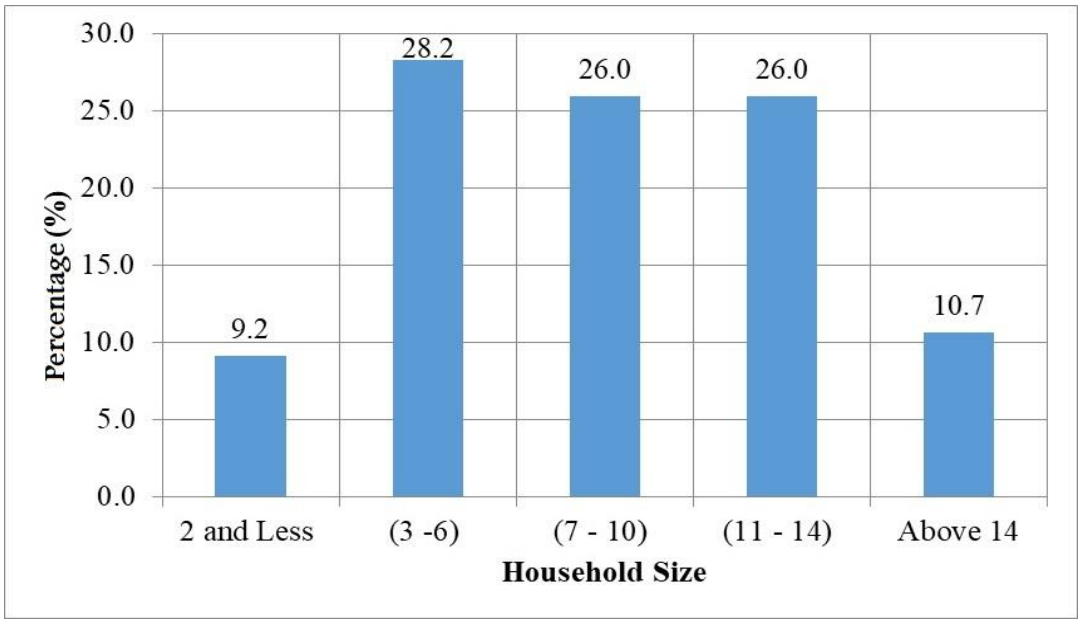

Figure 4.3 Distribution of Respondents by Household Size

Figure 4.4 indicate that 28.2%, 26.0% and 26.0% of respondent were members from 3 – 6, 7 – 10 and 11 – 14 sizes of households respectively. The large household set up is driven by cultural set up among pastoral communities in Mandera where polygamy is practised. Also, 10.7% and 9.2% were from above 14 and less than 2 household members respectively. These findings gave insight on the vulnerable group that include children. It also highlights the population growth of the study area that may have pressure on water and other natural resources.

4.3.6 Distribution of Respondents on Main Occupation and Ethnicity

The study aimed to ascertain the main occupation of the Mandera county residents. These occupations gave leads to factors that determine their vulnerability and possible disaster risk reduction mechanisms employed.

As detailed in the table, Mandera County is inhabited by *Somalis* with dominant 74.0% Gharre Clan followed by Degodia and Murrule clans at each 11.5%. The other (non-*Somalis*) communities in the study area were 3.1% who were mainly either business or employed people. Majority 65.6% (86) of Mandera County residents were nomadic Pastoralists, 18.3% (24) were Herders and 12.2% (16) were farmers along river Daua.

Table 4.4 Respondents Main Occupation and Ethnicity

Occupation	Ethnicity								Total	
	Gharre		Degodia		Morule		Other			
	F	%	F	%	F	%	F	%	F	%
Pastoralist	67	69.1	14	93.3	5	33.3	0	0	86	65.6
Herder	22	22.7	0	0.0	2	13.3	0	0	24	18.3
Farmer	7	7.2	1	6.7	8	53.3	0	0	16	12.2
Business	1	1.0	0	0.0	0	0.0	2	50	3	2.3
Employed	0	0.0	0	0.0	0	0.0	2	50	2	1.5
Total	**97**	**100.0**	**15**	**100.0**	**15**	**100.0**	**4**	**100**	**131**	**100.0**

4.3.7 Distribution of Respondents on Years Living in the Area

The research considered years that the participants lived in the study area was very important for it informed perception on drought experience. The results were as summarized (Figure 4.4). Majority 74.0%, of the household respondents had stayed over 20 years in the locale, 9.9% had resided 5 – 10 years and another 9.9% had lived 16 – 20 years. 3.8 % had lived there less than 5 years and remaining 2.3% had spent 11 – 15 years.

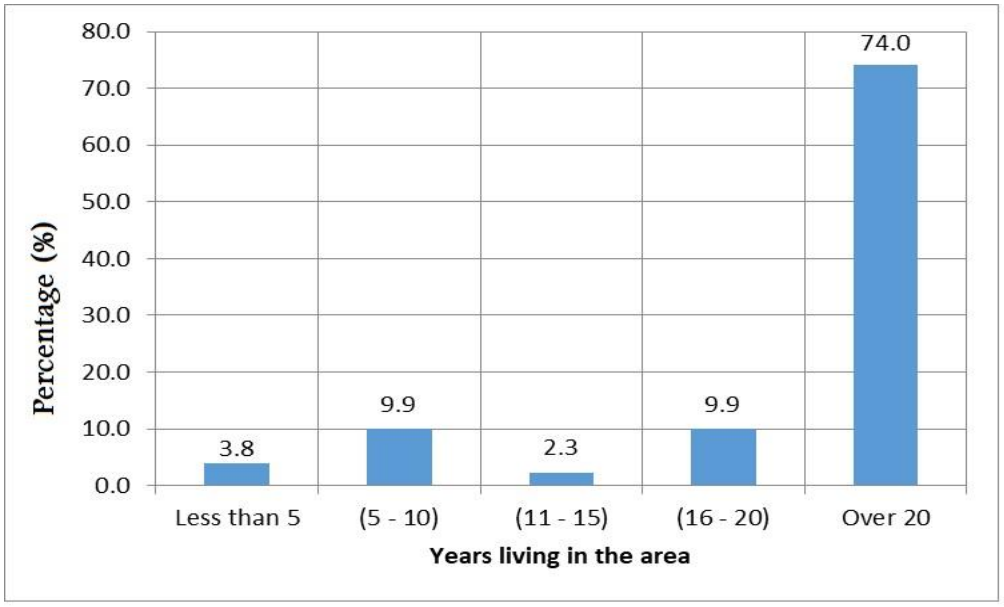

Figure 4.4 Distribution of Respondents according to Years Living in the Study Area

This finding revealed that most respondents had experience of famine and they were the right group to have been engaged in this study.

4.3.8 Land Ownership in the Study Area

Land ownership was vital because it addressed economic status based on land ownership and main source of livelihood of Mandera County residents. This information was key in assessing community vulnerability to drought (Figure 4.5). Vast communal land ownership is important to pastoral communities as it informs their socioeconomic well being and vastness of existing grazing landscapes for livestock.

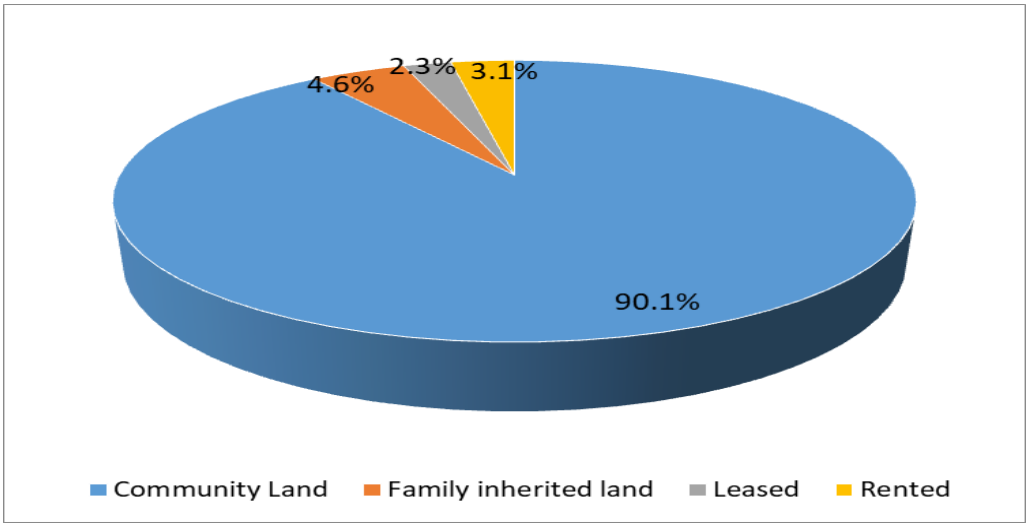

Figure 4.5 Land Ownership in the Study Locale

Vast majority (90.1%) of Mandera County residents dwelled in a community and were pastoralists. The other few were mainly shopping centre dwellers of which 4.6% lived in family inherited plots, 3.1% were in rented houses and 2.3% has leased plots. These findings show an element of drought vulnerability among the residents since the keep moving without much development on the community land. In fact, overgrazing was evident.

4.4 Climate Variability Trend in Mandera County Since 1989

The first objective was to determine climate variability trend of Mandera County since 1989 to the year 2020. The study interrogated the trends in climatic elements of temperature and precipitation since 1989. This study sought to find out scientific evidence if there were notable climatic variations that had led to the residents of Mandera County to a higher vulnerability to drought risk. Objectively, the study relied on the secondary data (Appendix VI) acquired from Kenya Meteorological Department.

4.4.1 Precipitation Monthly Trend Variations Since 1989

The findings on rainfall monthly trend variations since 1989 were as summarised in Figure 4.6.

