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Are The Drought Coping And Mitigation Strategies Used By The Turkana Nomadic Pastoralists Of Ilemi Triangle Region Of Northern Kenya Sustainable?

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Abstract: ***For many decades now, drought in the Horn of Africa has had a devastating impact on the lives of many people, the ecosystem and livelihoods of the pastoralist communities. It has remained a global concern that requires urgent interventions. This study was conducted with a view to analyse if the coping and mitigation strategies of the Turkana nomadic pastoral population of Ilemi Triangle, Turkana County, Kenya remain viable. It draws an experience on how the Turkana nomadic pastoralists in Ilemi Triangle continue to survive in such difficult environment that merely support livestock keeping and come only into limelight only in the year 2011 after Kenyan for Kenya initiative. The specific objective of the study was to establish factors causing vulnerability to drought, examine the indigenous methods of drought early warning system, determine the community indigenous drought coping strategies and evaluate the drought mitigation strategies in Ilemi Triangle. The study adopted a mixed research design involving descriptive survey and evaluation and used Cochran equation formula to calculate study samples sizes of 424. Study population consisted of Heads of households, community leaders, managers of NGOs, chiefs, and county drought coordinators in Turkana count. Data was collected using household questionnaire, Key informant interviews, and focus group discussion. Data were analysed using SPSS for frequencies and proportions followed by Chi square test at p = 0.05. Socio-economic characteristic show household heads were mainly men in both area (88% in Loruth and 85% in Napak), community regarded marriage highly (83% in Loruth and 87% in Napak) and no formal education (98% in Loruth and 94.5% in Napak). On the main causes of vulnerability, majority of the people in the two area identified severe drought impacts (21% in Napak and Loruth), conflicts with neighbour (21%) both in Loruth and Napak, poor early warning system practices (15% (32) in both Loruth and Napak) and poor and inappropriate support from the government (7% (15) in Loruth and 12% (26) in Napak). Drought of 2009 and 2011/12 was the most remembered due to excessive livestock mortality of > 75percentage. Results revealed that extreme drought events were increasingly frequent; more than 97% of the early warning methods were traditional to include observation of drying of water sources (29%, 62 for Napak and 30%, 64 in Loruth), and pasture (28%, 60 for Napak and 26%, 50 for Loruth) and Information from traditional community leader's. The top traditional coping strategies have included migration (58%, 123 for Loruth, 47%, 100 for Napak), herd splitting (9%, 19 for Loruth and 10%, 21 for Napak), and sending part of family to relatives (10%, 21 for Loruth and 7%, 15 for Napak). On mitigation practices, relief foods provision (70%, 149 in Loruth and 62% in Napak) and livestock management practices to include improving livestock health (5%, 11 in Loruth and 10%, 21 in Napak) were used in Ilemi Triangle. The study concluded that there are many factors causing vulnerability in Ilemi Triangle that have not been dealt with and frequent droughts have weakened the coping strategies and affected adversely the indigenous knowledge systems. Elaborate mitigation measures have never been developed in Ilemi Triangle and most vulnerable population has continued to suffer from chronic food insecurity. The study recommends for a robust drought sustained mitigation plans and formulation of a comprehensive drought management framework that aims at vulnerability reduction and a sustainable development.***

I. INTRODUCTION

A. BACKGROUND

The world is experiencing a surge of different disasters both in frequency and in severity (WMO, 2016). One of such disaster is drought, which is one of the leading contributory causes of vulnerability in the pastoral communities of Sub-Saharan Africa countries according to Mayunga (2017). The vulnerable pastoralist's population according to WHO (2018) remain the most affected by disasters together with their local institutions, which provide the mainstay of disaster prevention,

preparedness, and relief. The pastoralists vulnerability resulted from drought has drawn attention for the vision 2030 agenda on sustainable development goal number thirteen that discusses climate action and calls for urgent action to combat climate change and its impacts (UNESCO, 2017).

Drought is not a new phenomenon in Sub-Saharan African pastoral lands and drought itself has no definite definition according to Shilenje and Ojwang (2015). According to Mosley (2016), drought implies two or more consecutive years when rainfall that is less than 75 percent of the long-term average rainfall is received. According to Mayunga (2007), what is drought in one place may not be seen as drought in another place, even for the population coming from the same context of nomadic pastoralism. Quantitatively, CRED (2010) has provided that, Kenya has experienced about nineteen droughts from 1989 to 2010. All these droughts are experienced in Arid and Semi-Arid lands (ASAL) where Ilemi Triangle in Turkana County belongs.

Drought occurrences in the northern Kenyan corridor remain, therefore, an important issue among the nomadic pastoral communities. According to Lolemtum *et.al* (2017), these communities live in the marginal areas of the country and often experience variable rainfall, both in space and in time, which results in low resource base, pasture disappearance and unpredictable levels of forage productivity. The northern corridor environment in Kenya offers limited opportunities for subsistence activities apart from livestock rearing that the pastoralists entirely depend on (Nicholson, 2014).

WMO (2016) classifies droughts as to being meteorological, agricultural, hydrological, and socioeconomic. Meteorological drought according to Opiyo (2014) concern the reduction in rainfall for a specified period, which is below an agreed statistical amount of the long-term average for the specified period while agricultural drought occurs when the moisture level in the soil is insufficient to maintain average crop yields. Hydrological drought on the hand occurs when water in natural and manmade reservoirs fall below a certain threshold in a given period of time and finally socioeconomic is associated with the supply and demand of some economic good. Rain reduction in amount is a concern for nomadic pastoralists. Therefore, this study focuses on the meteorological form of drought, as it affects the study population most.

As drought onset remains low and its cumulative impacts over a long period to nomad's livelihoods, drought according to Bryan *et. al*, (2013) has persisted to be a major disaster that has contributed to a higher vulnerability requiring proper management. The frequency of droughts in ASAL regions according to Miriri (2018) have diminished the coping power of the population and allows no time to recover between droughts and, therefore, populations get more vulnerable to any shock of any nature and intensity. Other causes of vulnerability to drought according to Odhiambo (2013) include; ethnic conflicts along unmarked areas, poor implementation of timely disasters mitigation programs, climate change and aridity, weak drought early warning systems and erosion of indigenous coping strategies.

Turkana County is a sprawling arid land and has long been considered a difficult place to survive with an eighty-eight percent of the people in Turkana living below the poverty level Ford et. al, (2013). Nevertheless, the Turkana nomadic pastoralist's people represent an interesting example of how pastoralists cope within such unforgiving arid environments and manage with a number of adversities that are profoundly affecting their livelihoods. Turkana County was the hardest hit during the drought of the year 2011 leading to 'Kenya for Kenyans' initiative according to KRCS (2013) because most of the food reserves had dried up with widespread food insecurity in the country with many parts of Turkana trapped in the impacts of droughts and losing livelihood. The 'Kenya for Kenyans' initiative was an immediate targeted humanitarian emergency response by the KRCS to provide relief support the hunger stricken populations of Ilemi Triangle.

The year 2008-2009 drought and food crisis gave an opportunity to tap into local people's indigenous options, practices, and design a sustainable livelihood protection system but it never happened and instead, the government and humanitarian organizations continued to rely on supplying relief foods without exploring other options for sustainability (Ouma *et.al*, 2012). Nevertheless, despite the tough environment, excessive defies in Ilemi Triangle belt and having repeated drought with an average of 186 mm per year according to the Mureithi (2012), the Turkana nomadic population have never left their livelihood option and keep on surviving in such harsh environments where humanitarian assistance is almost absent. Hence, to ensure survival, pastoralists cope with the ecological stresses, unpredictable and frequent droughts disaster.

However, as the Turkana nomadic pastoralists continue to practice a relative resilient mode of production of livelihood according to Huho *et.al* (2009), frequent drought has exhausted their drought prediction levels, coping strategies, and renders the communities susceptible to any form of disaster. They remain, therefore, unstable with a raised inherent vulnerability that makes their coping strategies unsustainable and unhelpful when drought happens. Thus, efficient management of droughts that will minimize vulnerability and mitigate impacts, rather than a mere response to their occurrence, is required to lessen the population's vulnerability and enhance sound resilience. This will require a proactive multispectral approach that will ensure an output of a resilient society; thus, it entails an indigenous coping and drought management practices that are mainstreamed into the regional, national, and county development plans. This then requires adequate information on the traditional indigenous practices (Mayunga, 2017).

Although these drought problems are increasingly apparent in many countries in Sub-Saharan Africa according to Opiyo (2014), there has not been a national priority and clearly defined long-term strategies for pastoral areas development that has remained marginalized and with frequent drought (Mureithi, 2012).This trend according to Lekapana (2013) is associated to lack of understanding of indigenous drought management practices that are required to produce a compact agenda that will provide a better framework on combating frequent drought in such isolated settings.

The national government and the Turkana County government according to Bryan *et .al, (*2013) has done little to tackle the structural causes of drought vulnerability in the Turkana and Hitherto, the Kenya government's main response to ameliorate the problems in Turkana County has mainly been to provide famine relief food. This provision of relief food according to Opiyo, (2014) though initially seen as a temporary assistance to impoverished pastoralists to make up for a short-term loss of self-reliance, is now being treated as a permanent solution, which in turns brings dependency.

These Knowledge gaps jeopardizes the kind of the sustainable support the pastoralist ought to obtain to lessen vulnerability and improve their livelihoods, hence, has a very serious implication on pastoralist's economies and sustainability, continued survival in such hostile environment and reliance on livestock as pastoralist's livelihood option. The study was therefore conceived to determine the drought coping and mitigation strategies of the Turkana nomadic pastoralists of Ilemi Triangle in Northern Kenya after the extreme drought of the year 2011-2012.Understanding these will ensure an evidence-based framework of introducing and applying sustainable strategies that are more specific, viable and adequate for pastoral population's livelihood development structure that strives to ensure resilience to frequent drought disasters. Therefore, the need to investigate coping and mitigation strategies utilized in Ilemi Triangle.

B. STATEMENT OF THE PROBLEM

Despite a seemingly remarkable Progress in Drought, management in ASAL region of Kenya, vulnerability to drought remain unanswered with the coping and mitigation strategies weakened by Drought cycles. The reduction of the vulnerability can only happen if the coping and mitigation strategies are timely and adequately provided. Any occurrence of drought among the nomadic pastoral communities is a problem because of the risks associated with its adverse effects. Drought Impacts, increased frequency and severity exposes pastoralists, their livelihoods and ecosystem chances of survival as they depend on them. The recurrent drought in an already vulnerable pastoralist's livelihood reduces the nomadic pastoralist survival chances, makes them hard to readjust and recover from the hazard impacts, and reconstructs their livelihoods according to Gebrehiwot and Van der Veen (2013). As a result, the Turkana pastoralist's livelihood systems are sapped and remain increasingly vulnerable to external cyclic climatic shocks and weak drought management framework (Birch and Grahn, 2007).

During the experience of 2008- 2009 drought in the Horn of Africa that led approximately 60-70% of livestock was lost (Huho and Kosonei, 2014), This drought provided an opportunity to the government of Kenya to explore different strategies to safeguard pastoral populations and their livelihood from successive drought impacts and ensure resilience; however, little lessons were learnt because drought happened immediately in 2010-2011 In Ilemi Triangle leading to Kenya for Kenyan initiative. The population were subjected to permanent relief foods interventions and other unsustainable social protection schemes. This continued relief food provision without developing other sustainable long-term mitigation programs reinforces the cycle of dependency and vulnerability (Lekapana, 2013).

The majority of people in northern Kenya live below the absolute poverty line. According to the KNBS (2013), 87.5% of the Turkana population lives in absolute poverty, and more than 50% heavily relying on food aid and safety net programmes from year to year. The population who are already poor in these isolated parts of the country keep on struggling to cope with the extra burden of increasingly unpredictable drought, which is triggered by climatic change with a weak mitigation and coping strategies.

Little evidence is available on what drought coping strategies and the mitigation strategies the Turkana pastoralists of Ilemi Triangle used to safeguard themselves from repeated drought impacts. A few exceptions studies such as Mureithi (2012); Lekapana (2013); and Melle (2016) that have all concentrated on other areas of Turkana County without mentioning Ilemi Triangle and have provided recommendations on disaster prevention, conflict management and vulnerability causes and less of coping and mitigation strategies. There is therefore a knowledge gap.

The critical gap in response related to absence of knowledge had resulted to action deviation between what local populations apply and the action prescribed by the policymakers to mitigate drought impacts (Onyango, 2014). Hence, a created information gap that is necessary to inform changes required to ameliorate pastoralist's life, lessen their vulnerability and ensure resilience and survival. Therefore, this study was undertaken to analyses the indigenous coping and mitigation strategies for integration into the knowledge of designing an effective sustainable mitigation and coping strategies framework that target disaster risks reduction associated with drought shocks in the arid and semi-arid zone

C. RESEARCH OBJECTIVES

The overall objective of this study was to determine the drought coping and mitigation strategies amongst the Turkana nomadic pastoralists of Ilemi Triangle region of northern Kenya. The specific objectives of this study were to:

- ✓ Establish factors causing vulnerability to drought for the Turkana nomadic pastoralist's population of Ilemi Triangle, Turkana County in Kenya.
- ✓ Examine the indigenous methods of drought early warning system among the Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya.
- ✓ Determine the community drought coping strategies among the Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya.
- ✓ Evaluate the drought mitigation strategies among the Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya.

D. RESEARCH QUESTIONS

The study aimed to answer the following questions based on the specific objectives:

- ✓ What are the major factors causing drought vulnerability to the Turkana nomadic pastoralist's population of Ilemi Triangle, Turkana County in Kenya?

- ✓ What methods of indigenous drought early warning system do Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya utilize?
- ✓ Which are the community drought copings strategies options utilized by Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya?
- ✓ What is the drought mitigation strategies used by Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya?