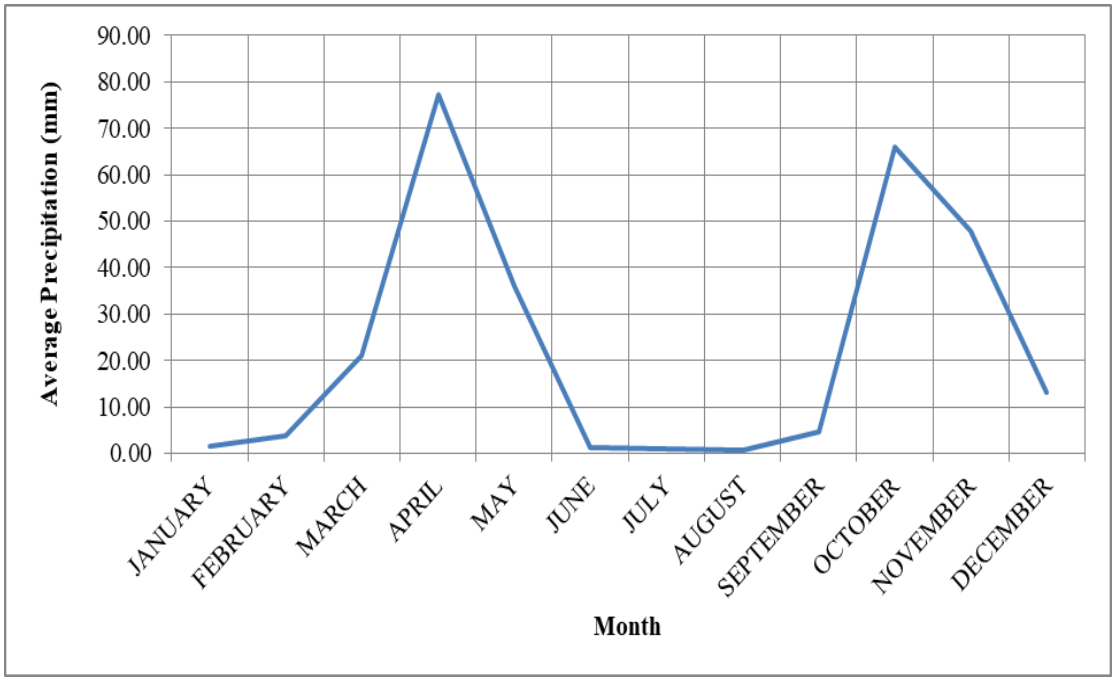

Figure 4.6 Precipitation Average Monthly Trend Variations

The findings (fig.6) demonstrate that Mandera County experiences both dry and wet seasons during specific months. Dry months were recorded from December to March and June to September, while wet months were recorded from March to June and September to December. Maximum rainfall occurred in April and October, with minimal precipitation occurring in January, February, June, and July, with some noticeable fluctuations across the research period illustrating climate change. At the time of the study, September 2019 marked the end of famine and the beginning of torrential rains that devastated sparse vegetation and even bridges, crippling transportation. Climate variability has been seen in many parts of Kenya. A recent study by Ngare et al. (2020) shows a pattern of climate variability in Mombasa that is exacerbated by climate extremes..

4.4.2 Average Temperature Monthly Trend Variations Since 1989

Figure 4.7 presents the average temperature trend for Mandera Meteorological Station.

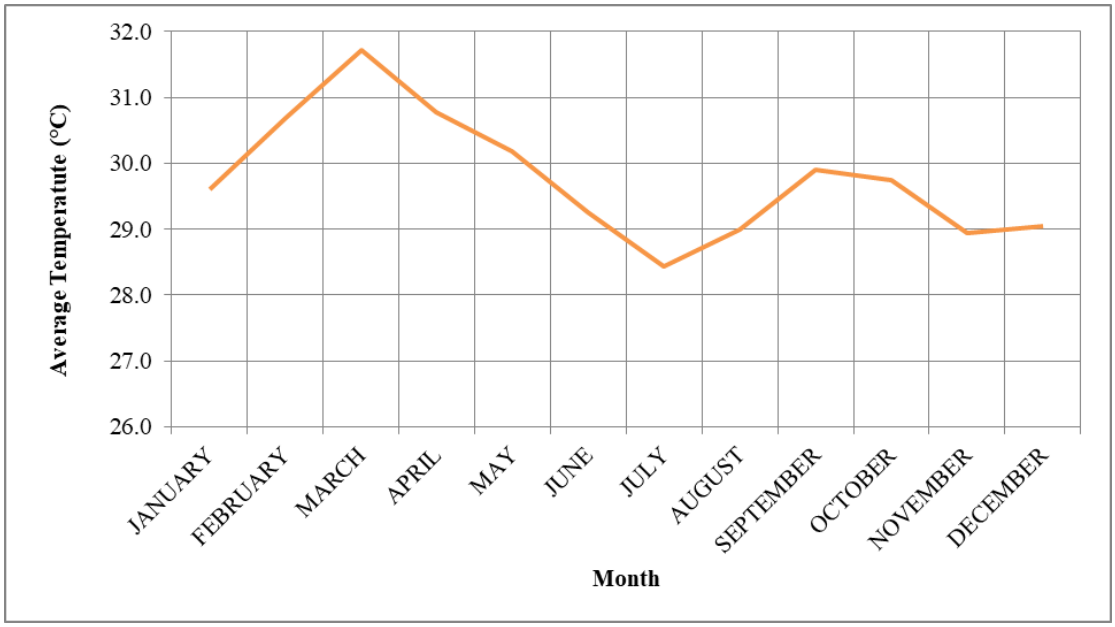

Figure 4.7 Average Monthly Temperatures Trend Variations

The output indicate that the average temperature has a slight increase over the years with some variations in months. For instance;

4.4.3 Precipitation Annual Trend Variations Since 1989

Based on average yearly; precipitation and temperature data as captured by Mandera Meteorological Department there was distinct trend variations. Figure 4.8 and Figure 4.81 give a summary of climatic trend variations. The rainfall trendline show a slight decline of rainfall in the past 30 years (1989-2018). However, the rainfall trend shows a monotonic trend where some years received more rainfall (1997 and 1998) unlike others. This is because of climate variability oscillation index retrospectively witnessed in the past 30 years.

Figure 4.9 shows yearly average temperature for Mandera County. The trendline shows rainfall averages declining slight across the years.

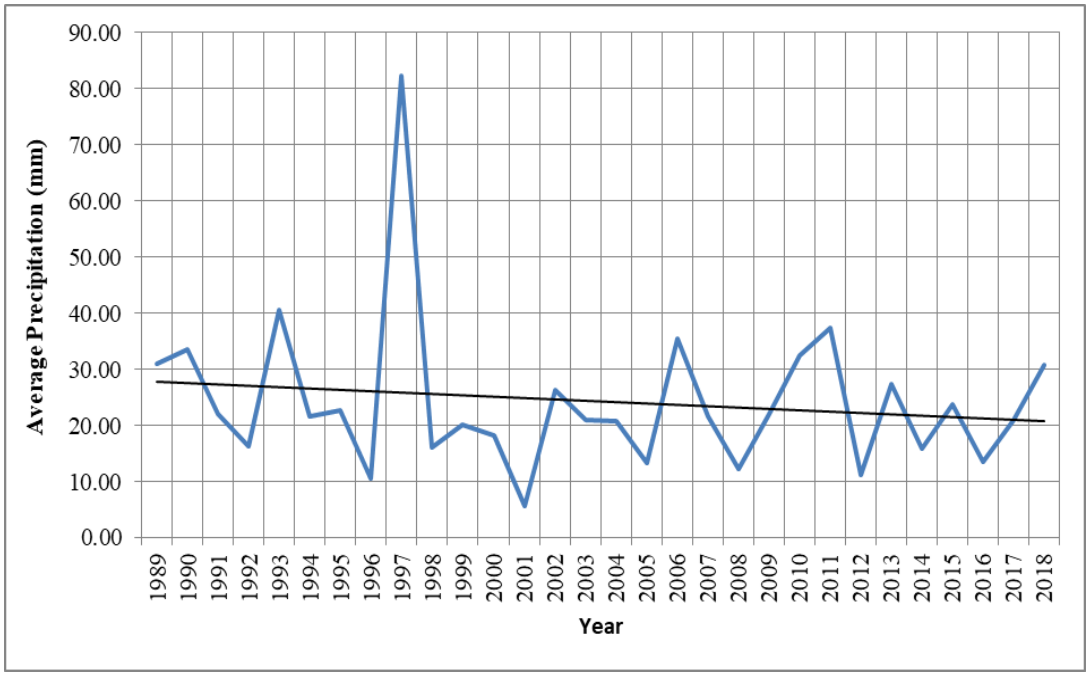

Figure 4.8 Yearly Precipitation Trend Variations

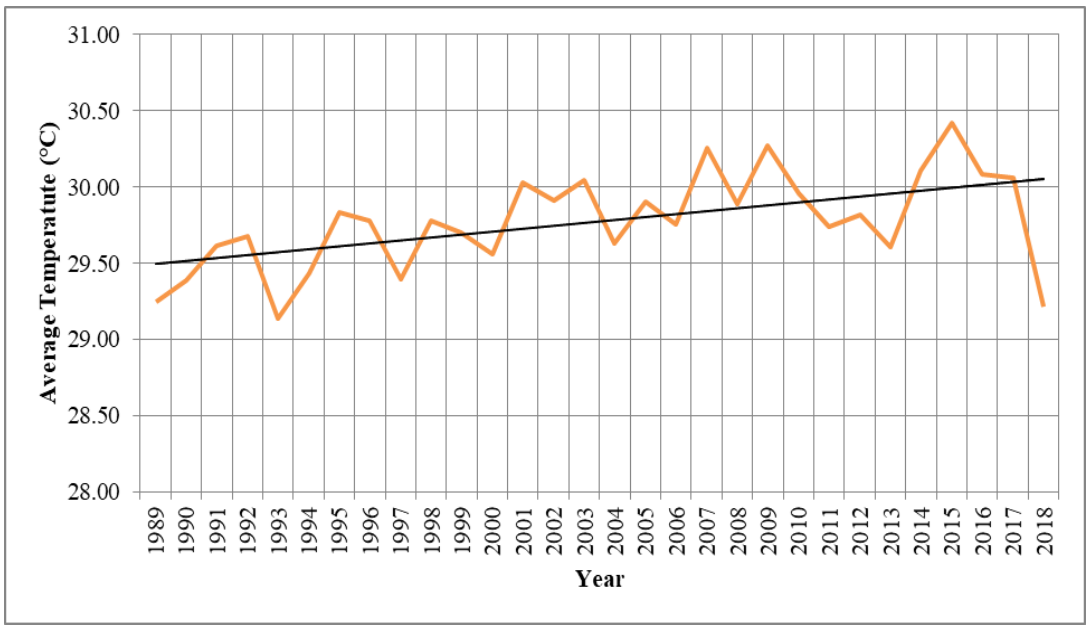

Figure 4.9 Yearly Average Temperature Trend Variations

With the utilization of linear trend, it was evident to change with much anomalies characterized by much rise or fall in all aspects of climate. The findings depict a decreasing average precipitation trend and increasing average temperatures in the study area as describe by equations i and ii.

$$Average\ Precipitation\ (mm) = -0.244245 * \text{Year} + 513.578 \ldots\ldots\ldots\ldots \text{i}$$

$$Average\ Temperature\ (°C) = 0.0192806 * \text{Year} - 8.8538 \ldots\ldots\ldots\ldots\ldots \text{ii}$$

Though precipitation keep decreasing as described by line equation it remained erratic or not significantly described by the outlined equation (i) since R-squared= 0.0240476 and p-value=0.413217. Average temperatures were significantly increasing as described by the linear equation ii where R-Squared were 0.282946 with p-values of 0.0024835**(**Table 4.5)

Table 4.5 Climatic Linear Trend Statistics

Item	**Average Precipitation**		**Average Temperature**	
Term	Year	intercept	Year	intercept
Value	-0.244245	513.578	0.0192806	-8.85381
Std Err	0.294053	589.14	0.0058005	11.6214
t-value	-0.830617	0.871743	3.32395	-0.761853
p-value	0.413217	0.390763	0.0024835	0.452518

It can be shown that the trend in precipitation in the study region is rising with what Trærup and Mertz, (2011), Pauline, Vogel, Grab and Liwenga, (2016) have noticed, both notably due to the growing frequency of the extreme precipitation and drought events from the 1950s on in Africa. The County trend reflects Paavola (2008) to some degree, indicating that precipitation will have fallen by 20% in 2100.Impacts of Drought Hazard on Pastoralist Communities in Mandera.

The second objective investigate the impacts of drought hazards on livelihoods of pastoral communities residing in Mandera County from 1989 to 2019. The study sought the main source of livelihoods of communities living in Mandera County in order to ascertain vulnerability and impact of drought hazard on pastoral communities in Mandera County. This part detailed the common food consumed, source of food, main source of water, livestock population, drought frequency, months of food

insecurity/water scarcity and pasture scarcity and lastly impacts of drought was elaborated.

4.4.4 Common Food Consumed

The percentage frequency of food items consumed in households are summarised in

Figure 4.10, top in the list was grains (58.8%), followed by meat (29.0%) and Vegetables (12.2%).

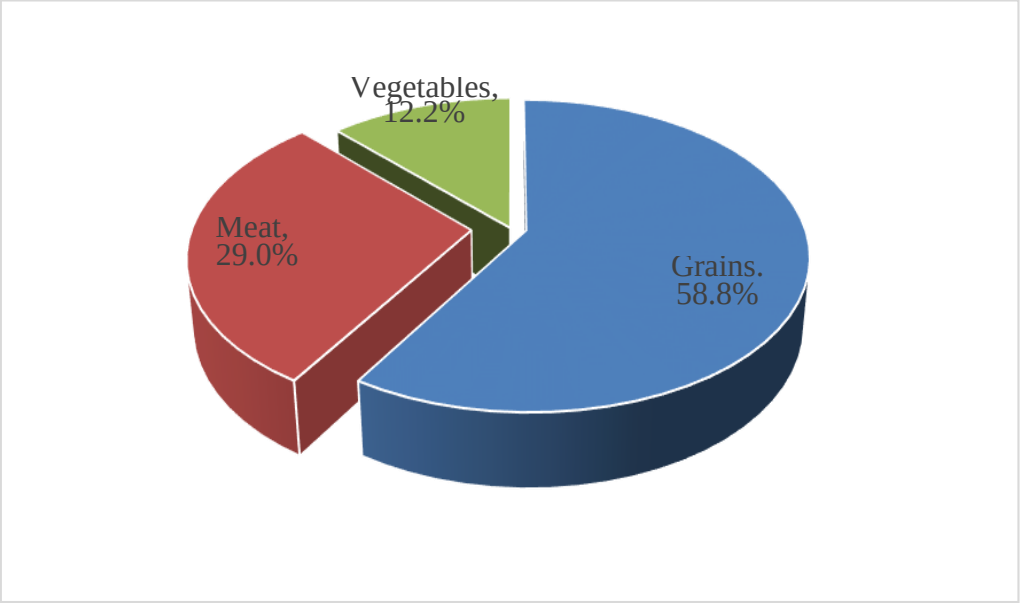

Figure 4.10 Common Food Consumed

4.4.5 Main Source of Food Consumed

Household food security largely depends on livestock for their food requirements. Figure 4.11 is a detailed summary of main source of food findings

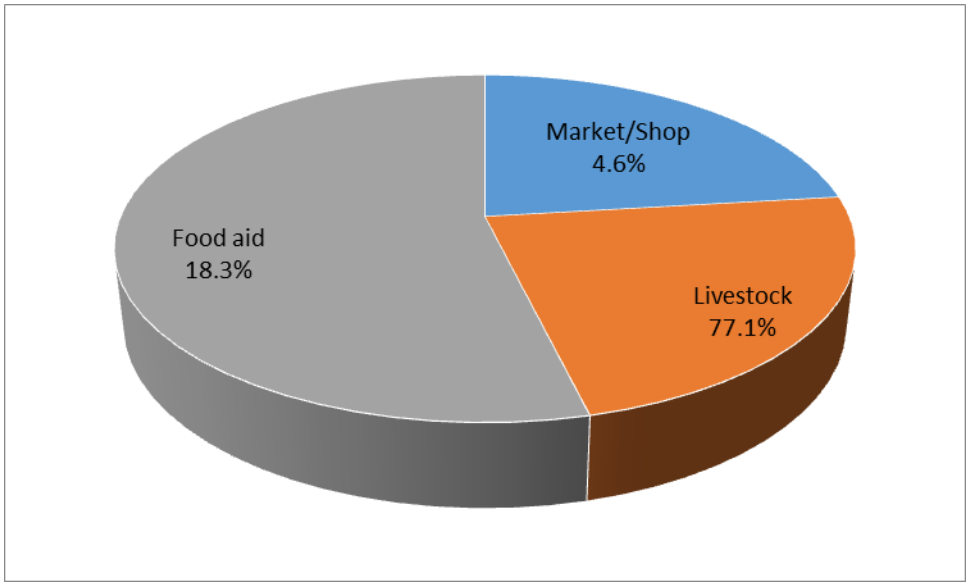

Figure 4.11 Main Sources of Food

Largely, the respondents admitted to rely heavily (77.1%) on livestock for food, 18.3% depended on food aid and 4.6% buy from market/shop. These findings imply that Mandera County residents are vulnerable to drought risk because if their livestock are affected by drought/famine their livelihood are disrupted.

4.4.6 Main Source of Water Used by Households

The study looked at aspects including water sources for households and water availability status. Table 4.6 gives the summary of main sources of water in Mandera County.

Table 4.6 Main Sources of Water Used by Households

Water Source	Frequency (f)	Percentage (%)
Dams	71	54.2
Rivers	33	25.2
Borehole/Piped	22	16.8
Water Harvesting	5	3.8
Total	131	100.0

Findings clearly show that about 54.2% (n=71) of surveyed households depend on dams, 25.2% (n=33) cited rivers, 16.8% (n=22) reported on boreholes and piped water and remaining 3.8% (n=5) stated rain as their main sources of water. These results depict high drought risk vulnerability since their water sources were not reliable for

dams and few seasonal rivers dry up in dry season. During the study's transect walks it was evident that there were few piped waters. Plate 1.1 and 1.2 detailed this finding.

Plate 1. 1: Piped Water at Bulla Mpya

Mandera county government in the year 2014 did this initiative at Bulla Mpya.

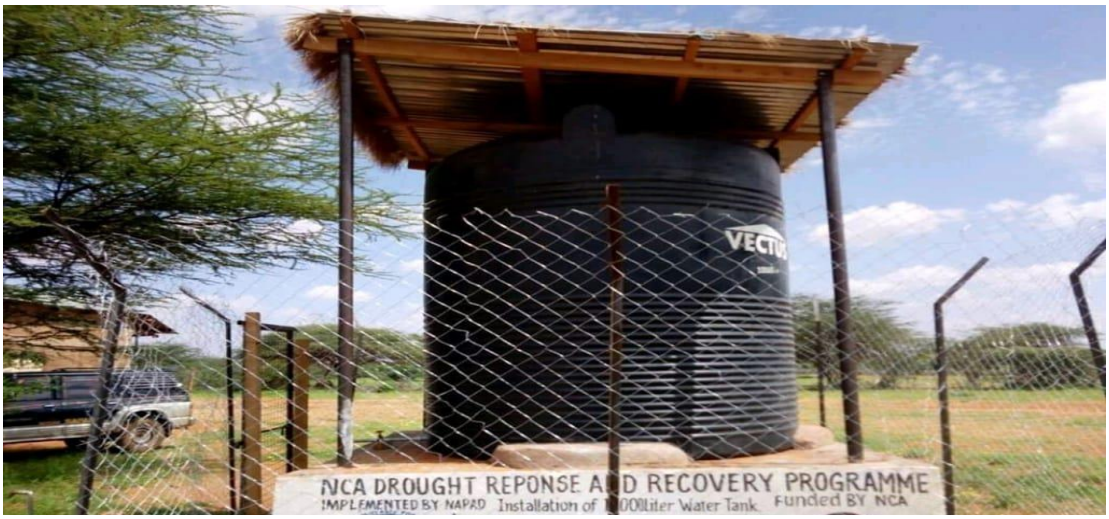

Plate 1. 2: Piped Water at Tarama

4.4.7 Livestock Population and Drought Frequency

The interviewees stated the type and quantity of animals maintained in their homes. The study found that an increasing number of firms-maintained goats, animals and camels. Other animal varieties raised in Mandera by pastoralists include small quantities of sheep, poultry and donkeys. This study consisted of nomadic herders and

their perspectives were thorough, representative and trustworthy in this setting. Table accounted for results of drought frequency as attributed by respondents in Mandera County.