E. JUSTIFICATION

As the Turkana Nomadic Pastoralists depend almost solely on natural resources, nomad livelihoods are endemically exposed to many uncertainties. For example, the vegetation cover of pastures in non-equilibrium contexts like African drylands depends on unpredictable variations in rainfall and other climatic factors (Scoones 1994). Accordingly, the Turkana nomads react to these uncertainties (crises) by employing different livelihood mechanisms. It is thus interesting to explore how the Turkana people deal with such uncertainties (namely drought) within their social networks. This knowledge would therefore enhance our theoretical and empirical understanding of the Turkana nomads' indigenous ways of coping with drought, as representative of what ways nomads follow under similar circumstances universally.

These findings should enable us to identify key variables in the patterns of local adjustments, which might be supported, modified or enhanced to develop long-range drought management mechanisms in Turkana County. The planning of low-cost, but high-benefit, approaches to cope with droughts require that they be built on patterns of local adjustment. Therefore, the knowledge gained through this research will help to evaluate the appropriateness of the existing approach to intermediation in Turkana and whether enough effort has been made to identify alternative approaches to safeguard livelihoods, ensure adequate coping and adaptation towards a resilient community.

The findings will further provide a potential evidence based opportunity and a research interest in a disputed Kenyan boarder corridor; to learn and provide framework of management of recurrent drought and a policy change in the management of drought in a vulnerable pastoral population within volatile borders.

Finally, this study finding could add to the existing literature on human adaptation to droughts. As we expand and enrich our knowledge of adaptation, it should be possible to design new methods that would not only enable pastoralists to cope with droughts but also to enhance our conception of their livelihoods, which may help us to rethink concerning the nature and content of external livelihood interventions, so that they are more consonant with the diverse ways in which pastoralists make their livings and build their worlds. This becomes even more crucial in the current situation in Sub-Saharan Africa where droughts are becoming both more frequent and severe than previously. When coupled with a general decline in food production, the urgency of the task becomes imperative.

F. SIGNIFICANCE

The new lessons generated from this study will enable various stakeholders to adopt an improved and more sustained synergies and strategy that will tackle drought impacts and promote mitigation measures. This will improve the Kenyan Strategic Plan of 'Vision 2030' and sustainable development goals (SGDs) especially goal number 13. The lessons will fill the knowledge gap about the coping and mitigation strategies among the nomadic population of Ilemi Triangle. Contributes to an informed scientific knowledge and data bank of the missed information on Ilemi Triangle belt that would be utilized for academic purposes. Therefore, contributes to the body of Literature.

Provides Turkana County and National Government with further information on steps required to improve the drought mitigation strategies, enhance the early warning system and Pitfalls to avoid vulnerability to drought among the nomadic pastoralists of Ilemi Triangle. Thus, strengthening the present Turkana County Integrated Development Plans and drought policies discourses in managing drought in Ilemi Triangle region.

Lessen Action Deviation. The new lessons learnt motivates Policy makers, governments and humanitarian organizations to look more into Ilemi region and direct default responses that are viable and efforts to relevant Areas. The knowledge will further facilitate a more understanding on the indigenous drought coping and mitigation strategies among the nomadic population, thus an environmental scanning tool by leaders.

The search for good governance and policy change particularly in now devolved Kenyan government services and units require evidence-based studies such as this one at the county level for more detailed information. The drought disaster risk reduction practitioners, sustainable development expats, and academics will have an eventual practical tool to refer to in cases of drought in Ilemi Triangle, Turkana County, Kenya.

G. SCOPE

The study covered the Turkana pastoralists in Ilemi Triangle region in Turkana County, Kenya and not in other neighbouring nomadic pastoralists living also within Ilemi belt. The study looked at the drought indigenous coping strategies within the Turkana nomadic pastoral population using own community initiatives and mitigation strategies used in Ilemi Triangle. The study targeted dry season when the migratory nomadic population move and dwell on specific migratory routes and villages. During rainy season pastoralists household heads do in many traditional ceremonies are not always at home and the ones present in the homes do not provide precise information because they are not in any form of calamity. Included respondents who were present in the household by the time of the survey and willing to participate. Exclusion criterion was non-resident of the study area, those below the age of 18 years, and those unwilling to participate.

II. LITERATURE REVIEW

A. INTRODUCTION

This chapter reviews literature on nomadic pastoral environment in relation to drought, factors causing vulnerability to drought for nomads and the Turkana nomadic pastoralist's population of Ilemi Triangle region; it investigates nomad's droughts early warning system practices, impact of droughts and the coping and mitigation strategies utilized by the Turkana nomad's population of Ilemi Triangle to counter drought hazards. These coping strategies are vital for any recovery from drought shocks and ensure that the nomadic population is not vulnerable to drought disasters.

B. DROUGHT CAUSES AND CHARACTERISTICS

According to Mayunga (2017), drought is considered the most complex but least understood kind of natural hazards, affecting a huge number of people than any other form of disaster. This is mainly because it has a tendency of being slow in onset WMO (2016).

Droughts are multi-faceted and may be contributed to by both natural and human factors according to (Masinde, 2012). The natural factors according to Armstrong *et al*, (2011) include temperatures, winds, relative humidity and rainfall while deforestation and overexploitation of water sources are the two main human factors that trigger droughts. A necessary and sufficient condition for any form of drought is therefore below-normal precipitation which can be caused by an array of natural factors such as over-seeding of clouds by dust particles from the earth's surface, an increase in albedo1, a decrease in the availability of biogenic nuclei for raindrop formation caused by reduced plant cover and similar factors (Opiyo, 2014).Droughts are also caused by oceanic circulations patterns (pressure and anticyclonic) that affect current and heat storage (Mayunga,2017).One interesting relationship among these variables according to Lekapana (2013) is that the below normal precipitation and or rainfall is the chief causative parameter of drought; soil moisture (responds to precipitation anomalies on a relatively short time-scale), stream-flow, reservoir storage and groundwater level are the main parameters reflecting drought impacts.

A study by Field (2005) highlighted that drought results in serious economic, social and environmental impact that forms the most common of all natural hazards affecting pastoral communities Therefore, drought results to loss of large numbers of livestock that leads to livelihood crisis among this nomadic population. The 2009 -2010 drought according to UNDP (2011) had seen Turkana nomadic pastoralists losing up to 80% of their livestock. The Kenyan government in 2016 declared drought as a national disaster because of the huge impacts it had to the ASAL region in Kenya to pastoral populations.

According to the Kenyan NDMA (2018), understanding of drought operational definition do not only assists nomadic pastoral populations in identifying and understanding the framework for both the commencement and termination of drought, but also ensures the drought severity degree is known so that it can well be mitigated. Below *et al*, (2010) have however, challenged many publications in the definition of drought operationally that deal with having a water resource indicator, which according to the study the definition is not consistent at all. From the perspective of pastoral households in Ilemi Triangle, an understanding of the characteristics of drought is needed at the level that would specifically address specific geographic location needs that will be required to tackle climate challenges with the precision that is necessary.

C. TYPES OF DROUGHT

Literature provides various forms of drought; mostly depending on the sector concerned according to Mureithi (2012). This includes meteorological drought, agricultural drought, hydrological drought, and socioeconomic drought according to Elmi and Birch (2013).

a. METEOROLOGICAL DROUGHT

Kigomo and Muturi (2013) suggest that meteorological drought is caused by the deficiency of precipitation from the normal over an extended period. However, this drought classification is in specific regions because the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region (Cullen, 2011). This drought type according to Delaunay (2017), presents itself in the forms of dryness (often in comparison to some 'normal' rainfall pattern) and the duration of the dry period. Therefore, dry periods come first, then days with no precipitation, second, consecutive days with little precipitation and third, little during a specific period of time (Collins, 2011). This type of drought involves only precipitation according to Kioko (2013) and it is a simple absence of rainfall from the normal.

This definition was adopted in this study because it delineates drought in a holistic manner that is understood widely by the pastoralists. Opiyo (2014) suggests that all droughts begin as meteorological and progress through the last three stages depending on the severity in the listed order. Though the literature provides accurate definition of the meteorological drought that form a major drought variable that is understands among the nomadic pastoralists, there are other context-based aspects in meteorological drought and weather that influences the coping and mitigating decision-making.

They remain vital in shaping pastoralist way of life and ensuring survival. Such understanding cannot be known barely by defining the meteorological drought type but rather by receiving the population perception of what make meteorological drought (Mureithi, 2012). Though the available literature has not specified if all forms of disaster can affect the nomadic pastoralists population or not. This study chose meteorological type of drought because precipitation remains the main a concern for nomadic pastoralists of Ilemi Triangle.

b. AGRICULTURAL DROUGHT

According to Delaunay (2017), agricultural droughts happens when plant response by using degree of departure from the expected yield as an indicator of weather conditions for a given year, on the theory that crops are good indicators

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of weather and their response presents a reliable tool for measuring drought while Onyango (2014) discusses the agricultural drought on situations where amount of water in the soil no longer meets the need of a particular crop, which measures drought as a physical phenomenon and finally Ford *et .al,* (2013) puts this kind of drought to occur when the soil moisture deficiency affects crop or pasture growth.

Though the study agrees with literature on agricultural drought type, this form of drought can be experienced in the areas where crop farming is done and not in Ilemi Triangle the research setting and therefore, was not adapted to the research area.

c. HYDROLOGICAL DROUGHT

Hydrological drought according to Delaunay (2017) is described in terms of deficiencies in surface and subsurface water supplies. According to Kioko (2013) this drought occurs when water in natural and manmade reservoirs fall below a certain threshold in a given period of time, often leading to reduction of natural stream flows or even ground water levels (in the streams, rivers, lakes, aquifers), plus stored water supplies. The main impact of this type of drought is on water resources systems Melle (2016). Therefore, this drought tends to show up more slowly because it involves only stored water that is used with less replenishing (Sheffield *et al*, 2012). Though the study agrees with literature on hydrological drought type, this form of drought can be experienced in the study context and it follows meteorological drought and therefore, was not adapted to the research area.

d. SOCIOECONOMIC DROUGHT

Socioeconomic drought according to Schrepfer, (2014) is a drought that is associated with the supply and demand of goods and services. This drought type according to Delaunay (2017) occurs when physical water shortages start to affect the community's wellbeing, their economic livelihoods, quality of life and their health or when drought shocks the supply. Though the study agrees with literature on social-economic drought type, this form of drought can be experienced in the study areas, however with the pastoralist's areas having poor infrastructure with absence of essential commodities, these type of drought to the nomadic population is observed as usual and cannot be taken much by pastoralists as drought because of the existing causes of vulnerability to it. The study did not apply this drought type as the main concern for nomadic pastoralists of Ilemi Triangle region is precipitations and so water and pastures for livestock and not on supply of goods and crops.

D. NOMADIC PASTORAL ENVIRONMENT IN RELATION TO METEOROLOGICAL DROUGHT

Dry land regions occupy forty-one per cent (41%) of the earth's land surface with over two billion people according to Delaunay (2017). Pastoralism is the dominant livelihood option in Arid and Semi-Arid Lands (ASAL) that forms 80% of Kenya's landmass according to Mureithi (2012) with over 85% of the population of the region engaging in livestock production as their means of survival. A case study by Brooks (2006) and Opiyo et al, (2014) on pastoralist's livelihood established that, livestock rearing has remained the dominant livelihood method in these dry lands.

The physical environment inhabited by the pastoral communities remains an important element of the pastoral system and their livelihood options. Such environments according to Opiyo et al, (2014), are considered to have extreme variable and receive unreliable rainfall both in space and in time. Consequently, these areas are characterized by the scarcity of water and seasonal variability of vegetation, and thus, more prone and vulnerability to drought.

This aridity in the pastoral environment makes other livelihood options like crop production unsupportable. Hence, the livestock productions remain to be the only viable and rational option under the existing technologies and environment to be practised. Moreover, together with a lack of enough water and pasture in pastoralist environments, certain constraints on pastoralist settlement patterns and livestock production occur according to Nicholson (2014). Livestock the main source of livelihood for pastoralists do not grow at the same rate as the human populations. In fact, livestock numbers according to Oxfam (2011) in East Africa have remained constant over recent years because of livestock starvation associated with recurrent drought and disease epidemics.

Nevertheless, droughts remain frequent in ASAL regions of the world that make up over 40% of the earth's surface according to Nicholson (2014). This region is occupied by over one billion people who depend entirely on it for their livelihoods according to Opiyo (2014). In Kenya, droughts have been experienced almost every ten years in the 1960/70s to once in every five years in the 1980s (Mureithi, 2012). However, this trend according to Opiyo, Wasonga, Janpeter and Mureithi, (2012) has increased to every 2-3 years in the 1990s and is getting more unpredictable since the year 2000. CRED (2010) has quantitatively provided that, Kenya has experienced about nineteen droughts from 1989 to 2010, all in ASAL areas where Ilemi Triangle in Turkana County belongs.

ASAL region remains characterised by poor road infrastructure, many pastoralists ethnic groups live close to each other, poor development, weak land policies governing the contested areas and high pastoralist's mobility in search of water and pastures according to UNDP (2013). The extended drought of the year 2011, according to Silale and Nyambegera (2014), enabled the Turkana nomadic pastoralists to lose up to 80% of their livestock. This severity, intensity, and frequencies of these droughts according to UNDP (2014) have hindered the recovery because the recurrent droughts disrupt the livestock growth before the recovery phase is completed. Together with the experiences of these recurrent droughts in this pastoral environment, the Turkana pastoralists like any other nomads are usually forced to cope through migration in and around Ilemi Triangle region in search of water and pastures for livestock. This movement often triggers conflicts with the neighbouring communities of mainly Toposa of South Sudan and Nyangatom and Dasanach of Ethiopia (UNDP, 2014).

The level of the humanitarian needs in nomadic pastoral environment has of the recent past increased dramatically and

has been in ominous critical need according to Murithi (2012). It is therefore, for the opinion that the pastoral systems due to recurrent drought impacts can no longer support the basic needs of this Ilemi Triangle pastoral population. Therefore, a huge outcry has been heard and reported recently in the media during the Kenyan for Kenya initiatives in 2011 and in 2017 on drought effects in Turkana County.