Table 4.7 Drought Frequency in Mandera County

Rate	Frequency (f)	Percentage (%)
Frequently	79	60.3
Occasionally	28	21.4
Always	24	18.3
Total	131	100.0

Based on the frequency of drought/water scarcity experienced by pastoralists in the research villages, 60.3% (79) of participants reported that their areas often suffer drought, 21.4% (28) mentioned that they every now and again experience water shortages, while 18.3% stated their experience on drought/ s in their area. These results show that the local study was frequently affected by droughts and water shortages, which caused a major drought disaster for pastoralists.

In terms of food insecurity months, food insecurity incidences appear to be mostly prevalent in dry season months (Table 4.8).

Table 4.8 Food Insecurity Months

Month	Village							
	Bulla Mpya		Takaba		Tarama		Total	
	F	%	F	%	F	%	F	%
January	4	8.5	2	4.7	12	29.3	18	13.7
February	12	25.5	9	20.9	5	12.2	26	19.8
March	10	21.3	12	27.9	5	12.2	27	20.6
April	6	12.8	5	11.6	5	12.2	16	12.2
July	11	23.4	5	11.6	5	12.2	21	16
August	4	8.5	2	4.7	4	9.8	10	7.6
December	0	0	8	18.6	5	12.2	13	9.9

The most food insecure months were March (20.6%), February (19.8%), July (16.0%), January (13.7%), April (12.2%), December (9.9%) and August (7.6%). The results are that most families don't really have adequately available food that reflects low productivity among the few households which grow their own food and rely on animals for direct dietary needs that increase their risk of drought.

4.4.8 Months of Water Scarcity

Drought is a consequence of prolonged water shortage situations. The respondents were asked to indicate their area's most prevalent water source (Table 4.9

Generally, respondents admitted that Mandera County had water scarcity but the most severe months were January as attributed by 32.8% (43), December as recorded by 29.8% (39), February as noted by 27.5% (36) and March as alleged by 9.9% (13). These findings imply that Mandera County is drought prone area.

Table 4.9. Water Scarcity Months

Village	January		February		March		December		Total	
	F	%	F	%	F	%	F	%	F	%
Bulla Mpya	16	34	15	31.9	4	8.5	12	25.5	47	83.9
Takaba	13	30.2	10	23.3	6	14	14	32.6	43	84.3
Tarama	14	34.1	11	26.8	3	7.3	13	31.7	41	82
Total	43	32.8	36	27.5	13	9.9	39	29.8	131	100

4.4.9 Months of Pasture Scarcity

In order to weigh household's drought vulnerability, the study looked at months of pasture scarcity. The results were as tabulated in Table 4.10.

The month with adverse pasture scarcity is January as indicated by 57 (43.5%) of respondents, followed by December as alleged by 15.3% (20) and then February by 11.5% (15). The other months were; March (8.4%), September (7.6%), October (6.9%) and another 6.9% in November. These findings imply why Mandera County Pastoralists practised nomadism. They admitted that nomadism was their way of life due adverse change in climate, which regulated availability of pasture.

Table 4.10 Pasture Scarcity Months

Month	Village							
	Bulla Mpya		Takaba		Tarama		Total	
	F	%	F	%	F	%	F	%
January	22	46.8	18	41.9	17	41.5	57	43.5
February	4	8.5	7	16.3	4	9.8	15	11.5
March	4	8.5	3	7	4	9.8	11	8.4
September	4	8.5	3	7	3	7.3	10	7.6
October	3	6.4	3	7	3	7.3	9	6.9
November	3	6.4	3	7	3	7.3	9	6.9
December	7	14.9	6	14	7	17.1	20	15.3
Total	**47**	**83.9**	**43**	**84.3**	**41**	**82**	**131**	**100**

4.4.10 Impact of Drought Hazard on Mandera Residents

It is public knowledge that drought impacts may be attributed to a combination of many factors, increase in rainfall variability for instance affects with associated impacts. According to Silvestri et al. (2012), said that changes in the supply of services to the ecosystem and animal health affect the lives of vulnerable people. Trump and Mertz (2011) have shown that rural household production in developed nations is more likely to be unclear and hence exposed to even larger risks as a result of heightened climate variability and accompanying shocks. The climate variability consequences in this research region are stronger since most of the pastors have demonstrated a lack of quality education, rely mainly on herding and the limited agricultural systems have been rainfed and people are less able to adapt to changes and to deal with them adequately. Figure is a summary of drought impacts in Mandera County.

Most respondents were really depressed and narrated series of historic droughts in the region that had caused serious environmental, social and economic problems; claiming lives, destroying livelihoods and rendering them helpless but to rely on food relief. Majority (61.8%) reported dominant impact to be livestock deaths, followed by acute water and pasture scarcity as noted by 16.0%, then 9.2% cited food insecurity leading to malnutrition, 6.9% noted economic impact accruing from food price inflation and 6.1% indicated loss of their relatives/neighbours. These findings unveiled the magnitude of drought impact in Mandera County that called for urgent interventions.

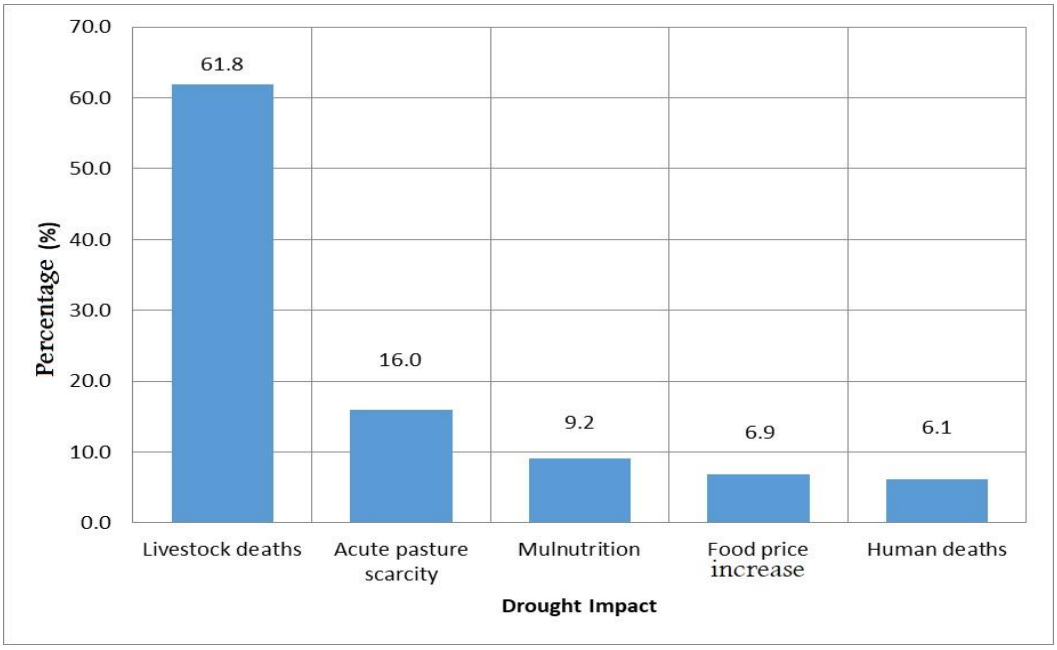

Figure 4.12 Major Drought Impacts

The key informants indicated that many challenges were faced during the post drought period. They stressed that, a fall in fodder/pasture may spur changes in community economic terms due to inflation, fall in livestock productivity and long-distance caravan migration in search of water and or pasture. They noted that some droughts last up to 2 years resulting to deaths to both the livestock and even people. According to the interviewed village leaders and leaders, most animals only conceive and produce during periods of heavy pastures due to reliable rain. They stated that some other wet seasons could trigger flood deaths. In dry seasons, livestock are less designed because of a sluggish and incomplete recovery to peak body weight after the rains and effects on climate change. The research got some evidence of the drought impacts: photograph (plate 1.3) taken during transect walks give this account. In fact, some respondents showed graveyards of their relatives.

© Researcher 2018

Plate 1. 3: Dead livestock at Takaba

4.4.11 Main Causes of the Drought and Impacts

To investigate awareness of respondents about the main causes of drought, the respondents were required to indicate the impact magnitude ranging from low to very high to their livelihoods. It is crucial to know the community's perception on the causes in order to suggest possible coping measures (Table 4.11). A total of 51.9% of the respondents indicated that climate change to a very high degree as the cause of drought impacts, 42.0% was for high degree cause and 6.1% were for medium degree cause. To a medium degree 42.7%, high degree 29.8%, very high degree 18.3% and low degree 9.2% of the respondents perceived that Population growth pressure on natural resources was the major cause of drought and impacts in Mandera. Those who believed that conflict and insecurity among pastoralists was the cause includes; 41.2% to a high degree, 29.0% to a very high degree, 22.1% to a medium degree and 7.6% for low degree. Based on Environmental degradation, 52.7% alleged to a very high

degree, 19.8% affirmed to a low degree, 18.3% to a medium degree and 9.2% were contended with high degree opinion.

Table 4.11 Perceived Causes of Drought and Impacts

Cause	Low		Medium		High		Very High		Total	
	F	%	F	%	F	%	F	%	F	%
Climate Change	0	0.0	8	6.1	55	42.0	68	51.9	131	100.0
Population growth	12	9.2	56	42.7	39	29.8	24	18.3	131	100.0
Conflict & Insecurity	10	7.6	29	22.1	54	41.2	38	29.0	131	100.0
Environmental degradation	26	19.8	24	18.3	12	9.2	69	52.7	131	100.0
Poor health	22	16.8	37	28.2	63	48.1	9	6.9	131	100.0
Overgrazing	12	9.2	15	11.5	48	36.6	56	42.7	131	100.0
Poor planning	0	0.0	22	16.8	85	64.9	24	18.3	131	100.0
Poor water resource management	0	0.0	13	9.9	67	51.1	51	38.9	131	100.0
Social inequalities	36	27.5	91	69.5	4	3.1	0	0.0	131	100.0
Lack of DRR awareness	6	4.6	24	18.3	84	64.1	17	13.0	131	100.0

On poor health limiting pastoralists' productivity, 48.1% maintained to a high degree cause, 28.2% asserted to a moderate degree, 16.8% were for low degree, 6.9% to a very high degree cause of drought. Most of respondents (42.7%) considered detrimental Cultural practices and Overgrazing to a very high degree was the major cause, 36.6% were for high degree, 11.5% to a moderate degree and 9.2% to a low degree.