The basic services provision such as water within ASAL region according to Bryan (2013) is inadequately provided or adapted to the nomadic pastoral lifestyle. The study will look at this service within Ilemi Triangle belt and how it is managed. Pastoralist communities need more investment in good basic services such livestock-marketing opportunities, drought mitigation and preparedness systems, access to climate information, and effective conflict-mitigation mechanisms. Both women's and men's needs and interests must be taken into account. Moreover, the civil society and local communities in the pastoral areas according to Opiyo (2014) require adequate support to build strong and representative pastoral organisations.

Water remain an important element in the pastoral living, pastoralists do settle in areas and environments where water is present and relocate to areas closer to water sources Opiyo (2014) and the availability of water according to Mureithi (2012) determines the amount of pasture and number of livestock these pastoralists can accommodate. Hence, water has remained an essential commodity to the pastoral population to have for their livelihood sustainability. It is consequently lack of this commodity that has led to migration and conflicts among different pastoral ethnic groups

The Turkana nomadic pastoral environment and livelihoods in Ilemi Triangle remain a wanting situation that requires support at all levels (Mureithi, 2012). Less information about this environment is known, and the recurrent drought, enormous suffering, and ensuing drought impacts affecting the pastoralists livelihoods according to Lekapana (2013) enabled the study to critically challenge the drought management support the Turkana nomadic pastoralists receive to ensure their survival, resilience to drought, and see the end of the negative media coverage of this nomadic environment.

The nomadic pastoralist's environment predisposes populations to social networking acts as both an informal safety net and a protection against drought impacts (Nicholson, 2014). This promotes social stability. The safety net function of networks is crucial to understanding the Turkana's ability to cope with economic or physical shocks to their livelihood. However, as many similar pastoral environments are managed differently, and diverse governments manage pastoral affairs differently (Opiyo,2014), it will be sound to understand fully how Ilemi Triangle belt pastoral environment affairs is managed because no much specific information on Ilemi Triangle region on drought related environment has been documented and researched.

E. DROUGHT VULNERABILITY AND ADAPTIVE CAPACITY

According to Opiyo (2014), understanding of people's vulnerability to drought is complex; this is because it depends on different forms like the biophysical and socioeconomic drivers of drought impact that determine the capacity to cope with drought. Vulnerability according to Nicholson (2014) is defined in many ways and it has different meanings when used in different disciplines and contexts. In this research study, drought vulnerability is used to highlight the socioeconomic and biophysical characteristics of the Ilemi Triangle region that makes it susceptible to the adverse effects of drought. The vulnerability of a population to disasters such as drought according to Nicholson (2014) depends on several factors such as population, technology, policy, social behaviour, land use patterns, water use, economic development, and diversity of economic base and cultural composition.

According to Goldman and Fernando (2013), the erosion of the elements of resilience that determine the ability of a household to absorb stresses, and maintain essentially the same structure, function and feedbacks influences vulnerability. As such, vulnerability is a function of macro (economic, institutional and environmental setting) and micro (access to resources, coping strategies) factors at household level. The frequency, the high intensity and the risks of drought according to Lekapana (2013) prevents nomadic pastoralists from adopting sustainable technologies and practices that are ensure resilience, hence creating a nexus that increases the cycle of vulnerability and depletes the capability to overcome hunger and poverty.

In Kenya, droughts have been experienced almost every ten years in the 1960/70s to once in every five years in the 1980s (Mureithi, 2012). Therefore, becoming cyclic in nature. However, this trend according to Opiyo (2014) has increased to every 2-3 years in the 1990s and is getting more unpredictable since the year 2000. From the year 1990 to the year 2010, the government of Kenya had declared five national disasters attributable to drought of 1992/93, 1995/96, 1999/2001, 2004/2006 and 2008/2009 (Huho and Mugalavai, 2010). CRED (2010) study elaborates that drought has become more unpredictable since the year 2000 because of its increased frequency in recurrence. This increased frequency in recurrence has allowed no time for communities to recover between droughts and, therefore, populations get more vulnerable to any shock of any nature and intensity.

a. CAUSES OF VULNERABILITY TO DROUGHT IN THE PASTORALISTS AREAS IN KENYA

Lekapana (2013) defines vulnerability as the extent to which a natural or social system is susceptible to sustaining damage from climate change while Mureithi (2012) describes being the vulnerability as just a concept that has been used in different research traditions, but there is no agreement on its meaning. However, Schrepfer (2014) agrees that vulnerability shows the degree of defencelessness or rather powerless to different societal hazards that can vary either because of variable exposure to the hazards. Vulnerability to Meteorological drought is a complex topic with many facets and perceptions according to Musembi and Kameri-Mbote (2013). Therefore, lack of universal definitions of both words increases the difficulty in designing an acceptable framework (Cook and Vizy, 2013).

Vulnerability to drought has both biophysical and social dimensions. Vulnerability accordingly has damaging effects to population's livelihood and not just life and properties. The more affected people are, the more they find it hard to readjust to the effects of hazards and reconstruct their livelihoods following the disaster. Disaster according to Ericksen *et .al,* (2013) occurs when a hazard affects vulnerable people who are already vulnerable. The combination of hazards, vulnerability and inability to reduce the potential negative consequences of risk results in disaster.

The impact of the drought hazards is dependent on the coping capacity of the people and the severity of the hazards, nevertheless, the nomadic population will remain vulnerable if the coping strategies are not put in place and or not the indigenous nomadic pastoralists coping strategies are not strongly supported. The coping capacity of the nomadic population will entirely depend on accumulated assets at biophysical and social levels according to UNDP (2014). According to Silale and Nyambegera (2014), vulnerability to drought is caused by factors such as; undeveloped infrastructure, weak authority, ineffective markets, high population growth, desertification, deforestation, inadequate/inappropriate technology, lack of information and awareness, urban development, lack of social benefits and institutional support, lack of communication with macro political and economic systems.

Vulnerability according to Silale and Nyambegera (2014) has damaging effects to population's livelihood and not just life and properties. Therefore, the more the affected people are, the more they find it hard to readjust to the effects of hazards e and reconstruct their livelihoods following the disaster. A recent case study on resource based conflicts on traditional adaptation to climate variability and change amongst northern Kenya pastoral communities in Wajir County, by Ouma *et al,* (2012) argued that the current ability of pastoralists to respond to drought is limited not only due to the increasing frequency of drought, but also increasing population, a dwindling resource base, conflict, changes in access to land and water, as well as the impact of other shocks such as flooding and disease outbreaks.

Moreover, Helgeson *et al*, (2013) suggest that this pastoral population vulnerability is mainly associated with poverty. Nicholson (2014) study has reported poor community initiatives, involvement, and empowerment in drought management, lack of support to traditional coping strategies and overdependence on traditional livestock livelihoods, poor soil, low government policies on drought management in ASAL regions, illiteracy among the pastoral community to be the major causes of vulnerability to drought hazards.

Moreover, a similar case study by Murithi (2012) in Turkana County provided a number of causes of vulnerability to Meteorological drought in Turkana pastoral environment to include the traditional perception of resources ownership, non-conservation of pasture to be used during the dry season, inadequate security apparatus in the boarders and poor infrastructure in ASAL regions.

A multi-method study by Opiyo (2014) on measuring household vulnerability to climate-induced stresses in pastoral rangelands of Kenya, concluded that poor community initiatives, involvement and empowerment in drought management, the little knowledge on other modern ways of livelihood, cultural beliefs, habits and traditions, inadequate rainfall and inadequate adaptation to new challenges, lack of support to traditional coping strategies and overdependence on traditional livestock livelihoods as the main causes of vulnerability to drought. Nicholson (2014) have also suggested of weak government policies on drought management in ASAL regions, to be among the top causes of vulnerability to drought hazards.

Excessive drought impacts lead to vulnerability among the Turkana nomadic populations. Mureithi (2012) study identified and grouped the causes of drought vulnerability in to five main types and categories of vulnerability to include political factors, social, technological, economic and environmental factors.

Political factors causing vulnerability include inadequate knowledge in drought exit strategies, ineffective drought early warning systems, and Government policy (Appendix ix) on resource ownership, poor security systems, poor infrastructural development, inadequate knowledge in alternative livelihoods, and communal ownership of resources.

Social factors include Illiteracy, traditional livestock values that constrain livestock marketing, poor community initiatives in drought management, local people's views on individualization of resource ownership, culture, beliefs and traditions, little/Inadequate knowledge in modern ways of life, inadequate adaptation to new challenges. This is a strong factor in Ilemi Triangle and this study considers this vulnerability type as key in Ilemi Triangle. The technological factors according to Lekapana (2013) involve use of traditional technologies, non-conservation of pasture while economic factors enabling vulnerability include dependence on traditional livelihoods, nomadism, and inadequate knowledge in other forms of savings.

The economical vulnerability further translates to highly dependence upon the economic status of individuals, communities and nations according to Nicholson (2014). The poor are usually more vulnerable to disasters because they lack the resources protect themselves from being negatively impacted by disasters (Lekapana, 2013).

The last factor according to Mureithi (2012) is environmental factors that include inadequate rainfall, reduced underground water recharge, high temperature and poor soil. These impacts according to Mwangi (2010) depend entirely on the recent history of drought events, underlying coping strategies in place, the resilience of the pastoral system and severity of drought in the meteorological form. A study by Murithi (2012) in the same setting in Turkana argued that drought among the nomadic populations increased food insecurity, excessive use of relief foods, inter-clan conflicts, shortage of pasture, depletion of water resources, lack of proper healthcare and sanitation. Nicholson (2014) further discusses that the environmental vulnerability involves natural resource depletion and resource degradation as the key aspects causing vulnerability, which is a major factor in Ilemi Triangle and is considered by the study.

According to Lekapana (2013), drought further leads to increased school dropouts, early marriages, widespread rural-urban migration, loss of livestock, breakdown of traditional coping strategies, general poverty, loss of livelihood, spread of

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livestock diseases, environmental degradation, deaths, and paralyzed economic activities. These factors encourage vulnerability to the nomadic pastoralists.

In pastoral setting, Speranza (2010) mentions that their major concern is scarcity of water and pasture for herds', starvation and malnutrition, livestock deaths, altered herd structure, the deterioration of herd's condition and a collapse of livestock markets as a result of drought. Kigomo and Muturi (2013) studies have provided that a number of Meteorological drought impacts to pasture and range lands to include reduced production of forage in range land, development of desert areas and reduced utilization of rangeland and forest by products, changes in vegetation composition of range lands and reduced productivity of range lands and reduced regeneration of desert species and produce poor-quality forage while Silale and Nyambegera (2014) mentioned of high livestock mortality rate and lack of livestock pregnancy and abortion occurred, weight loss in livestock, loss from dairy and livestock products and side losses: increased fodder costs, water supply and parasitic diseases .

Drought has led to reduction in number of livestock kept per household and this led to vulnerability (IFRC, 2014). If household have more livestock, they can act as insurance during drought and will have some left after drought reducing them. The severity of drought signposts goes hand with the livestock numbers according to McDowell (2016). The lesser the livestock numbers left after drought, the severe the drought effects are experienced. The larger the livestock numbers or increased numbers seen in the years between 2010 to 2015 during drought, the more the feed required hence, more vulnerability to livestock starving (Mureithi, 2012). Table 2.1 provides the population of livestock in Turkana County. These populations do keep mainly of Shoats (goats and sheep) that are higher than cattle, donkeys and camels.

These small livestock stocks reproduce faster than the big livestock and therefore, form a subsistence base for the pastoral community. Camels in Napak in Ilemi Triangle are not preferred because of the mountainous topography of the area. Nevertheless, the data is not segregated into different areas of Turkana County and there is absent livestock numbers data for the years between 2006 to 2008. Little information is known about livestock population before and after drought in Turkana County. Turkana County ministry of Livestock have not adequately documented this loss in each household during different droughts. This study argues that regular livestock census will not be important for proper analysis during drought but also good in planning where the support will be required.

Year	Goats	Sheep	Cattle	Camel	Donkey
1993	0	0	153,350	63,153	0
1994	0	0	165,000	94,000	0
1995	1,704,000	862,000	198,000	112,800	0
1996	1,788,667	894,333	201,960	114,492	0
1997	1,833,333	916,667	200,000	115,230	0
1998	1,833,333	916,667	200,000	115,230	0
1999	2,168,100	1,084,050	234,420	144,960	0
2000	1,626,000	813,000	176000	138,000	32,000
2001	1,626,000	813,000	176000	138,000	32,000
2002	1,951,200	975,600	193,600	140,760	32,640
2003	1,951,200	975,600	193,600	140,760	32,640
2004	2,021,000	1,054,400	197,900	172,400	35,160
2005	2,021,000	1,054,400	197,900	172,400	35,160
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	5,994,881	3,517,148	1,534,612	832,462	558,189
2010	6,023,656	3,545,285	1,638,947	865,177	591,077
2011	6,052,570	3,687,097	1,311,158	899,178	625,903
2012	6,081,622	3,834,581	1,594,368	934,515	662,782
2013	6,111,054	3,987,964	1,942,399	971,242	701,833
2014	6,140,387	4,147,481	1,882,399	1,009,412	743,184
2015	6,169,861	4,313,380	1,945,312	1,049,082	786,972

Source: Turkana County MOPEFL (2017).

Table 2.1: Estimated livestock census from 1993-2017, Ilemi triangle, Turkana, Kenya

Therefore, it will be important to ensure proper analysis to support the vulnerable households that lost their livelihoods during drought proper livestock population is required. A good record of such loss during drought must understand and compare the dynamics during drought scenarios so that nomadic pastoralist population in the northern Kenya can adequately be helped to mitigate drought. This will support in developing sustainable options plans and budgets for such groups that lost livestock because of drought.