Poor governance and lack of proper planning was also cited as one of the causes of drought, 64.9% of respondents was for high degree cause, 18.3% to very high degree and 16.8% noted to a moderate degree. 51.1% alleged to a high degree poor water resource management as the cause of drought, 38.9% to a very high degree and 9.9% to a moderate degree. On the other hand, social inequalities were rated moderate or low by 69.5% and 27.5% respondents respectively as the cause of drought and impacts in Mandera County. Lack of drought risk reduction awareness among the residents attracted attention of the respondents as a cause of drought in their locale;

64.1% for a high degree, 18.3% reported medium degree, 13.0% for very high degree and 4.6% attributed to a low degree.

4.5 Opportunities and Constraints for DRR

The third goal was to identify potential disaster risk reduction possibilities in Mandera County. The study collected information from key informants and household participants on drought risk management availability and sources, copying mechanisms, and hurdles to successful drought risk management.

4.5.1 Drought and Risk Management Interventions

Figure 4.13 displays the effects of drought risk management strategies in the different villages evaluated in the county of Mandera.

A majority of 62.6 per cent (82) of respondents said there were interventions in their areas for drought risk management, compared to 26.0 per cent (34) for those who stated that the risk management interventions for drought were not being undertaken. A minor number of 11.5% (15) of respondents did not know of the proximity of drought risk management actions.

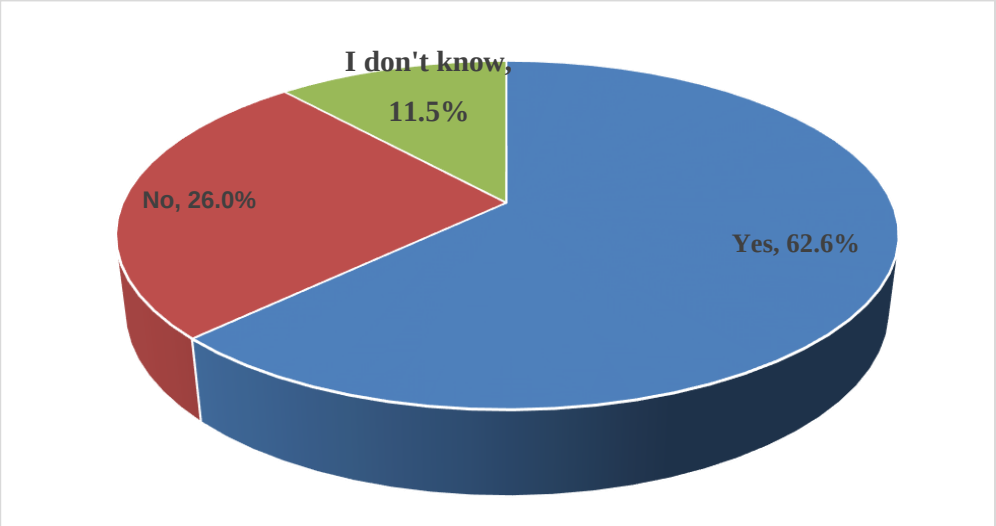

Figure 4.13 The Risk Management Interventions

4.5.2 Sources of Drought Risk Management Interventions

The study investigated how pastoralists manage the drought situation to determine the potential and constraints of Mandera County drought/disaster risk reduction. Risk knowledge relates to personal understanding and processing of danger information (Paton et al., 2006). See results in Figure 4..

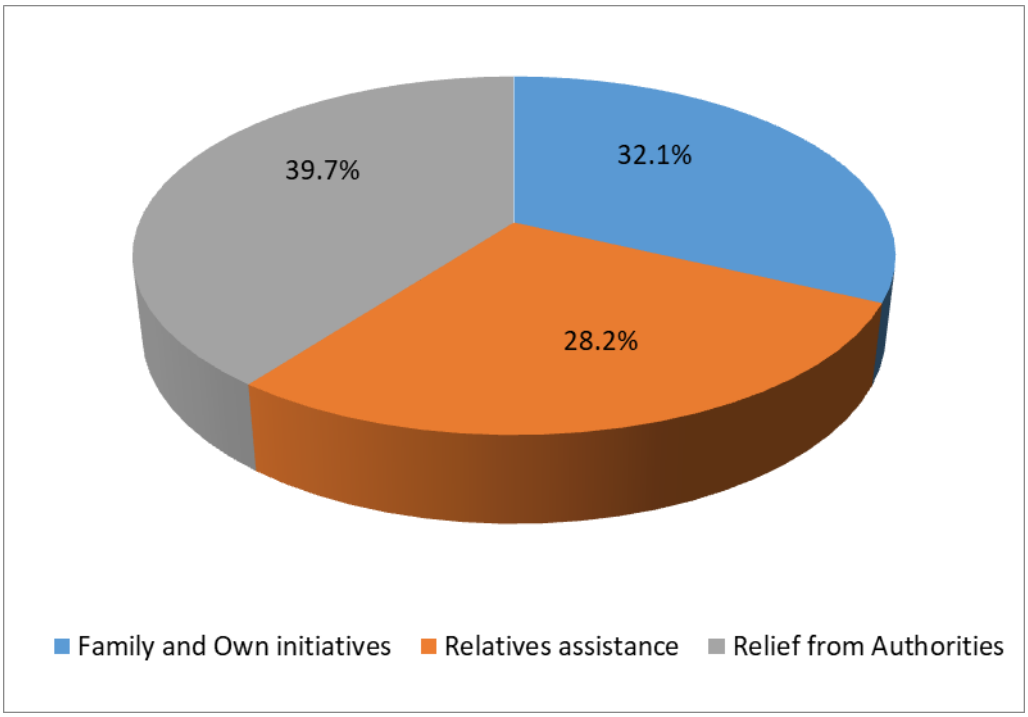

Figure 4.14 Drought Risk Management Interventions

Correspondingly 39.7% of respondents said they received help from the officials about how to get out Taraba of the problem, 32.1 percent said they employed their own initiatives, and 28.2 percent said that they had got the help from family and friends mostly residing outside the area out of the dry matter. *Resilient Mechanisms towards Drought Risk Reduction*

Coping, adjustment and resilience comprise portfolios and avenues for people to achieve their livelihood objectives. The strategies are divided into three basic categories: intensification and extension, diversification and migrations (Nayak et al., 2017). The reason is that the better one knows the hazard process, the better prepared response and preparedness measures are used to reduce vulnerability and hence catastrophe risk (Paton and McLaughlin, 2008; Hansson *et al.*, 2020). Figure 4.15

detailed findings on copying, adaptation and resilient mechanisms employed by Mandera County residents towards drought risk reduction.

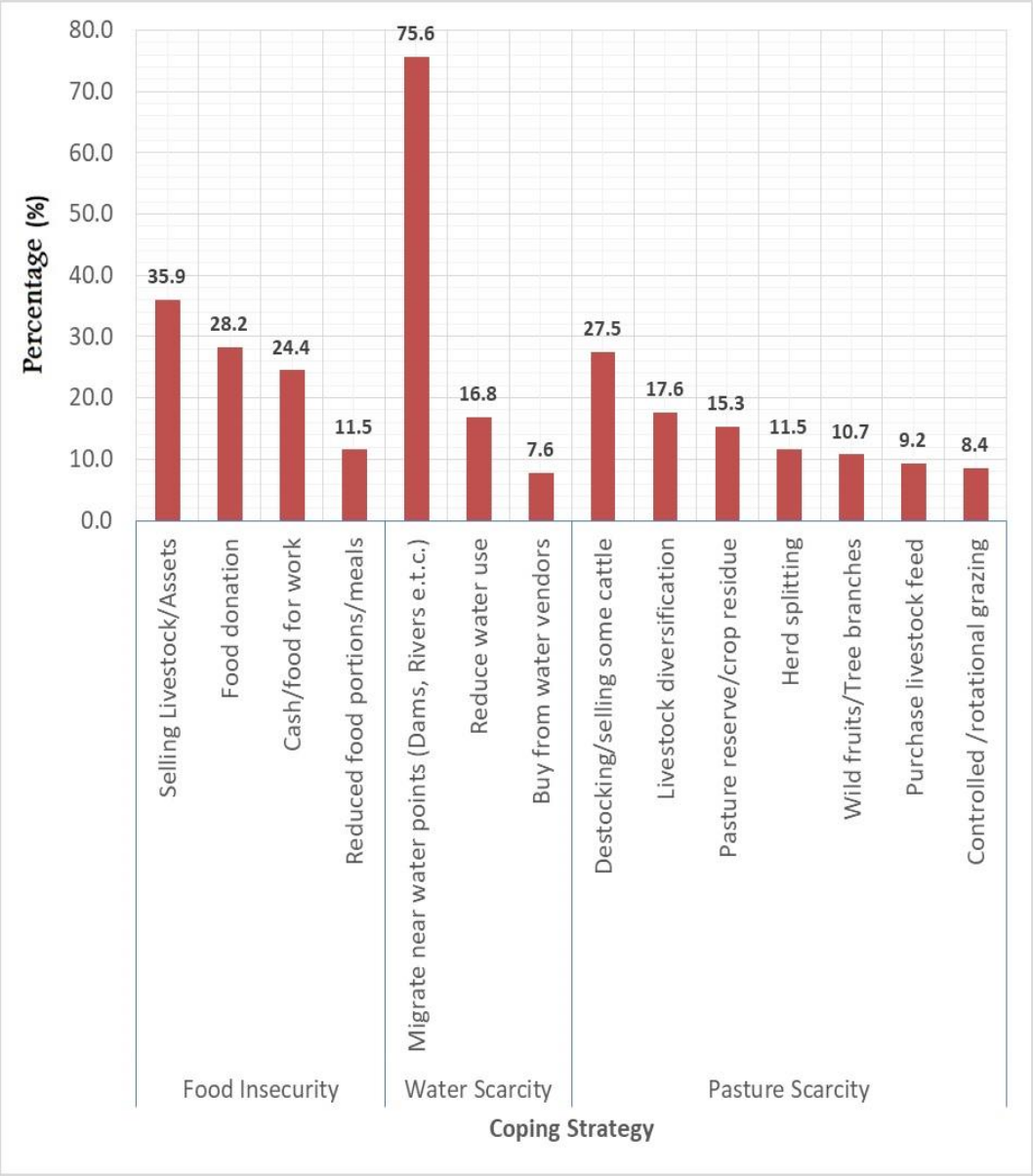

Figure 4.15 Resilient Mechanisms

Based on food insecurity the respondents rank selling of livestock and other assets at the top as attributed by 35.9%, followed by reliance on food aid/donation with 28.2%, then cash or food for work by 24.4% and reduced food portions/meals by 11.5%. Water scarcity were curbed by migration towards water point as reported by 75.6%, reduced water uses as alleged by 16.8% and buying from water venders as suggested by 7.6%.

The problem of pasture scarcity attracted a number of resilient mechanisms ranging from destocking or selling of some livestock as noted by 27.5% of respondents to livestock diversification (rearing of more resistant stock like camels) as suggested by 17.6%. Also, 15.3% reported on the use of pasture reserve and crop residue, 11.5% were for herd splitting, 10.7% suggested desperate measures of using wild fruits/roots and tree branches to feed their livestock, 9.2% opted to buying livestock feed and at the least were 8.4% cited controlled or rotational grazing to avoid overgrazing.

Some of the main informants interviewed commented on copying with the challenges of throughout the drought that herders, Mandera County Government, NGOs reacted to the crisis in a number of previously discussed techniques. The recovery time has been characterized as harder for the less favoured/poor community members, given the majority of their assets are lost during the drought. Drought-prone residents are able to replenish bank savings or animals borrowed from others during drought.

Impediments Hindering Efforts towards Drought Risk Reduction

The study investigates the impediments hindering efforts towards drought risk reduction in Mandera County, the respondents stated and rated what they consider as huddles (Table 4.12)

Table 4.12. Impediments Hindering Efforts towards Drought Risk Reduction

Impediment	Little Extent		Moderate extent		Large Extent		Very Large		Total	
	F	%	F	%	F	%	F	%	F	%
Low/Lack of technical capacity	1	0.8	47	35.9	51	38.9	32	24.4	131	100.0
Poor inter-agency coordination	10	7.6	49	37.4	37	28.2	35	26.7	131	100.0
Lack/Limited funds	0	0.0	22	16.8	60	45.8	49	37.4	131	100.0
Lack/limited DRR measures	11	8.4	63	48.1	46	35.1	11	8.4	131	100.0
Lack/Limited preparedness	1	0.8	11	8.4	74	56.5	45	34.4	131	100.0
Other priorities	8	6.1	28	21.4	91	69.5	4	3.1	131	100.0

The study indicated that most respondents (38.9%) cited Low/Lack of technical capacity at the local level, followed by 35.9% moderate, 24.4 % extremely large, and

0.8 % minor. Poor inter-agency coordination and political will was cited as a hindrance by up to 37.4% of respondents, 28.2% by large, 26.72% by very large, and 7.6% by little. Also, 45.8% acknowledged very much, 37.4% acknowledged very much, and 16.8% acknowledged somewhat the lack of drought mitigation money. In most cases 48.1% of respondents suggested that the measures for reducing risk of drought were in a very moderate way a barrier, 35.1 percent to a significant extent and 8.4%, for very big and small amounts correspondingly. With regard to the unrestricted relation between readiness, advance detection and better communication strategies, 56.5 percent maintained a significant barrier, 34.4 percent claimed to be very extensive, 8.4% was moderate and 0.8 percent to a small level. Other Mandera County priorities have been recognized as a hindrance to 69.5% of respondents to a big degree, 21.4% to a moderate degree, 6.1% to a small degree, and 3.1% to a really significant level. Institutional Capacity in Improving Pastoral Communities' Resilience to Drought Risk

The fourth objective of the study was to evaluate institutional capacity in improving pastoral societies' resilience to Drought Disaster and their capacity for action in Mandera County. This part addressed availability, nature, rating and effectiveness of the support offered by people/institutions especially during droughts.

4.5.3 Availability of People/Institutions Support during Drought Disasters in Mandera County

The household survey results indicated that 93.1% (n=122) agreed to seek and got support from available institutions and on the other hand 6.9% (n=9) reiterated. Figure 4.16 and Table 4.13 presents the findings.

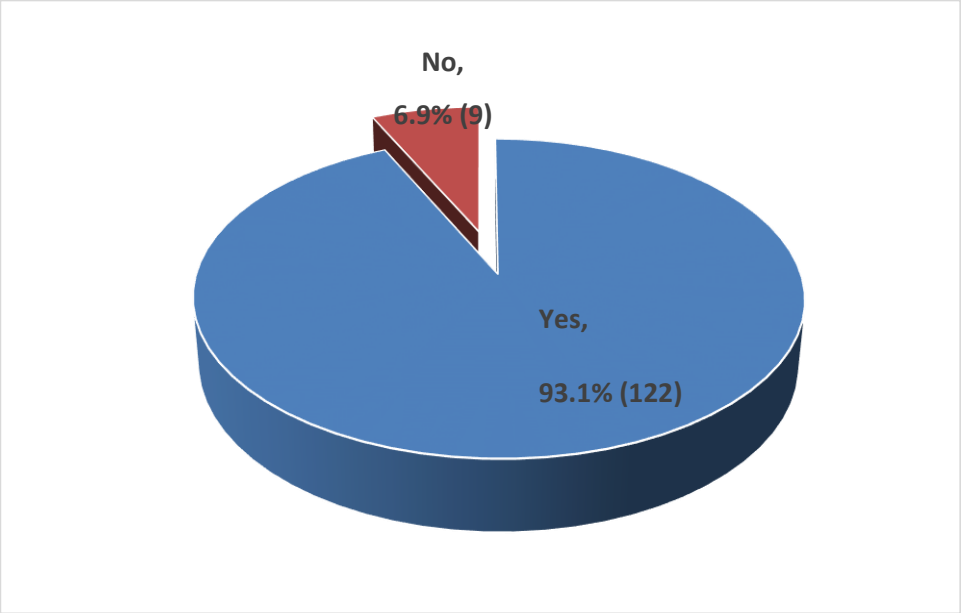

Figure 4.16Availability of People/Institutions Support

People often turn to village chiefs, county governments, local NGOs, civil society organizations (CSOs), and international NGOs for assistance, according to key informants, household survey respondents, and key informants.

Table 4.13 Institutions Offering Support

Institutions offering support	Frequency (F)	Percent (%)
County Government of Mandera	30	22.9
Islamic Relief	26	19.8
Livestock Resilience Program	18	13.7
National Drought Management Authority	18	13.7
RACIDA	18	13.7
Community Based Organisation	8	6.1
Kenya Red Cross	6	4.6
NCA	4	3.1
Civil society	3	2.3
Total	**131**	**100.0**

Household survey rank County Government of Mandera to be the to be the main source offering support to them as attributed by 22.9%, followed closely by Islamic relief as reported by 19.8%, livestock Resilience Programme, National Drought Management Authority and RACIDA comes third as cited by 13.7% for each. The other institutions were; Community Based Organization, Kenya Red Cross, National drought management authority and Civil society with 6.1%, 4.6%, 3.1% and 2.3%

respondents backing respectively. This is also observed by Stayi et al. (2021) on socioeconomic improvement and support to agropastoral by external organization

4.5.4 Nature and Rating of People/Institutions' Support during Drought Disasters in Mandera County

Table 4.14 details the types of support provided by the selected institutions.

Table 4.14 Support Nature and Rating

Nature of Support	Rating							
	Low		Medium		High		Total	
	F	%	F	%	F	%	F	%
General support	5	13.2	26	68.4	7	18.4	38	29.0
Social	11	27.5	22	55.0	7	17.5	40	30.5
Financial	20	37.7	28	52.8	5	9.4	53	40.5

Based on the nature of support financial aid top the list as reported by 40.5%, then social support as identified by 30.5% and finally general support as suggested by 29.0% of the respondents. Majority (58.0%) of the respondents gave medium degree on overall rating of these support aspects, followed by medium as testified by 27.5% and very high rating as recounted by 14.5 % of the respondents.

4.5.5 Effectiveness of Approaches Employed by People/Institutions during Drought Disasters in Mandera County

The study also aimed at examining the effectiveness of the whole building process as a dry-risk decrease in investment in Mandera County in the perspective of mitigation strategies adopted by the various cited organisations.

From the study, majority 62.6%, ,77.1% and 81.7% of the respondents affirmed that direct cattle buying, animal traders using microfinance, support pastoralists start income generating activities and allocate food security fund respectively were effective in influencing drought disaster risk reduction in Mandera County.

Table 4.15 Effect of Rehabilitation Mechanisms in Mitigation of Drought

Approach	Not	Less	Undecided	Effective	Very	Total

	Effective		Effective						Effective			
	F	%	F	%	F	%	F	%	F	%	F	%
Direct livestock purchase	0	0.0	24	18.3	11	8.4	82	62.6	14	10.7	131	100.0
Transport subsidy to traders	50	38.2	30	22.9	6	4.6	41	31.3	4	3.1	131	100.0
Micro-financing traders	5	3.8	6	4.6	6	4.6	82	62.6	32	24.4	131	100.0
Water harvesting	21	16.0	20	15.3	20	15.3	52	39.7	18	13.7	131	100.0
Support pastoralists	0	0.0	0	0.0	0	0.0	101	77.1	30	22.9	131	100.0
Promote agro-marketing	0	0.0	0	0.0	0	0.0	102	77.9	29	22.1	131	100.0
Allocate food security fund	0	0.0	0	0.0	6	4.6	107	81.7	18	13.7	131	100.0

Transport subsidy to livestock traders and water harvesting and storage were reported to be working but with less magnitude as compared to the former as detailed in Table 4.15.