The available literature on the impacts of drought are general and are typical in every drought related setting where nomadic pastoral live. However, the ones observed in Ilemi Triangle region is simply for practicing livestock option are not much different, though; evidence based will be required for the specific area documentation and proof. It will be worth to understand what impacts of drought the Turkana nomadic population of Ilemi Triangle receive in order to prepare, change policies, and plan adequately on how to manage them in order to lessen vulnerability.

The literature available provides the global causes of Vulnerability to drought within nomadic pastoral environment; however, not much information is documented on the specific causes of vulnerability to drought in Ilemi Triangle, which the study will aim to fill this gap.

b. MEASURING DROUGHT VULNERABILITY AND THE ASSESSMENT MODELS

According to McDowell (2016), vulnerability is an essential part of hazards and risk research and refers to the susceptibility of people, communities or regions to natural or technological hazards. Makwara (2013) also put it as an amalgamation of damage potential and coping capacity, but it also appreciates the versatile nature of vulnerability by acknowledging three vulnerability dimensions to include economic, social and ecological factors.

To measure vulnerability, Kumpulainen (2006) suggests factors that cover damage potential and coping capacity, as well as the range of all three vulnerability dimensions. Moreover, two other models and or approaches used to measure vulnerability according to Cutter *et al,* (2003) and UNDP (2004) include Hazards-of-place model measuring mainly social vulnerability and the UNDP's Disaster Risk Index (DRI) model that measures and compares the physical exposure to hazards, vulnerability and risk between countries.

Damage potential indicators according to Kumpulainen (2006) measures anything concrete that can be damaged by a hazard and measure the scale of possible damage in a

particular region while the Coping capacity indicators measure the ability of a community or a region to prepare or respond to a hazard. These assessments measure either human properties or the existence of infrastructure (Huho and Kosonei, 2014). At the same time, coping capacity indicators point out social and place inequalities. However, the vulnerability of natural areas according to Cannon *et al*, (2003) is not easily measurable, especially since not all hazards pose a threat to the environment.

Cutter *et al*, (2003) have concentrated on measuring social vulnerability, which is an integral part of the Hazards-of-place model. Here, social vulnerability includes both social inequalities (social factors that influence the susceptibility of population groups to harm and that affect their ability to respond) and place equalities (characteristics of communities and the built environment, such as level of urbanization and economic vitality). This definition includes both the social and economic vulnerability dimensions of the Hazard's project, although damage potential has a slightly smaller role in the model (Hadley 2012).

A second model for measuring vulnerability to hazard is UNDP's Disaster Risk Index (DRI) according to Kumpulainen (2006). This module measures and compares the physical exposure to hazards, vulnerability and risk between countries (UNDP 2004). Here, the physical exposure refers to the number of people located in areas where hazardous event occurs combined with the frequency of hazard events. In this model, population density is not seen as an indicator of vulnerability, but a condition for a disaster risk to exist. Vulnerability explains why, with a given level of exposure, people are more or less at risk. Vulnerability according to UNDP (2004), therefore, refers to the different variables that make people less able to absorb the impact and recover from a hazard event.

These may be economic (lack of reserves), social (weak social organisation), technical (poorly constructed housing) or environmental (fragility of ecosystems). The prime reason for developing the DRI according to Huho and Kosonei (2014) was to improve the understanding of the relationship between development and disaster risk. With a separate analysis of four natural hazards, it became clear that disaster risk (risk of death in disaster) is considerably lower in high-income countries than in medium- or low-income countries. Therefore, the DRI is innovative for two reasons: first, it takes into account the development aspect and secondly it uses a different set of vulnerability indicators for each hazard.

Little information is available on what drought vulnerability assessment tool is practical for nomadic populations especially those who roam across borders of different countries like in the case of Ilemi Triangle and it will be worth to test these tools to identify their applicability.

c. ANALYSIS OF HOUSEHOLDS' VULNERABILITY TO METEOROLOGICAL DROUGHT

According to Ichara (2012), there are various ways of analysing vulnerability, namely, socio-economic, biophysical and an integrated approach, which unites both socio-economic and biophysical factors. The socioeconomic vulnerability assessment approach focuses on the socio-economic and political status of individuals or groups. In any given society, Füssel (2007) reports that individuals vary in terms of education, gender, wealth, health status, access to credit, access to information and technology, formal and informal (social) capital and political power, which are responsible for variations in vulnerability levels. Consequently, vulnerability is considered a starting point that exists within a system before it encounters a hazard event (Mureithi, 2012). In this regard, vulnerability is constructed by society because of institutional and economic changes.

The socio-economic approach focuses on identifying the adaptive capacity of individuals or communities based on their internal characteristics. One major limitation of the socio-economic approach is that it focuses only on variations within society, but in reality, societies vary not only due to socio-political factors but also because of environmental or biophysical factors. Marcus (2005), suggest that this socio-economic approach does not account for the availability of natural resource bases, which have the potential to counteract the negative impacts of environmental shocks. For example, areas with easily accessible underground water can better cope with drought by utilizing this resource than areas without it Mureithi (2012). Therefore, the study did not prefer it.

The second approach is the biophysical that attempts to assess the level of damage that a given environmental stress causes on both social and biological systems. It is sometimes known as an impact assessment. The emphasis is on the vulnerability or degradation of biophysical conditions (Opiyo, 2014). This is a dominant approach employed in many studies on the causes of vulnerability to drought. However, Füssel (2007) challenges this model by declaring it merely informative, and has limitations in assessing biophysical factors that are not sufficient as a risk-hazard approach. This approach also stresses on extreme events while neglecting the root causes and the everyday social processes that influence differential vulnerability. Therefore, was not applied in the study.

The third approach is the integrated vulnerability analysis, which according to Opiyo (2014) combines both the socio-economic and biophysical factors. This approach includes all the internal state of vulnerability and external situation. This present study applied the integrated vulnerability approach to develop vulnerability indices for every household. Most of the reports do not reveal the root causes of factors contributing to drought vulnerability in the households that are specific to the nomadic populations but deals with unsafe conditions and dynamic pressures. This study will elaborate more on this.

d. MANAGEMENT OF VULNERABILITY TO METEOROLOGICAL DROUGHT

According to Mureithi (2012), disaster vulnerability management in Kenya is in its infancy stage for lack of proper policy framework both in the County and in Country at large and the national disaster management bill is still in draft form since 2002. The Kenyan government according to Opiyo (2014) have continued to implements short-term ad-hoc interventions that mostly do not improve the situation and this partly explain why when similar disasters happen, the population condition remain the same or worsens.

Meanwhile, the management of vulnerability remain uncoordinated in Turkana County with different humanitarian partners preferring certain models of programs to lessen disaster risks, but all have failed to curb vulnerability (Onyango, 2014). Drought in many Arid and Semi-Arid areas has remained cyclic as many pastoralists remain affected with recurrent drought strikes. Accordingly, the institutional framework is non-existent around where these pastoralists live and migrate to (Mureithi, 2012) .Therefore, the drought management models based on the traditional disaster management models including the preparedness, mitigation, emergency and reconstruction have remained unpractical because lack of capacity to implement them and or there is absence of seriousness in National and County government, and humanitarian organisation to lessen populations drought vulnerability .

The vulnerability in nomadic pastoral areas according to Mureithi (2012) is further attributed to absence of appropriate livestock production technologies, population increases especially from mobile pastoralists, inequality, marginalization, poverty levels, illiteracy, cultures and traditions, cattle rustling and absence of other livelihood options.

Management of vulnerability to drought in Ilemi Triangle from the literature has not been fully exploited and the prominence of study interest in undertaking this research to cover this gap originated with two experiences: First having worked in almost all rural setting of Turkana County, the observable recurrent drought impacts with the enormous suffering, the less involvement of populations in managing drought, made the study to feel that something needed to be done by the Kenyan government and Turkana County to change things for the better, to enhance the Turkana people's resilience to drought, and see the end of the negative media coverage that documents repetitively the pastoralists misery. The Turkana's own capacity to recover and manage drought has not been tapped and supported in order to inform on changes to reduce shocks, and ameliorate livelihoods (Lekapana, 2013).

The ability to cope even under challenging and changing environments in the past implied that there is much wisdom held by the Turkana people that need to be understood. It is therefore worthwhile to ask ourselves what their indigenous livelihood strategies were, and investigate why people who had previously sustained their livelihood in the absence of outside intervention are currently suffering ecological and economic stress.

Moreover, the study own observation and experience while working in many other African nomadic pastoralist populations settings in informs of how there is general unbalanced kind of support that these nomadic pastoralists populations receive from their respective governments and the kind of support will signify how vulnerable they are. The study observes variety of drought management practices applied in one area used in decreasing vulnerability that are not practiced in Turkana Ilemi Triangle region and can be tested. The triangulation of the FGD and key informant's information from the study will provide a clear drought management framework in Ilemi Triangle and how ought to be managed.

With a cyclic nature of drought causing excessive vulnerability, a drought research institute in ASAL region of Kenya can be a solution to managing vulnerability according to Lekapana (2013). The study observes that as Turkana County is always caught up unprepared for drought, the cost of managing impacts remains huge and the National government is usually forced to declare the catastrophe, it will be interesting to understand what supports them to manage vulnerability. Mureithi (2012) have suggested of having water and weather institutions in arid areas to fast tract weather information and sharing to the communities adequately. The institution will produce weather extension officers who can work on public awareness of drought knowledge and making populations prepared thus empowering them.

e. ADAPTIVE CAPACITY

Reviewed articles indicate that most Turkana nomadic pastoralists have adapted to the cyclic trends of droughts, and with time, the populations have come to rely on complex adaptation and coping strategies to abate vulnerability and losses of livelihoods from drought impacts Schilling *et al*, 2012).

The strategies according to Schrepfer (2014) include complementary responses such as communal land ownership, engaging in other livelihood activities like crop farming, fishing, charcoal burning, and wage labour, movement, large and diverse herd's management and use of informal social security systems. However, with recurrent drought, some of the important adaptation strategies that ensure continued survival have been weakened. Moreover, the nomadic pastoral displacement. Conflicts, poor government policies, human and livestock diseases have aggravated their vulnerability (Lekapana, 2013).

Accordingly, due to the impact of drought, the Turkana are diversifying their livelihoods. This process has been hastened by conflicts, especially livestock raid around the porous borders. Moreover, little is known from the Turkana herders how in the past have managed drought. According to Lekapana (2013), Turkana nomads have constantly switched back and forth between a range of livelihood activities depending on weather conditions and kept survival adequately. The literature is missing on how the government supports Ilemi Triangle population to manage and mitigate drought to ameliorate livelihoods. According to Mureithi (2012), the Turkana nomadic pastoralists in the past mobilized a set of livelihood strategies that they resorted to in times of stress.

Tsegaye, Vedeld, and Moe (2013) observed that some of the adaptation strategies are triggered by climate variability and change, and those adaptations are often purposeful and directed, while others can also come up because of other non-climate-related social and or economic changes. For example, a nomadic pastoralist moving from one area to the other have a great chance of having conflicts could primarily be not motivated by drought but rather other factors. Using socio-political risk of conflict to a more secure area, may not be primarily motivated by climate events like drought, but rather by other either demographic, social or political factors. Clearly, attributing adaptations to climate variability and

change at a community level is not a simple process especially within the highly unpredictable arid and semi-arid regions. However, irrespective of adaptation rationale, both purposeful and unintentional adaptations can generate short-term or long-term benefits to the climate-affected communities. This article section seeks to show that the Turkana nomadic pastoral past and present adaptation experiences by the can provide lessons for governments wishing to reduce vulnerability for long-term climate resilience interventions.

F. DROUGHT EARLY WARNING SYSTEM BY NOMADIC PASTORALISTS COMMUNITIES

Mutua (2011) suggests that nomadic population observe plants, solar system, wind and bird's movement, clouds patterns and behaviour of living organism's recognition as their early warning signs for impending drought. These indicators and pastoralists feeling support the traditional early warning system employed by the nomadic pastoralists, usually issued by elders to enable the nomadic population cope with anticipated drought event or a natural hazard (Ichara, 2012).

Moreover, Pearson (2012) has suggested that, most of the pastoral communities in Kenya have indigenous early warning systems and mechanisms of dealing with drought. These systems according to Mutua (2011) includes traditional indigenous weather forecast and climate prediction practices that are based on indicators that are established over generations through keen observation of livestock behaviour, birds, insects, the solar system, winds, clouds, and the feelings of the human body. These communities in ASALs recognized unique situations associated with the behaviour of the living organisms, and the locations and patterns of cloud, winds, the moon and stars (Mosley 2016).

According to Pearson (2012), these predictions based on these indicators and human feelings supported the early warnings issued by the elders to enable the community cope with the anticipated natural hazard. Observed historical trends allow for reasonable predications of future weather patterns. However, with the increased severity and frequency of drought over the last few decades this form of forecasting is getting less reliable than it was in the past Gupta, and Singh, 2011). However, Table 2.3 information is available with NDMA Turkana County on warning stages adapted to detect drought. However, the Turkana nomadic population will not be aware of such criterions if they are not well informed.

Although there are numerous literatures on pastoralists' drought early warning strategies, scanty information is available on the same for pastoralists of Ilemi Triangle and indicator for drought eminence in Ilemi Triangle region has not been researched and elaborated by any relevant study .There is little connection and literature available of the participation between traditional early warning and the modern early warning information and this study will bridge this gap of exploring early warning in Ilemi Triangle. This study will provide an opportunity to understand the mechanisms of the early warning systems within the Turkana nomadic pastoral population of Ilemi Triangle. This gap of knowledge on the indigenous early warning system methodologies prompts an investigation into what exist that is utilized by the Ilemi Triangle nomadic population to detect drought and prepare them.

Situation	Description
Normal:	Environmental, livestock and pastoralists welfare indicators show no unusual Fluctuations but remain within the expected seasonal ranges.
Alert:	Environmental and livestock stress indicators start to fluctuate outside the expected seasonal ranges within certain localized areas. An alert stage can also be signalled when unusually low asset status is reached within the district.
Alarm:	Environmental and livestock stress indicators continue to fluctuate outside the expected seasonal ranges and this situation extends to most parts of the district. Pastoral welfare indicators begin to fluctuate outside expected ranges. Reports of displaced population groups due to collapse of the pastoral system become more frequent.
Emergency	The environment and the pastoralist population are in a state of emergency. Displacement of herders and their families continues due to large-scale mortality of livestock and the further collapse of the pastoralist system. All indicator values including those of pastoralist welfare fall to very low or minimum levels.

Source: NDMA Turkana County (2016)

Table 2.2: Drought Warning Stages adapted for Turkana and used by Kenyan National drought management Authority (NDMA)

G. NOMADIC PASTORALISTS' INDIGENOUS COPING STRATEGIES

Coping strategies refer to a set of measures adapted to attempt to meet physiological, social, economic and political needs of everyday life according to Masendeke and Shoko (2013). According to Opiyo (2014), factors that determine coping capacity of individual's households revolves around the household characteristics, social networks and political institutions, biophysical and environmental factors. Bryan (2013) suggests that coping with drought remains the final piece of a holistic drought risk management strategy, alongside the pre-drought activities of risk mitigation and risk transfer. Ford (2013) further suggests that coping strategies are actions and activities that do usually take place within existing structures and form the kind of responses that individuals, communities or population do to different challenging hazards.

According to Bryan (2013), government and humanitarian organisations must comprehend the nomadic population way of life because it is advisable to appreciate why previous functioning systems in the absence of outside intervention suffered ecological and economic pressures; traditional coping

strategies that have been left by nomadic populations need to be preserved for the future generations. Improvement of food security is more likely to result from strengthened indigenous coping strategies other than from introducing new ones that cannot be owned and esteemed by the nomadic pastoral populations.

Munang (2014) on the other hand explains coping strategies as the immediate short-term measures instituted to minimize risks. The Turkana nomadic pastoralist's people represent an interesting example of how pastoralists cope within arid environments and manage with a number of adversities that are profoundly affecting their livelihoods. They remain the second largest pastoralist's ethnic group after Maasai (Johnson and Wambile, 2011). This nomadic people cope by roaming the dry northwest corner of Kenya, primarily the Turkana County bordering South of Ethiopia and South Sudan and East of Uganda.

These bordering ethnic groups in the neighbouring countries and along the disputed land named Ilemi Triangle; all move freely around the boarders in search of water and pasture for their livestock, frequently attack each other during the search of these resources, speak similar language, have similar cultural background, solely practice nomadic pastoralism and believed to have same origin named "*Ata Nayeche* ". These neighbouring ethnic groups include the Jie, Dodos and Karamojong of Uganda on the West of Turkana, Toposa of South Sudan and Nyangatom of Southern Ethiopia. They move closer to each other during drought and within the Ilemi Triangle.

a. MOVEMENT

Ichara (2012) have described two forms of mobility commonly used be pastoralist to be either resources exploitation mobility and escape mobility. Escape mobility involves long distance migration to escape drought conditions while resource exploitation mobility responds to unpredictable pasture and water resources availability. All these forms are used to ensure that the livestock-keeping livelihood is maintained. Long distance movement of pastoralists and their livestock across districts and international borders according to Bryan (2013) is one of the key drought response strategies used by many nomads across Africa. The internal movement within the same the region according to Sherwood (2013) is carried out in close grazing areas or next to permanent water points.

However, agreements and negotiations are vital preconditions if this pastoral community seeks access to a grazing land and water outside their territory. The movement of these pastoralists in search of water and pasture for livestock, Ogato (2013) suggests is usually organized and do follow a predictable pattern that usually starts from local dry season areas on the periphery of water sources, through to safe refuge grazing zones and finally ending mobility cycle in distant places.

Mobility ensures that these nomads use forage and water resources includes moving to minimize the effects of droughts, and being able to use underused distant pastures from settlements (Masendeke and Shoko, 2013). In Turkana County, the Turkana nomads of Northern Turkana according Melle (2016) do migrate towards the fringes of Loriontom and Lokwanamor mountains ranges during the dry season and to the plains of Ilemi Triangle during the rainy seasons.

Nomadic pastoralists move progressively according to Masendeke and Shoko (2013) following systematic routes during the drought and rainy seasons to the valleys and to the hills with their livestock. They migrate back to the valley of Ilemi Triangle when rains start. It is thought that during this rainy season according to Mureithi (2012) that the Turkana pastoralists do many feasts to include traditional dances, and marriage ceremonies.

The detailed description of Turkana mobility type has been explained by Schrepfer (2014) is shown in Table 2.3.

TYPE OF MOVEMENT	INTERNAL OR CROSS BOARDER	ACTION
Traditional nomadic	Internal	Right to freedom of movement and choice of residence as contained in Kenya's constitution, regional and international human rights law provides protection.
	Cross-border	Need for national and regional pastoral mobility policy in line with the AU Policy Framework for Pastoralism in Africa.
Coping strategy movement	Internal	Right to freedom of movement and choice of residence as contained in Kenya's constitution, regional and international human rights law provides limited protection to those who migrate as a form of adaptation. Need for migration management through the strengthening of pastoral governance and in particular rangeland management.
	Cross-border	Need for national and regional pastoral mobility policy in line with the AU Policy Framework for Pastoralism in Africa.

Source: Schrepfer, (March, 2014)

Table 2.3: Pastoralist Mobility Types in Turkana County in the Northern Kenya

Many studies have described movements of pastoralists as one of the major coping strategy to drought, however, specific Ilemi Triangle areas in the plains and mountains where these nomadic pastoralists migrate to and or the methodology and

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arrangements required to migrate is not fully documented and this study will fill this gap.

b. LIVESTOCK SALES

According to Lekapana (2013) studies, pastoralists do sell their livestock to cope with drought. These practices could be to breed more females than male as male livestock are the ones usually sold. However, common practices during drought period according to Sherwood (2013) are that livestock prices do get low because the livestock body conditions or emaciated, so, the nomads have to sell more male livestock. Little is documented where pastoralists of Ilemi Triangle sell their livestock during drought, as it is essentially important to reduce livestock numbers before drought before excessive drought impacts are felt. Little about the market availability is known in Ilemi Triangle and this study will fill this gap in understanding how these pastoralists cope by selling their livestock.

c. HERD SPLITTING

According to Bryan (2013), during the dry season, nomadic pastoralists do divide their herds to smaller and smaller groups to find pasture. Families too are separated; other livestock are given to families to remain along the rivers in the plains especially with camels, sheep, and goats because they do not move to further mountains while cows are given other family members especially youth to move far towards the mountainous region of Ilemi Triangle. This helps according to Lekapana (2013) nomads to share risks and maximize the scarce range resources by herd splitting.

Sherwood (2013) argues that, if there is plenty of browse and no pasture, these areas are reserved for browser's livestock to include camels and goats, but where there is only pasture without browse, the pastoralists choose such areas for grazing only cattle and sheep. Such adaptability and arrangements according Lekapana (2013), supports nomads much that they can manage their livestock adequately. They do separate these livestock and grazed them separately.

A lot of literature supports this practice because it shields the poorer households from the adverse impacts of drought; however, how it is done in Ilemi Triangle is yet to be documented.

d. MAINTAINING CLANNISH AND KINSHIP LINEAGE

Maintaining clannish, kinship lineage and social network in many nomadic pastoral contexts do supports a lot in times of disasters; according to Sherwood (2013), this practice cuts across all nomadic population and do promote sharing of risks and lessening of vulnerability in managing livestock. Livestock is therefore, shared among families for the purpose of subsistence and reproduction. This further shields the poorer households from the drought impacts while the wealthier ones spread the risk during the dry period.

The *'Kwatela'* clan of Turkana ethnic group mainly inhabits Ilemi Triangle, though, some '*Ngisiger'* clan live in the East and '*Yapakuno', Ngiwayakwara and 'Lukumong'* clans live in the southern of the Ilemi Triangle. How these clans interact, support each other, maintain a social network inside Ilemi Triangle during difficulties is yet to be known, and will be interesting to understand through this study.

e. LIVELIHOOD DIVERSIFICATION

The nomadic population have further embraced livelihood diversification in order to cope with drought stresses and it has become a common phenomenon in most pastoral households.

This according to Huho and Kosonei (2014) includes a wide variety of alternative income generating activities, the collection of firewood, charcoal burning, and collection of gum Arabic among other activities. Like other Pastoralists, Pastoralists in the Western part of Turkana County according to Lekapana (2013) do engage in different livelihood diversification choices to include aloe production, wage employment, retail trade, farming along rivers Turkwel, Tarach, and fishing in Lake Turkana.

According to Mary Stella and Wakhungu (2013), it is always vital to diversify livelihood to increase sustainability of community food security among population and the study considers this as an important element in survival in harsh environment of this study. However, how nomadic pastoralists of Ilemi Triangle diversify their livelihood is not yet documented. This study will fill this gap of knowledge.

f. LIVESTOCK DIVERSIFICATION

Herd diversification is a common adaptation strategy practiced by most pastoralists in Africa. In Kenya, pastoralists who practise this according to Helgeson *et al,* (2013) live mostly in arid and semi-arid. They have to diversify according to Ouma *et al,* (2012) because most sheep and cattle remain the sensitive to drought while goats, donkeys, and camels are more resistant to drought-induced stresses.

The secondary data in Table 2.4 typically shows the behaviour observed in many nomadic pastoral areas. This coping behaviour utilized by the pastoralists in Afghanistan has been practical and seen in the in many settings pastoralist in Kenya.

Coping behaviour used by pastoralists	Description
Herd management	Transport of animals to areas where forage is available; sales and Slaughter of animals; diversification or switching of species composition within the family herd
Generation of food stores	Cereal stores made to prevent needless distress, sales of livestock; Stores of milk, meat, fat, wild fruits, grass and others
Forage supplementation	Preparation of hay, lopping of trees (leaves, fruits, and branches), and supply of commercial forage supplements, others

Coping behaviour used by pastoralists	Description
Supplementing and diversifying of income	Hunting, food gathering, fishing, trade, working in urban areas
Distribution of resources and demand	Herd and family splitting, temporary migration, transfer of animals within social networks (whether with kinship basis, or with stock associates) on which individuals have legitimate claims, resource sharing (e.g., circulation of milking animals)
Migration to urban areas and within same setting in search of grass and water for livestock	Migration within Ilemi triangle for the research setting and to the urban areas mainly in search of white collar jobs and in the setting it is mainly as watch men

Source: UN (2010)

Table 2.4: General Pastoralist's coping behaviour change of during drought

The literature review, therefore, strongly supports the recommendation from a recent case study on resource based conflicts on traditional adaptation to climate variability and change amongst pastoral communities in Wajir County, Kenya by Ouma *et al*, (2012) which recommends the drought recovery instruments, security measures, market development, income diversification and rural development, livestock health and marketing in order to promote the livelihoods of the pastoral populations. Insights from previous studies on coping strategies are crucial in appreciating extent of how the pastoralists cope with drought, problem they experience and how the need to design an appropriate mitigation strategy at the regional, national and or local levels is required for this population.

However, much of the literature and scientific knowledge for drought coping strategy used by pastoralist fails to provide critical insights on the interaction between the drought variable and human factors at the micro or household level. Moreover, nomadic pastoral population livelihoods have to depend entirely on natural resources that are endemically exposed to many qualms. For example, nomadic pastoralists depend on pasture that depends on unpredictable variations in rainfall and other climatic factors (Onyango, 2014). These uncertainties caused by drought enable the pastoralists to employ different livelihood mechanisms to ensure survival.

Although numerous studies on nomadic pastoralist's drought coping strategies were conducted in Kenya according to Lekapana (2013), scanty information is available on the same for pastoralists of Ilemi Triangle. Moreover, barely any research on drought coping strategies has ever been conducted amongst the Turkana pastoralists of Ilemi Triangle belt in Turkana County. To bridge this gap of knowledge, the study explored the community drought coping strategies employed by this pastoral group in Ilemi Triangle both in the present and in the past times because these droughts according to the Mureithi (2012) are not only recurrent but have a great impact on the preferred livelihood options of the pastoral populations.

Furthermore, there is a need to tap in to local's experience to manage drought adequately. The base knowledge within the local population is paramount is adapting what best can support to reduce the vulnerability among the populations. It is thus interesting to explore how Turkana people of Ilemi Triangle deal with such drought uncertainties in Ilemi Triangle and within their social networks. This knowledge would therefore enhance and complete our theoretical and empirical understanding of the Turkana nomads' indigenous ways of coping with drought today, as representative of what ways nomads follow under similar circumstances universally especially those on the border with other countries.

Findings of this study should enable us to identify key variables in the patterns of indigenous adjustments that might be supported, modified or enhanced to develop long-range drought management. As a result, the current study provides evidence for policy decisions concerning the possibilities to cope and recover from drought shocks as a pre-requisite for enhancing resilience in ASALs. Moreover, for the reason that no single indicator can be used to generalise all the settings even in similar environment, this study finding will fill the gap of knowledge on the practices utilized by the Turkana nomadic population of Ilemi Triangle in coping with droughts.

H. DROUGHT MITIGATION STRATEGIES AMONG THE PASTORAL COMMUNITIES

According to Spadacini (2011), reoccurring nature of drought in Kenya and the increasing humanitarian suffering to include loss of lives, conflict, food insecurity and child mal-nourishment in its wake and demonstrates that there is need for a sustainable strategy to end drought triggered humanitarian crisis in Kenya. UNDP (2013) suggests that livestock production account for about 90 per cent of employment and family incomes in many arid and semi-arid areas of the north and the northeast in Kenya. Many in these communities according to Lekapana (2013) in the northern Kenya have been hardest hit by drought cycles and have only remained on begging point on food aid.