4.6 State of Disaster Risk Reduction in the County

The research sought Mandera County situational analysis to ascertain the dependent variable (Disaster risk reduction). Household survey gave rise to information summarized in Table 4.16.

The findings implied, majority 68.7%, 61.8% and 63.4% of the respondents' rate to a little extent that there were; awareness and knowledge shared among residents, drought risk identification and early warning mechanism in place and an effective and affordable practices of drought mitigation and preparedness respectively. With regard to drought policy framework (political commitment and responsibilities) majority 71.8% rate it to a moderate extent as the remaining lot attracted varied opinions. The

least rated to no extent was inter-agency coordination as noted by 67.2% though a few 32.1% rated to a little extent.

Table 4.16 Disaster Risk Analysis and Risk Reduction in Mandera County

Situation	No Extent		Little Extent		Moderate extent		Great Extent		Total	
	F	%	F	%	F	%	F	%	F	%
There is awareness	6	4.6	90	68.7	30	22.9	5	3.8	131	100.0
There is early warning mechanism	26	19.8	81	61.8	24	18.3	0	0.0	131	100.0
There is drought policy framework	6	4.6	20	15.3	94	71.8	11	8.4	131	100.0
There are effective and affordable practices	10	7.6	83	63.4	19	14.5	19	14.5	131	100.0
There is inter-agency coordination	88	67.2	42	32.1	0	0.0	1	0.8	131	100.0

4.7 Disaster Risk Reduction Inferential Statistics in Mandera County

Melville and Goddard (1968) employ the chi-square to test two category variables' dependence. The study tried to understand the link between dependent and qualitative variables using inferential statistics such as correlation and chi-square test. Inferential statistics is used to discover the relationship among variables, differences between subgroups, and how multiple independent variables explain the dependent variable (Sekaran, 1992).

4.8 Chi-square Descriptive Analysis

It is public knowledge that Drought Disaster Risk may be considerably reduced by early and pro-active strategies that strive to lessen vulnerability and exposure to hazards rather than reactive strategies such as humanitarian responses to disasters. The study's hypothesis is that Drought shocks have no association with effective and affordable practices of drought mitigation and preparedness in Mandera County. Chi-square descriptive analysis was as presented (Table 4.17).

Table 4.17 Chi-square Descriptive Analysis

		To extent	To nolittle extent	aTo moderate extent	a To a great extent	Total
Low	Count	1	5	0	2	8
	Expected	.6	5.1	1.2	1.2	8.0
	%Within climate Change	12.5%	62.5%	0.0%	25.0%	100.0%
Medium	Count	6	35	8	6	55
	Expected	4.2	34.8	8.0	8.0	55.0
	%within climate Change	10.9%	63.6%	14.5%	10.9%	100.0%
High	Count	3	43	11	11	68
	Expected	5.2	43.1	9.9	9.9	68.0
	%Within climate Change	4.4%	63.2%	16.2%	16.2%	100.0%
Total	**Count**	**10**	**83**	**19**	**19**	**131**
	Expected	**10.0**	**83.0**	**19.0**	**19.0**	**131.0**
	%Within climate Change	**7.6%**	**63.4%**	**14.5%**	**14.5%**	**100.0%**

The two-way contingency table was conducted to evaluate whether climate change as drought causes was associated to effective and affordable practices of drought mitigation and preparedness. The climate change has three levels (Medium, high and very high) whereas drought mitigation and preparedness had four levels of effectiveness. Majority of the respondents attribute climate change as the main cause to a very high extent and effective practices of drought mitigation and preparedness at 43 (63.2%).

4.9 Inferential Statistics Analysis

H_0: Drought shocks has no association with effective and affordable practices of drought mitigation and preparedness in Mandera County

Table 4.18 Inferential Analysis

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	4.468[a]	6	.614	.624
Likelihood Ratio	5.591	6	.470	.574
Fisher's Exact Test	4.764			.533
N of Valid Cases	131			

The cause of drought risk and the effective, cost-effective strategies of drought mitigation and preparedness were not significantly related to global warming; X2 (6, N=131) = 4,468a, P=0,624. Fisher's Exact Test, p=0.533, indicated that the two variables are not statistically associated. The Chi-square independence test, however, exemplifies a breach of assumption that all cells should just have predicted counts greater than or equal to 5 as shown in Table 4.18 (33.3 percent) showing an expected count of 4 cells less than 5, meaning that the sample size is not sufficient to run a Chi-square Independence Test that can optimize the likelihood of causing wrong decisions (Kroonenberg and Verbeck, 2018).Both phi and Cramer's V have reported the precise significance of P=0.624, which implies that the hypothesis is null and that there is a notable link between climate change as the reason for the risk of drought disasters and effective and affordable dryness mitigation and preparedness activities.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The research project's findings, conclusions, and recommendations are summarized in this chapter.

5.2 Summary of the Findings

The first objective of the study was to interrogate trends in climatic elements of temperature and precipitation since 1989 in Mandera County. The results show increase in average maximum temperature overtime. However, some months had temperature fluctuations. The maximum temperature had also risen overtime. The annual total precipitation was decreasing across the trend. From the results, rainfall and temperature anomalies were observed in Mandera County.

Secondly, the study sought to determine the impact of drought on the livelihoods of pastoral communities in the county of Mandera. The study indicated that the vast majority of respondents owned animals and had to deal with drought on a regular basis. Drought caused cattle mortality, acute pasture scarcity, a spike in food prices, and the deaths of humans. Livestock deaths were a severe drought impact in the area, with acute pasture scarcity having an immediate effect on pastoralists. According to these consequences, the vast majority of respondents believed that climate change had made things worse for them.

The third objective of the study was to explore opportunities and constraints for disaster risk reduction. The survey found that most respondents highlighted low/lack of local technical competence as a major barrier to reducing drought risk. Poor inter-agency coordination and political will were also mentioned up by respondents. Some responders said lack of/limited drought risk reduction strategies was a hindrance. The absence of/limited relationship between readiness, early warning, and early response was major hurdle.

The fourth purpose of the study was to examine the capacity of institutions to improve the resilience of pastoral societies to drought disasters and their ability to act. It was customary for people to seek village leaders, chiefs, county governments, local non-

governmental organizations, CSOs, and International Non-Governmental Organizations (NGO) for assistance. It was followed by livestock Resilience Program, which was supported by Islamic relief. The most prevalent form of aid they received was major financial assistance. Others said they had gotten social help, as well. According to the statistics, the majority of respondents were satisfied with the assistance they had received.

5.3 Conclusion

Consequential climate change vagaries have proliferated overtime with noted climate variability effect in Mandera County where from the retrospective study of rainfall and temperature study. The notable climatic changes have intensified overtime that affects the socio wellbeing of pastoral activities with change of weather patterns in the area that is no longer predictable.

Drought impact has proliferated in Mandera that not only affect livestock but endangers the lives of the pastoral communities. These communities practise pastoralism as a primary economic activity as their source of livelihood. However, this keeps plunging as more deaths of livestock is witnessed, difficulty on access to reliable pastures to better their livestock. With this drought impact, the foot security model is become chronic within its access, availability and affordability.

Even with drought vulnerabilities in pastoral communities especially in Mandera County, we need proper holistic support and knowledge to mitigate this recurrent and emerging effects. For the pastoral communities to curb or reduce surging drought impacts, they need government and county government support to build sustainable resilient. This can be through education and transitioning to sustainable pastoral practices that can withstand perennial droughts.

Finally, giving support to pastoralist in the event of drought is not the solution to problem. Money or financial aid cannot save pastoralist from drought but rather building capacities that are sustainable. Proper climate smart models like water access to livestock should have delt with for proper mitigation drought shocks in ASAL areas that are being heightened by climatic changes.

5.4 Recommendations

The following recommendations were made from the findings:

1. Develop proper climatic changes prediction models in ASALs especially in Mandera County to ascertain season variation through projection for preparedness of pastoral communities. Developing a drought management strategy based on early warning systems that provide manageable risks within pastoral communities.
2. Establish proper and sustainable pastoralism model for pastoral communities towards mitigation of perennial droughts that impair their lifestyles when they occur.
3. Encourage pastoral communities in Mandera County to engage in other socioeconomic activities that are drought resilient unlike pastoralism that is vulnerable to drought impacts.
4. Build capacities among pastoral communities to be drought resilient rather than provision of financial aid when drought strikes. This could solve drought problematic effects in the future.

5.5 Areas for Further Studies

In view of the gaps identified by the study there is need to examine the following areas in detail:

1. Establish the role of indigenous pastoral education in management of drought in disaster risk reduction in a different setting in Kenya.

2. Ascertain importance of incorporating smart pastoral practices towards climate change and risk mitigation.

3. Determination early disaster warning systems among pastoral communities in ASAL climate change sensitive areas.

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APPENDICES

APPENDIX I: QUESTIONNAIRE FOR HOUSEHOLD MEMBERS

Introduction

Date:	Questionnaire No:		
Constituency:	Ward:		
Village:	GPS Points:	Northing's	
		Easting's	

This questionnaire is designed purposely for academic work to assess "**Disaster Risk Reduction Interventions for Enhancing Resilience among Pastoral Communities of Mandera County, Kenya**" Kindly respond to **ALL** questions.