The humanitarian crisis resulted from drought have been increasing in severity since the year 2001 according to Ouma *et al*, (2012). In Kenya, the drought of the year 2011 has been the worst drought in 60 years (Silale and Nyambegera, 2014). Since then, drought in Kenya has increased every year in severity and impact as the coping mechanism and capacity of affected populations get undermined. Sustainable interventions therefore need to be initiated and should aim to reduce the impact of drought and the causes of vulnerability in the Northern Kenya. Hence, there is need to capture the gains in interventions now manifesting themselves in this drought as grounds for intensifying efforts to continue to ensure the impacts of future droughts are mitigated.

Therefore, helping pastoralists cope with and recover from both environmental and man-made hazards through proper mitigation has been major focal by the Kenyan government, humanitarian organisations (NGOs) and United Nations (UN) agencies working in the country according to Lekapana (2013). This support lessens vulnerability and ensures these nomadic pastoralists' communities in the arid and semi-arid areas in Kenya get resilient. According to UNDP (2014), the Kenyan Government and non-government agencies intervene in various forms both in direct and indirect activities in order to help pastoralists cope with and recover

from drought. The Kenyan government according to Lekapana (2013) provide mitigate programs drought its body named National Drought Management Authority (NDMA) that was established in 2011 under by legal notice number 171 of the States Corporation Act (Cap 446) have ensured a coordination of structured drought management programs, supporting drought-related policy formulation and coordinating preparation of contingency action plans and risk reduction plans.

NDMA according to GOK (2011) is further supposed to spell out risk reduction awareness and education, and coordinate the implementation of risk reduction programs, drought mitigation and relief activities while generating, consolidating and disseminating drought management information. However, this implication is barely changing the vulnerability of the nomadic population according to Lekapana (2013). Mureithi (2012) has further mentioned some examples of humanitarian organisation operating in Turkana and Ilemi Triangle to include Save the Children, World Vision, Oxfam and VSF. These organizations according to Tsegaye, Vedeld and Moe. (2013) have worked closely with the local community in the areas of humanitarian, relief and development interventions. If these communities are adequately supported to include on proper pastoral economies protection and livestock management practices, then they will have less vulnerable to drought.

With an increasing donor fatigue on funding continuous relief food operations in nomadic pastoral areas that receive frequent drought, a newer approach to solve this problem is required according to Taylor (2013). Proposer mitigation measures against this need to be in place. However, for drought management to succeed in the great horn of Africa where nomads live, drought managing institutional need to be established and be backed by legislation on drought management practices. The available literature on this is little and this research study provides clear solutions to this. Meanwhile, societies living in the drought prone regions need to cope with drought through up scaling of mitigation programs and activities while dropping any constraining traditions that enhanced Tesfaye and Assefa (2010).

Proactive drought governance systems in many parts of the world like in Australia and India according to Mureithi (2012) have resulted to drought risk reduction. There is excessive vulnerability in Turkana County amid huge drought impacts and recurrent drought. Many of the Kenyan drought management policies (Appendix XII) created are not yet adaptive and practical to pastoral population and its livelihood because populations with wider traditional knowledge are not consulted (Lekapana, 2013). However, many humanitarian organisations in ASAL regions of Kenya have poor understanding on drought management strategies and keep on implementing relief food or uncoordinated similar non-viable activities before and after the drought (Mureithi, 2012). These uncoordinated drought management responses according to Opiyo (2014) do not allow room for implementation of stronger programs that meet the needs of the vulnerable populations.

Legislation on drought and practical and adapted policies need to be re-energized and financed. The scaling up of coping strategies need to be fully supported. A study by Lekapana (2013) suggest that a part from common emergency relief food provided by the government, the County and humanitarian organisations to hunger stricken populations in arid and semi-arid areas in Kenya, the humanitarian organisation with the government do support drought affected populations with water provision and livestock based interventions. Water related interventions provided do include water trucking, borehole development and maintenance, provision of hay and supplementary feeding to livestock, distribution of water tanks and construction of water pans. Livestock based intervention include destocking, provision of livestock health services and livestock feeds.

Solh and Ginkel (2014) mentions that there are less mitigation practices that the government have implemented in drought affected population in ASAL regions and government have relied upon on just supplying relief foods and this has enabled populations to be more dependent without thinking other practical measures of reducing vulnerability. However, as drought remain non abrupt issue, Opiyo (2014) suggest that the Kenya government should concentrate on four issues to reduce drought vulnerability: Creating resilience enabling environment for population for over the long term, strengthening government capacity to respond, and early scaling up of food, nutrition and livelihood interventions and good coordination of interventions. Additionally, adequate and appropriate plans and actions to reduce impacts of drought are ingredients of an effective intervention measures.

According to Tuimur (2017), drought does not have to lead to emergencies and disasters in Kenya because early interventions through coordinated programs and better preparedness save lives and livelihoods. Lekapana (2013) further suggested that key sustainable actions and solutions in aid and semi-arid zones in Kenya to end drought-triggered emergencies require integrated response strategy. This according to the study include ensuring a sustainable recovery of livelihoods and restore local coping mechanisms to enable populations deal with the recurring problem of drought, supporting the increase of pastoral-livestock production by providing water, establishing disease-free zones, improving breeding services and promoting an efficient marketing system, utilize Kenya's irrigable land to provide water in times of drought instead of depending on rain-fed agriculture and synergize the efforts of the diversity of livelihoods among the pastoral population and improving coordination of mitigation programs with many actors engaged in drought interventions in Kenya.

Tuimur (2017) describes mitigation as one the four main components for management of drought in nomadic pastoral population that can support to according to include early warning system, contingency planning, mitigation measures, relief, and rehabilitation. According to Lekapana (2013), there are close linkages among these four components of drought management. Specific policies for resilience are not only closely related to mitigation, but are also necessary for specific mitigation measures. Moreover, the strategies that guarantee access to specific grazing reserves during drought periods must be developed in the general policy on pastoral land tenure, and the effectiveness of emergency marketing interventions may be severely limited by a lack of marketing

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infrastructure and price distortions in end markets according to Sol and Ginkel (2014).

There are also interrelations between mitigation measures, relief and rehabilitation. Relief should ideally be targeted during emergency on particularly vulnerable sections of the population that cannot be reached by mitigation measures. It is also argued that restocking done to pastoral population after drought will make livestock purchase as mitigation measure easier (Lekapana, 2013). Taylor (2013) argue that relief activities need to focus on the vulnerable group of the population that cannot be reached by mitigation measures and that restocking after drought, will make livestock acquisition as a mitigation measure easier to do.

However, less about mitigation strategies is documented for Ilemi Triangle and the population have continued to remain vulnerable amid presence of Yearly Turkana County and National government resources allocations for improving pastoral livelihood and NDMA respectively.

a. DROUGHT EARLY WARNING

Early warning system (EWS) according to Thornton and Gerber (2010) form a method of collecting information and monitoring drought in order to provide timely and necessary notice to the population when drought threatens and therefore take an appropriate response. Early warning further provides a framework for the governments, donors, and humanitarian organizations to intervene promptly and avoid humanitarian crises according to ILRI (2010). Early warning system in Kenya has been initiated and decentralized to the county levels in order to decrease threats caused by droughts in most of the ASAL according Huho *et al,* (2009).

The Kenyan EWS model is efficient and effective in terms of identifying various stages leading to emergency though the implementation of its contingency plan has been less effective because of lack of funding Taylor (2013). According to Thornton and Gerber (2010), some of the major components and indicators of an early warning system include livestock production and mortality, human health, weather system, vegetation coverage, agricultural production, local market basket prices, movements of nomadic population and nutritional status.

In Turkana County, the population knowledge of early warning system according to Lekapana (2013) and Lewa (2015) have been weakened because of absence of drought information sharing, absence of modern weather prediction apparatus and meteorological stations network in Ilemi Triangle, weakened traditional indigenous prediction framework and absence of its recognition and integration in to the management of drought. These according to Sol and Ginkel (2014) affect the dissemination of early warning information to grassroots level and community remain reluctant to utilize the information and change their livelihood behaviour.

Therefore, an early warning system that does work for Ilemi triangle need to include recognise and support the indigenous early warning practices, support transmission of data collection, information development, dissemination and development of action triggering mechanisms.

b. CONTINGENCY PLANNING

Coping strategy to drought has a major positive impact to safeguarding the livelihood of the nomadic population and goes in line to the contribution of the UNICEF (2018) PRS strategy for Food Security objectives. Planning in drought management is vital for both mitigation and action taking. It further helps in Turkana, the research context, Ouma *et al*, (2012) suggests that a drought contingency plan has been developed containing emergency preparedness actions and different tasks of different groups and levels to include the donor, government ministries, infrastructures involved and populations.

Moreover, proactive contingency planning according to Taylor (2013) helps to save livelihoods with populations preparation to eventual disasters minimize worse before they happen. This will further include the development of overall drought preparedness strategy and policy, institutional structures, forecasting capabilities and early warning framework and plans that express measures geared towards helping communities that are at vulnerable and get safeguard with their livelihoods by being alerted on the imminent hazards and assisted to take actions against the threat.

However, according to Lekapana (2013), Kenya does not have specific drought management policies planned and instead many are crosscutting that is scattered in various sector policies that do exist and manage drought-related emergencies. These drought policies (Annex XII) Lekapana (2013) suggest a need for regular review and adaptation according to the changing drought stresses.

As the contingency planning remain essential in management of drought, little is known about the drought contingency planning in Ilemi Triangle. It will be worth to appreciate and understand the present drought plans that are available in Ilemi Triangle, so that they can be critically tested for their viability to respond adequately to cyclic drought situations.

c. MITIGATION

This component in the model assists in reducing drought impact to the population with different interventions measures Ouma *et al*, (2012). Mitigation measures according to UNDP (2013) can both be structured or even none structured and in the structured measures, issues like water development infrastructure for the nomadic population and market for livestock are implemented while non-stricture measures could be utilization of policies, knowledge development by consolidating practices in drought mitigation, and awareness of the population and community's empowerment on drought mitigation and preparedness programs.

In Turkana County, the governments, humanitarian and development partners have continued to invest on drought mitigation strategies to include social protection scheme through the HSNP implemented by NDMA to contribute towards economic growth of the vulnerable households and protection of livelihoods. However, few studies exist on the effectiveness of such mitigation schemes for addressing incremental climatic change events, and the changing nature of climate risks as part of dynamic livelihood trajectories

(Devereux *et al*, 2011). In Ilemi Triangle, little is even known if such programs or mitigation practices exists and this study will cover this gap.

d. RELIEF

Involves the activities carried out in an event of drought and immediately after according to Lekapana (2013). Relief food provision has been a common relief activity together with emergency primary health care and cancellation of debts in countries experiencing recurrent disasters according Mbogo, Inganga, and Maina, (2014). Nevertheless, with immediate relief food commonly known to be provided during relief emergency, little other is known what relief measures are practiced in Ilemi Triangle and this study will cover this gap.

e. REHABILITATION

Reconstruction is required to restore systems that collapsed due to the effects of drought. Lekapana (2013) further suggest that this process is vital as it restores vital systems and full relieves from drought-stricken areas. Examples of rehabilitations done in nomadic settings include restocking, livelihood diversification, distribution of seeds, agricultural credit offer and sedentarization policy change and resilience to drought. Pastoral institution building establishment and support of homegrown pastoral institutions is one of the prerequisites to help in mitigation of drought.

Traditional institutions are essential in supporting traditional coping strategies Pastoral associations should have a role to play in various ways including conflict resolution, negotiated tenure regimes for dry-season and drought-time grazing, communal management of water resources, the protection of grazing rights, access to and management of the natural resources, the delivery of human/livestock health services, revenue collection by charging for grazing rights and water use and collective livestock trade and marketing Fitzgibbon (2012).

A case in point in the pastoral community's association in Turkana West supported by local humanitarian organization Lotus for Kenya Development Organisation (LOKADO) where Karamojong cluster tribe meet at *"Moru Ata Nayeche*" (Thought to be the origin of Turkana). This meeting and associations promote peace, share of water, and pasture resources across the borders and conflicts are resolved amicably. These local pastoral institutions have a direct link between the local population and the government and they support community-based natural resources management.

Moreover, ILRI (2010) advises that if the nomadic populations are supported in creating a market for their livelihood (livestock), improving the Infrastructure in the regions of nomads including the road network and ensuring availability of water points for livestock then the vulnerability to drought will be lessened. Security in the northern Kenya, especially in Ilemi Triangle, remains a big challenge to pastoralists who move frequently in search of forage, water and pasture commodities for their livestock. This large area is subjected to restriction to access and utilization of such commodities due to conflicts (Huho *et al*, 2009).

Accordingly, in Ilemi Triangle belt, no one week passes without attacks from neighbouring ethnic groups to the Turkana nomads in this Ilemi Triangle because the boarder has remained porous with excess arms proliferation, the Triangle dispute continues because of the resources therein and the claims of where Ilemi Triangle lies has never been solved until to date. Improving security is a prerequisite for more efficient grazing land-use and especially during drought-time that these pastoral groups move frequently.

Intergovernmental agreements, political will, communities policing, negotiations along the borders with other boarding pastoral groups in South Sudan and Ethiopia and employment of Kenya police reserve are critical (Lott, Christidis and Stott, 2013). This should be initiated and enforced by the government through the development of drought management policies that target special contexts across volatile boarders.

There is a lot of literature on the drought mitigation strategies; however, scanty information is available on the same for pastoralists of Ilemi Triangle region, Turkana County. It remains further evident that hardly any research of mitigation practices has ever been conducted amongst the Turkana pastoralists of Ilemi Triangle of Turkana County. Findings of this study should enable the identification of key mitigation mechanisms that ensure resilience.

The knowledge received from this study will help to evaluate the appropriateness of the existing approach intermediation in Turkana because less has been done to identify alternative approaches. The information is important in planning activities that are affected by weather activities and helps in mitigation against adverse climatic conditions (Onyango, 2014). To bridge this gap, the study explored drought mitigation strategies employed in Ilemi Triangle.

I. METHODOLOGICAL APPROACHES RELEVANT TO THE CURRENT STUDY

Methodological approach discusses how different materials and methods were arrived at in the study. This is considered because it provides rationale or a framework of using the research methods in chapter 3. The methodological approaches used in this study were both Qualitative and Quantitative approaches. This involved collecting data and converting data into a numerical form in order to facilitate the analysis and conclusions. Random sampling was utilized to give each participant an equal chance to be chosen (Creswell, 2009). Purposive sampling method was used to target the key respondents and FGDs.

According to Masih *et.al*, (2014), the observational approach ensures an existence of observable reality, which generates evidence-based study that can be made known through statistical analysis of existing data. Therefore, this study strives to investigate a mathematical relationship between coping strategies utilized by the Turkana nomadic population and individual characteristics of the environment and individual's. Hence, the appropriateness of this quantitative methodology. The Cross-sectional study designs further examined the participants simultaneously with the data being collected at one point according to Shilenje and Ogwang (2015), thus, saving on the cost and time.

The study preferred and utilized this integrated methodological approach for this study in order to capture all relevant information and data on Turkana nomadic pastoralist community's perceptions on the coping and mitigation strategies with drought management practices. This combined methodology provides wider evidence as the options required for change of policies, practices and management of drought in most challenging, insecure environment.

J. MODELS AND THEORIES RELEVANT TO THE CURRENT STUDY

Models in disaster management can serve many purposes in shaping many lives in human societies (Dube, 2018). One such purpose is that models can simplify one's understanding of how things happen, for what purpose and how problems affecting people and their environment can be solved (Platt, 2015). Hussain (2013) notes that in the field of disaster management, models are based on the understanding that disasters are temporary interruptions to development processes, and that the job of disaster practitioners is to take appropriate action to quickly return to the normal the course of development. This suggests that models are there to be implemented and enforced by disaster practitioners, a situation that should be prevailing in a country like Kenya where drought disasters seem cyclic. However, if models are not properly used to aid in decision-making, then, even good models may turn out to be of little significance.

Dube (2018) has provided five main reasons to demonstrate the purpose of models in disaster management. The reasons are as follows: Models can be used to simplify complex events through distinguishing between critical elements. This is because the usefulness of such models is more realized when there is need to respond to disasters within a short possible time. Secondly, comparing actual conditions with a theoretical model can lead to an improved understanding of the prevailing disaster situation in a country, and thus facilitating the planning process and the effective implementation of proactive plans that are related to disaster management and a comprehensive completion of disaster management framework.

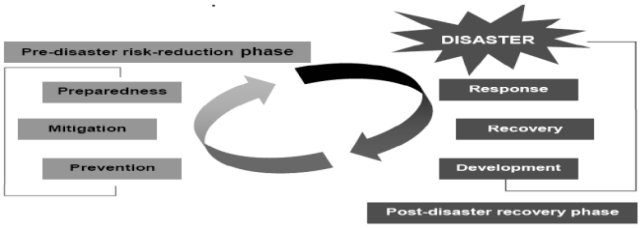
Thirdly, presences of a model for disaster management remain an essential element in quantifying disaster situations or events and when documented, models will support to establish a common understanding between various stakeholders involved in managing disasters. Model, therefore, smoothen the amalgamation of disaster relief and recovery efforts in lessening population vulnerability to drought (Platt, 2015).

Disaster management practitioners to manage hazards and disaster have used various models. Through document analysis, this study identified and discussed five common types of disaster management models. These prominent models have been used regularly in the disaster management field. The five models identified by the study are the traditional model or disaster management continuum model (Sillah, 2015), the expand-contract model (Dube, 2015), the disaster crunch model (Hai and Smyth 2012), pressure and release model (Marcus, 2005) and the Kimberly model (Albtoush *et al*, 2011). Marcus (2005) further classifies them as both logical models, integrated models and causes models.

Therefore, it can be argued that a well-defined and clear model is highly beneficial in the management of disasters because it facilitates the securing of support for disaster management efforts. Hence, disaster management needs a formal system, or a model, to manage and possibly reduce the negative consequences of a disaster. Disaster management mainly concentrates on reducing vulnerability and hazards, for reducing disaster impacts. However, study argue that government often does not have direct control over reducing 'natural hazards'. As a result, government mainly should focus on reducing the vulnerability for reducing disaster impacts.

a. TRADITIONAL MODEL OR DISASTER MANAGEMENT CONTINUUM MODEL

The traditional disaster management continuum model is the earliest model to be used in the field of disaster management. The traditional continuum model comprises the four distinct phases of mitigation, preparedness, response and recovery. According to Sillah (2015), the traditional model, activities, which are aimed at reducing the negative effects of potential disaster, are carried out during the first stages of the model. It is, therefore, a kind of logical model that provides a simple definition of disaster stages and emphasizes the basic events and actions that constitute a disaster according to Platt (2015).



Source: Coburn, et al, (1994).

Figure 2.1: The Traditional Continuum Model of Disaster Management

The traditional model assumes that hazards and disasters can be managed through a sequence of activities in each of the main four phases of mitigation, preparedness, response and recovery (Bankoff, 2001). Activities in this model are aimed at reducing the negative effects of potential disaster and are carried out during the first stages of the model. This model can be applied in the management of disasters in Ilemi Triangle because it is easy to comprehend, implement and appreciate disaster events. The traditional model is simple to follow and puts mitigation and preparedness phases before occurrence of disaster, whilst response and recovery phases come after disaster impact (Marcus, 2005).

The mitigation phase in Figure 2.1 entails eliminating or reducing the threats as possible and appropriate (Manitoba 2000). It is worthwhile to note that mitigation also encompasses some elements of the preparedness phase, for example, the provision of early warming, public education and resource mobilization. The preparedness phase on the other hand, consists of putting in place systems, which can handle any possible disaster.

For instance, response mechanisms, vulnerability assessment and setting up an institutional framework. Sillah (2015) adds that the preparedness phase involves putting in

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place measures that allow people to react in the face of disaster. However, this phase does not nullify occurrence of any possible disaster. The response stage follows disaster occurrence, with its major aim being to provide.

According to Marcus (2005), an essential model of a drought management system adapted to a pastoral context will, therefore, include a distinction between mitigation activities to minimize the impact of drought on production systems and livelihoods, and relief activities for the welfare of those rendered destitute. Often, the early warning and contingency planning during the onset of drought, while relief is more appropriate at a later stage can trigger mitigation activities. Longer-term policies for resilience are necessary for specific mitigation measures. Thus, plans to guarantee drought-time access to specific grazing reserves must be developed in this nomadic context according to Bankoff (2001).

b. EXPAND –CONTRACT MODEL

The expand-contract model in figure 2.2 challenges the sequential structure of activities proposed in the traditional model, while advocating for community involvement in disaster management. Therefore, the model is a community-based disaster management tool, as it assumes that disasters occur when a hazard overwhelms a vulnerable community. This Module is in form of an integrated approach that involves characterises the phases of a disaster by the evolution of functions such as strategic planning and monitoring (Marcus, 2005). In these models, modules are linked as events and actions.

According to Dube (2015), activities in the expand-contract model occur simultaneously, and continue side-by-side, expanding or contracting as needed. Each strand of the model varies, depending on the existing relationship between the hazard and the community's conditions of vulnerability. This therefore, suggests that many activities for disaster interventions can be carried out at the same time when dealing with various disasters in Ilemi Triangle. During disasters situations, the expand-contract model highlights that vulnerabilities of communities are more pronounced than the capacities that the communities possess (Kieft and Nur 2001). According to Dai (2013), a notable feature of the expand-contract model is that it overcomes the major weaknesses of the traditional model, which views disasters as managed in a phased sequence.

These elements are dependent on each other in terms of providing support and can be further broken down into layers of sub-components. The advantage of this model is that it provides a balance between preparedness and flexibility in order to respond fluidly to the specific needs of disasters. Since this model provides the link between actions and events in disasters, such links can be tight or loose. For example, it strongly links hazard and risk management activities but fails to provide a tight linkage between the four stages of disaster management, which are important elements in a disaster management process (Cannon, 2004).

Source: Atman (2003).

Figure 2.2: The Expand-Contract Model of Disaster Management

However, just like any model the expand-contract model is not without criticism. One notable limitation of the model is that it explains the parallel nature of activities, without explaining the cause and effect relationship. Furthermore, the expand-contract model does not explain the available disaster risks. The weaknesses of the cause and effect perspective that the expand-contract model ignores, can be addressed by the strengths of the disaster crunch model. The study did not apply this model because possible damage was not among the objective of the study. The integrated models characterize and emphasize on the phases of a disaster by the evaluating the functions such as strategic planning and monitoring.

c. THE DISASTER CRUNCH MODEL

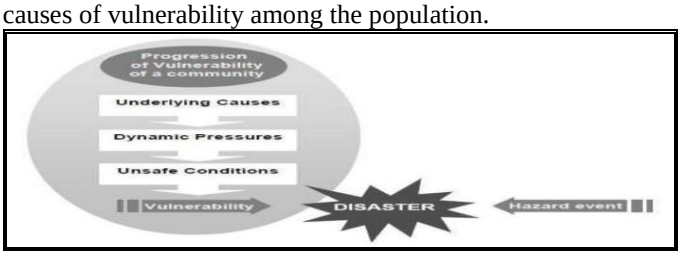
This Model has been viewed as a framework of understanding and analysing the causes of disasters. Crunch Model (Figure 2.3) is a kind of Cause type of Model. The crunch model adopts a cause and effect perspective because of its focus on the causes and impact of disaster (Hai and Smyth 2012).

The Model according to Dube (2015) is understood to analyse vulnerabilities and coping capacities of disaster-affected communities. According to the crunch model, the progression of vulnerability of a community is revealed. Furthermore, the underlying causes that fail to satisfy the demands of the people are identified according to Sillah (2015). This model goes further to estimate the dynamic pressures and unsafe conditions. The model is important as it can help practitioners to understand and react to people's vulnerability to disasters (Hai and Smyth 2012). *Crunch Model, therefore***,** explains the relationship between natural hazards and vulnerabilities of communities, making the model applicable to this study in Ilemi Triangle disaster situations.

Hai and Smyth (2012) further assert that the Crunch Model helps practitioners to understand and react to disaster vulnerabilities facing people. According to this model, a disaster happens only when a hazard affects vulnerable people (Hai and Smyth 2012). Dube (2015) notes that pressure can be released on those communities vulnerable to risk by decreasing or eliminating the various root causes, dynamic forces, and/or unsafe conditions available.

However, the disaster crunch model has also not been spared from criticism of scholars and practitioners. Cutter *et al*, (2008) have argued that the crunch model lacks the feedback in the system and fails to adequately address the coupled human–environment system associated with the proximity hazards. Despite its weaknesses, the advantages of crunch model can be employed to study and understand hazards and disasters in Ilemi Triangle. Furthermore, this

model has been applied in the study because it induces solutions by encouraging and motivating the application of the coping and mitigation strategies through understanding of the causes of vulnerability among the population.



Source: Blaikie et al, (1994).

Figure 2.3: The disaster Crunch Model of Disaster Management

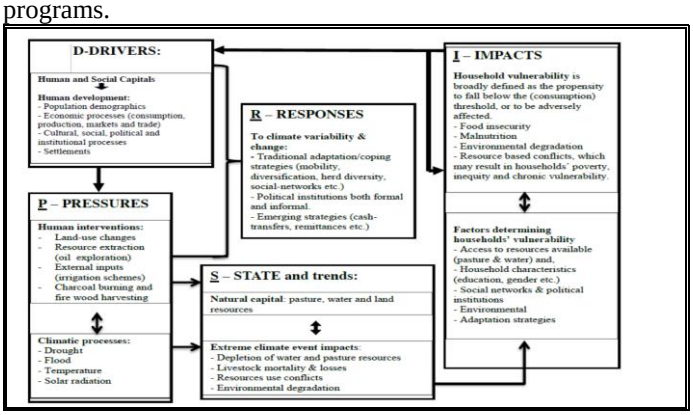
The model is further useful for understanding the various faces of interaction between factors of vulnerability and hazards. In addition to this, understanding vulnerability should go beyond the identification of vulnerability according to Dube (2015), it needs sound understanding of the root causes of vulnerability and why a particular segment of population suffers in every disaster. This study explores the root causes of vulnerability among the pastoral population of Ilemi Triangle as one of the study specific objective and this study will apply this Model.

d. PRESSURE AND RELEASE MODEL

This is a second type of the Cause model according to Kimberly (2003). Pressure and release Model (Figure 2.4) is considered more as the reverse of the crunch model. Heijmans (2001) suggests that this model indicates how applying preventive and mitigation actions can reduce the risk of disasters. As the identification of the mitigation strategies in Ilemi Triangle remain a specific objective of this study, this model is then relevant. The Model begins by addressing the underlying causes and analysing the nature of hazards and therefore, leads to safer conditions of population that will eventually support in preparing the community to deal with disasters (Cannon, 2004).

Understanding and utilization of this model according to Dai (2013) is paramount and can only be applied to the causes of drought vulnerability that are known, however, the causes of vulnerability and the drought coping strategies by the Turkana nomads of Ilemi triangle is yet to be known and this study will strive to understand this. Nevertheless, the study in social sciences have widely accepted the Pressure and Release Model (PAR Model) because it ensures sound understanding the various faces of interaction between factors of vulnerability and hazards (Cannon, 2004). According to (Blaikie *et al*, 2005), understanding of the vulnerability should go beyond the identification of vulnerability. It needs to understand the root causes of vulnerability and why a particular segment of population suffers in every disaster. This study will investigate this in Ilemi Triangle.

According to Schilling *et al*, *(*2012), this model (Figure 2.4) informs that, the recurrent drought hazards have resulted in depletion of water and pasture resources that are critical for pastoral production systems in the rangelands. This model is applicable in Ilemi Triangle hazard because it is complete, it enables identification of impacts of drought, pressures responses required and driving factors to drought vulnerability, thus, ensures a deep understanding on identification of main causes of vulnerability to drought on households. The model also supports not only in the identification of the climate induced processes that interact in an arid environment to impact on pastoralist livelihood system but also the scientific understanding of the specific coping strategies that Ilemi Triangle pastoralists use to cope with drought for more effective targeting of policies and resilience programs.