SECTION A: DEMOGRAPHIC OF RESPONDENT

1. What is your Gender?

   Male ☐ Female ☐

2. What age bracket do you fall in?

   Less than 20 Years ☐ 20-29 years ☐ 30-39 years ☐

   40-49 years ☐ 50-59 years ☐ Over 60 Years ☐

3. What is your marital status?

   Married ☐ Single ☐

   Divorced ☐ Widowed ☐

4. What is your family set-up?

   Polygamous ☐ Monogamous ☐

5. What is your highest level of education attained?

   ☐ ☐ ☐

Primary Secondary Tertiary College

University ☐ No formal education ☐

Other(Specify): _____

6. What is the size of your household/nuclear family?

Less than 2 ☐ 3 – 6 ☐ 7 – 10 ☐ 11 – 14 ☐ Above 1☐

7. What is your main occupation?

Herder ☐ Farmer ☐ Pastoralist ☐

Business ☐ Wage Employment ☐

Other (Specify):

_____

8. What is your Ethnicity/clan?

Gharrre ☐ Degodia ☐ Morule ☐

Other ☐

Other (Specify): _____

9. How long have you lived in this area?

Born Here ☐ Below 5 Yrs 5 – ☐ ☐

11 – 15 Yrs ☐ 16 – 20 Yrss ☐ Over 20 Yrs ☐

10. What type of ownership is your resident land?

Community land ☐ Family inherited land ☐ Leased ☐

Rented ☐

Other (Specify): _____

SECTION B: DROUGHT IMPACTS, CAUSES AND VULNERABILITY OF PASTORAL COMMUNITIES

11. Please specify the type and quantity of animals kept in your household?

Type	**Number**
Cattle	
Sheep	
Goats	
Camels	
Donkeys	
Poultry	
Others (Specify……)	

12. What is your common food consumed in your area?

Grains ☐ Legumes ☐ Meat ☐ Blood ☐

Vegetables ☐ Bananas ☐

Other (Specify) _____

13. Which is the main source of food items consumed here?

Market/shop ☐ Livestock ☐ Home-grown ☐

Food Aid ☐

Other (Specify) _____

14. What is the source of water common at the household?

Dams ☐ River ☐ Borehole ☐ Piped ☐

Rain ☐ Other (Specify) _____

15. How often do you encounter drought in this area??

Always ☐ Frequently ☐ Occasionally ☐

Rarely ☐ Never ☐

16. Which month(s) do you experience food insecurity/water scarcity/pasture scarcity incidents?

Month	Food Insecurity	Water scarcity	Pasture Scarcity	Other Incidents
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				

17. What did the drought shock cause to your household?

Livestock Deaths ☐ Food price inflation ☐

Acute water shortage ☐ Acute pasture scarcity ☐

Human deaths ☐ Malnutrition ☐

18. What do you think are the main cause of these droughts impacts?

Kindly put a tick to rate this cause in relation to your situation

Key: 1 = LOW: Unlikely to cause much impact, 2 = MEDIUM: Limited in scale and recovery is swift, 3 = HIGH: Cause widespread and long lasting

Cause	Agreement Scale		
	1	2	3
Climate Change (High temperature, high winds, low relative humidity, greater sunshine, less cloud cover, precipitation deficiency, reduced infiltration etc.			
Population growth pressures on natural resources			
Conflict and insecurity among pastoral communities in Mandera County			
Environmental degradation (e.g., Loss of top soil, deforestation)			
Poor health limiting household productivity			
Detrimental cultural practices (e.g., Overgrazing)			
Poor governance (e.g., Inability of the vulnerable communities to influence government decision making)			
Poor water resource management			
Social inequalities (e.g., between the rich and poor or between men and women)			
Lack of access by communities to information on Drought Risk Reduction			
Other (specify and rate)			

SECTION C: OPPORTUNITIES AND CONSTRAINTS FOR DISASTER RISK REDUCTION IN MANDERA COUNTY

19. What is your copying, adaptation and resilient mechanisms towards drought risk reduction?

Risk	Strategy/Mechanism	Rank
	Selling Livestock/Assets	
	Food donation	

Food Insecurity	Cash/food for work	
	Reduced food portions/meals	
	Other (Specify)	
Water Scarcity	Migrate near water points (Dams, Rivers etc.)	
	Reduce water use	
	Buy from water vendors	
	Other (Specify)	
Pasture Scarcity	Destocking/selling some cattle	
	Livestock diversification	
	Pasture reserve/crop residue	
	Herd splitting	
	Wild fruits/Tree branches	
	Purchase livestock feed	
	Other (Specify)	

20. What do you consider as impediments hindering efforts towards drought risk reduction in Mandera County?

Use the Likert scale of 1 to 5.

where 1= no extent,

2= little extent,

3= moderate extent,

4= large extent and,

5 is to a very large extent.

Barriers to Addressing Causes of Drought Impacts	**1**	**2**	**3**	**4**	**5**
Low/lack of technical capacity at the local level					

Poor Inter-agency coordination or political will					
Lack or limited drought mitigation funds					
Lack or limited awareness of drought risk reduction measures among the residents					
Lack of early prepared warning systems					
Other priorities of Mandera County Government					
Other (Specify……)					

21. Have you been involved in Drought Risk Reduction plan?

Yes ☐ No ☐

What drought contingencies are the pastoral communities engaging in reducing the danger of drought disasters in Mandera County?……

……

……

…

SECTION D: INSTITUTIONAL CAPACITY IN IMPROVING PASTORAL COMMUNITIES' RESILIENCE TO DISASTER RISK REDUCTION IN MANDERA COUNTY

22. Do you know of any/people Institutions that have support you during drought disasters?

Yes ☐ No ☐

23. Kindly tick and name those institutions/people?

(State their support)

Category	Institution Name	Nature of Support (Financial, Social, Legal,

		Infrastructural or Agri-input)
Local Government		
National Government		
Community Based Organization (CBO)		
Local Non-Governmental Organization (Local NGO)		
International Non-Governmental Organization (International NGO)		

24. How do you rate the assistance given by people and/or institutions you noted above?

People/Institution Name	Rating				
	Very Low	Low	Medium	High	Very High

25. How can you assess the efficiency of the following techniques in the Mandera County??

Intervention	Not effective	Less Effective	Undecided	Effective	Very effective
Direct livestock purchase					
Transport subsidy for livestock traders					
Micro financing livestock traders					
Water harvesting					

Income generation					
Capacity building					
Agro-marketing					
Food security					
Other (Specify……)					

In the County, which components of drought relief strategies should be strengthened in disaster risk reduction?

Explain……

……

……

……

……

……

……

……

SECTION E: SITUATION OF DISASTER RISK REDUCTION To what degree is the situation of Drought Disaster Risk Reduction in Mandera County?

Situation	**To no extent**	**To a little extent**	**To a moderate extent**	**To a great extent**	**To a very great extent**
There is awareness and knowledge shared (A well informed public and participatory process)					

There is drought risk identification and early warning mechanism in place					
There is drought policy framework (s) (Political commitment and responsibilities)					
There are effective and affordable practices of drought mitigation and preparedness.					
There is inter-agency coordination					

THANK YOU!!!

APPENDIX II: INTERVIEW GUIDE FOR KEY INFORMANTS

1. What do you understand of drought?

2. How does drought affect the household?

3. What indigenous methods do use to mitigate drought To a?

4. What are your main challenged during post drought?

5. What is your drought coping mechanisms?

6. How would you describe government and development agencies' work in this field to facilitate coping and recovery policies??

7. What are some policy problems to be addressed to lessen the risk of drought in the pastoral household??

APPENDIX III: INTERVIEW SCHEDULE FOR INSTITUTIONAL BODIES

Interviewer……

Date……Start Time……

Background Information

Organization……Designation……

Project's Role

1. What is your project's mandate, mission and vision here in Mandera?

2. For how long has this organization been in existence?

3. What is the organization's expertise and experience?

4. Give examples of your organization's achievements in reducing risks.

Disaster Risk Reduction (DRR)

1. What disasters have occurred in Mandera within the last 30 years? List them.

2. What is the nature and behaviour of the recurrent hazards in Mandera?

3. What is the frequency of the aforementioned disasters?

4. Are there any changes in the characteristics of these disasters for the last thirty (30) years; if so, in what ways?

5. Who is the most vulnerable in the community by the impact of the climate-related hazards? In what ways?

6. What mechanisms do you have for assessing hazard, vulnerability and risk in your projects?

7. What challenges are encountered in administering Disaster Risk Reduction measures in Mandera?

8. What would you propose to improve Disaster Risk Reduction and Drought Early warning in the County?

Local capacities

1. Is there indigenous knowledge in Disaster Risk Reduction by communities residing in Mandera?

2. What lessons, if any, have you gained from residents in order to avert and lessen risk?

3. In your opinion, what ways have the local communities have gained from your undertakings?

Government intervention

What is your opinion about the states capability to respond to potential disasters in terms of?

1. Implementation of legislation and follow-up

2. Human capacity including knowledge and skills

Adequacy of infrastructure and monetary resources to support Disaster Risk Reduction

Drought Disaster Risk

1. How does drought rank amongst the hazards?

2. What are the drought Disaster Risk Reduction mechanisms being practiced by your organization?

3. Are the communities engaged in the implementation? Give examples.

4. How effective are your interventions pertaining the drought Disaster Risk Reduction?

5. **Early warning systems (EWS)**

1. What EWS mechanisms are in place?

2. What information is made available to the community (when, how and frequency)?

3. How are Early Warning messages shared and by who?

4. Are the EWS in the County adequate? If not, what would you recommend to improve?

Public Participation

1. To what extent are the views of affected people incorporated in the Disaster Risk Reduction process? Do they influence the final decision?

2. What concerns have the local communities raised regarding the project? How did you address these concerns?

Gender issues

1. Does your organization have a gender policy?

2. Describe the role that women play in the risk reducing activities in your projects?

Inter-agency cooperation

1. What kind of cooperation do you have with government departments and other NGOs regarding Disaster Risk Reduction activities?

2. What have you learned from Semi-Autonomous Government Agencies (SAGAs) regarding Disaster Risk Reduction, and what do you think they could learn from you?

3. What could be improved regarding the interagency co-operation?

Thank you for participating in this survey. Do you have any questions?

APPENDIX IV: OBSERVATION SCHEDULE

	Observation item	Location/Village	Status	Comment
1.	**Vulnerability and Potential threats of Drought:** • Bare, dry or cracked lands • Dry dams/rivers • Dead livestock • Malnutrition	Takaba		
		Tarama		
		Bulla Mpya		
2.	**Coping Practices** • Food reserve • Pasture/animal feed reserve • Water reserve barrels/dams • Food aid • Migration caravan	Takaba		
		Tarama		
		Bulla Mpya		