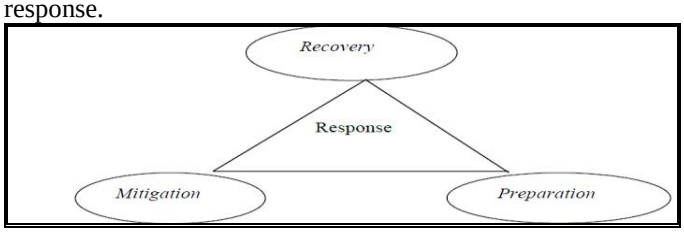
Source: Opiyo (2014).

Figure 2.4: Pressure and Release Model for Progress of Vulnerability Management of Drought and Participatory Management Framework

e. KIMBERLY'S MODEL FOR MANAGING COMPLEX DISASTER EVENTS

Kimberly (2003) also came up with a model, which he also condensed to the four phases of mitigation, preparation, response and recovery.

According to the Kimberly model (Figure 2.5), mitigation and preparation stages of disaster management are located at the bottom level, whilst the recovery stage is situated at the top. This model shows the response phase as the largest, longest and most visible stage of disaster management (Albtoush *et al*, 2011). However, the model remains suitable for managing complexity in disasters in the Kenyan set up. By situating the stages of mitigation and preparation at the same bottom level of the model, the model suggests that the two phases remain the driving force for successful disaster response.



Source: Kimberly, (2003).

Figure 2.5: Kimberly Model of Drought Management

The recovery stage is at the top of the model, as it illustrates what remains after the response stage. One weakness of the Kimberly model is that it can be used only in specific disaster situations, as it requires suitably staff capacity in order to effectively deal with all the stages of disaster management. The model according to Dube (2015) has a further bias towards the management of disasters occurring in

health institutions than in any other contexts and requires sound budget for well-trained and skilled staffs to manage it. This model will be difficult to apply in Ilemi Triangle where technical staffs are absent and the capacity of the population is low.

a.

.11 Conceptual Framework

A good conceptual framework for relationship between the drought coping and mitigation strategies according to Creswell (2009), should not only capture a complex dynamics and sensitivity which is the degree at which a system is affected by drought but must also describe the household's social economic characteristics. The conceptual framework is developed to support understanding of the actions and inactions of individuals and communities in respect to drought. Intentions to respond to drought can be explained in the causes of vulnerability, motivation by populations to address drought and the coping capacity of individual households and institutions (Bowen, 2009).

This study borrowed the concept of a Sustainable Livelihood Approach (SLA) that provides a useful guideline for understanding the survival strategies that households and individuals adopt during a crisis. In this study, the concept advances the understanding of the Turkana livelihoods, coping plans and mitigation strategies amid the challenges caused by the vulnerability to drought. SLA offers livelihood improvement opportunities through poverty reduction efforts by taking stock of the circumstances surrounding people, as they perceive them according to Lekapana (2013). According to Otieno (2009), to better understand how Turkana pastoralist's copy during in crises, a framework is presented and it involves incorporating the sustainable livelihood approach.

The model has been used to analyse Turkana pastoralists' coping strategies to dry land situations with special attention to drought, and to refine the current livelihood approaches to crisis response in the Turkana. It is pointed out in a model that the Turkana people's livestock live hood during crises needs to be understood carefully in terms of two issues access essentials like water and pasture for a better livelihood and capabilities of the local people to make their living more meaningful.

The SLA therefore, is a method of analysing and changing the lives of people experiencing poverty, vulnerabilities and disadvantage. According to Zwaagstra *et al,* (2010) Sustainable Livelihoods Approach brings in a participatory approach based on the recognition that all people have abilities and assets that can be developed to help them improve their lives. It improves understanding of the livelihoods of the poor. It organizes the factors that constrain or enhance livelihood opportunities, and shows how they relate. It can help population plan development activities and assess the contribution that existing activities have made to sustaining livelihoods. A livelihood is sustainable only when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities (Lekapana (2013). The pastoralist's livelihoods include their livestock, capabilities and activities that are for a means of living.

The sustainable livelihoods approach is a way of thinking about the objectives, scope, and priorities for pastoral development activities. It is based on embryonic thinking about the way the poor and vulnerable population manage their lives. It discusses on the importance of policies and institutions play in relieving populations from vulnerabilities and support in development of activities that are people-centred, responsive and participatory. The sustainable livelihoods approach facilitates the identification of practical priorities for actions that are based on the views and interests of those concerned but they are not a panacea. It therefore, makes the connection between people and the overall enabling environment that influences the outcomes of livelihood strategies. Thus, bringing attention to bear on the inherent potentials of people in terms of their skills, social networks, and access to physical and financial resources, and ability to influence core institutions all these reduces vulnerability to drought (Tuimur, 2017).

Vulnerability is characterized as insecurity in the wellbeing of individuals, households, and communities in the face of changes in their external environment. People move in and out of poverty and the concept of vulnerability captures the processes of change better than poverty line measurements. Vulnerability has two facets: an external side of shocks, seasonality's, and critical trends; and an internal side of defencelessness caused by lack of ability and means to cope with these. Vulnerability is characterized as insecurity in the wellbeing of individuals, households, and communities in the face of changes in their external environment. People move in and out of poverty and the concept of vulnerability captures the processes of change better than poverty line measurements.

Vulnerability according to Mureithi (2012) has two facets namely an external side of shocks, seasonality's, and critical trends; and an internal side of defencelessness caused by lack of ability and means to cope. Livelihood strategies and outcomes Dai (2013) are not just dependent on access to capital assets or constrained by the vulnerability context; the environment of structures and processes also transforms them. Structures are the public and private sector organizations that set and implement policy and legislation; deliver services; and purchase, trade, and perform all manner of other functions that affect livelihoods. Processes embrace the laws, regulations, and policies and in turn, determine the way in which structures operate. Policy-determining structures cannot be effective in the absence of appropriate institutions and processes through which policies can be implemented. Processes are important to every aspect of livelihoods. They provide incentives that stimulate people to make better choices according to Mureithi (2012).

The Sustainable Livelihoods Approach (SLA) according to Zwaagstra *et al,* (2010) encourages thinking out of the box. It frees development practitioners from conventional approaches that are often restricted to identifying problems and finding solutions. It invites them to look at contexts and relationships so that development activities can become more process-oriented. It compels them to look for multiple entry points and to move beyond a homogenous "community" view and a narrow sectorial perspective. It represents an important shift away from the focus on project inputs, outputs, and the assumed mechanical links between them.

In particular, the SLA stresses the importance of

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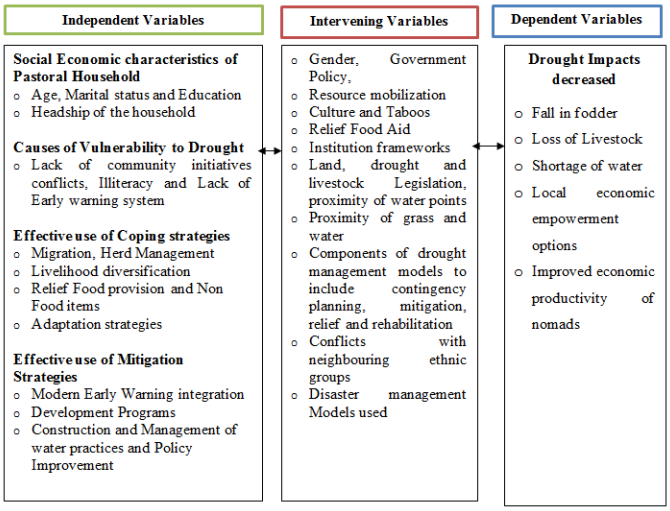
understanding institutions by mapping the institutional framework and linking the micro to the macro and the formal to the informal. Therefore, it calls for a new style of policy appraisal that moves from universal prescriptions to context-specific approaches that allow alternative, local perspectives to reveal themselves in the policy framework (Ouma *et al*, 2012). The choice and strength of this SLA is that it supports understanding of the changing combinations of modes of livelihood in a dynamic and historical context, acknowledges the need to move beyond narrow sectorial perspectives and emphasizes seeing the linkages between sectors and calls for investigation of the relationships between different activities that constitute livelihoods while drawing attention to social relations.

Yohannis *et al*, (2017) stated that SLA can be implemented on pastoral production systems and permits comparison of the vulnerability, coping and sustainability of livestock based livelihoods. This approach places people, particularly pastoral communities, in the centre of a network of interrelated influences that affect how they create a livelihood for themselves and their households. Pastoralists have assets to which they have access to including natural resources, skills, knowledge, and sources of credit, education and social networks. The extent of their access to assets is influenced by the vulnerability context. This takes account of shocks (e.g. droughts, epidemics), trends (e.g. economic and political) and seasonality (e.g. prices). Access is also influenced by the prevailing social, institutional and policy environment, which affects the ways in which pastoralists relate and use their assets to achieve their livelihood goals (Mureithi, 2012).

The independent variables in the conceptual framework (Figure 2.5) for the understanding of the relationship between vulnerability to drought and drought coping and mitigation strategies utilized included causes of vulnerability and the social economic characteristics of the household and independent variables remain the impacts of drought. The intervening variable are the variables included gender, religion, boundaries etc. these variables includes factors to which the study have no much control over them but affected and impacted the vulnerability of the nomadic population. Figure 2.5 provides a conceptual framework on the practices of managing drought. It contains different variables that contribute to the objectives of the study. Therefore, the framework provides a lens through which the Turkana people's livelihood during drought and famine could be understood, and is a useful heuristic tool for guiding the research.



Source: Researcher, (2016)

Figure 2.5: Conceptual Framework Model for relationship between vulnerability to drought and coping strategies used by Turkana nomadic pastoralists in Ilemi Triangle, Turkana County Kenya

III. MATERIALS AND METHODS

A. INTRODUCTION

The chapter covers research materials and methods used during the research study. It includes; study sites description, study population description, research design, sampling strategy, and data collection procedure, data processing, validity and reality of the instruments, ethical consideration, limitation and assumptions and finally analysis and presentation.

B. STUDY SITES

The study was conducted in Ilemi Triangle region of Turkana County, Kenya lying in the latitude 4°59'17. 39" N and longitude 35° 19'23. 40" E with a total area 14,000 km². Turkana County in the North West part of Kenya, with a nomadic pastoral population, covering an estimated area of 77,000km² and has a population estimated at 939,080 people according to Situma (2013). Ninety per cent (90%) of Turkana population lives in the remote rural areas that lacks infrastructure. Turkana County is bordered by Uganda to the west, South Sudan to the north, Ethiopia to the northeast, West Pokot County in Kenya to the south, Baringo and Samburu counties to the east (Figure 3.1). Approximately 80% of the Turkana land is classified as arid or very arid with only 3% of the County being suitable for limited rain fed crop production according to Otieno (2009). Therefore, the majority of the population are pastoralists.

Turkana County climate according to Mosley (2016) is characterized as warm or hot, with temperatures ranging between 24 to 40 degrees Celsius. It experiences very high temperatures during the day and moderate temperatures during the night all year round (Opiyo, 2014). This excessive heat accelerates depreciation of forage due to the high rate of evapotranspiration, drying up of surface water sources, failure

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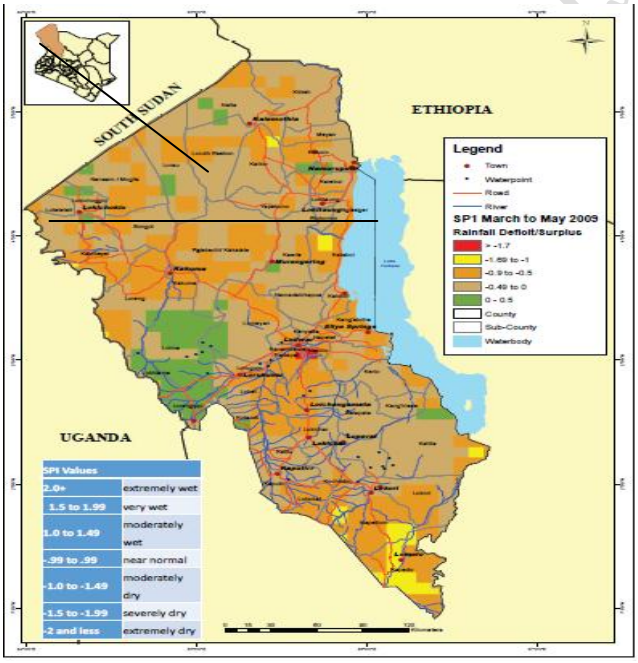
of vegetation growth and pasture for livestock and heat stress on livestock. Rainfall is erratic and unpredictable both in timing and in distribution. Most of the precipitation is partitioned as run off through the myriad of seasonal streams and rivers that drain the highlands that surround Turkana County. In general, the rainy season is locally known, as *"akiporo"* comprises long rains between April and June and short rains between October and December. January, February and September tend to be the driest periods locally known by the name "*akamu".*

Rainfall tends to be the highest in the western parts of the Turkana County and other areas of high elevation (NDMA 2018). According to Mureithi (2012), Turkana has been considered a County of burning desert of sand and stones that hardly a blade of grass anywhere, harsh and uninviting by any standards and an area with an immature ecosystem characterized by instability. The average of 216 mm drops of rain is usually received during long rains (NDMA 2018).

Turkana (Figure 3.1) was selected for the study on the basis that it has been subjected to historical and repeated droughts episodes that have left the region vulnerable. Ilemi Triangle in the far Northern part of Turkana County was preferred because it has been the most affected part of Turkana County by the year 2011 drought that came mainly into the limelight through famous Kenya for Kenyan initiative by the Kenya Red Cross society (KRC) and supported hunger stricken Turkana nomadic populations.

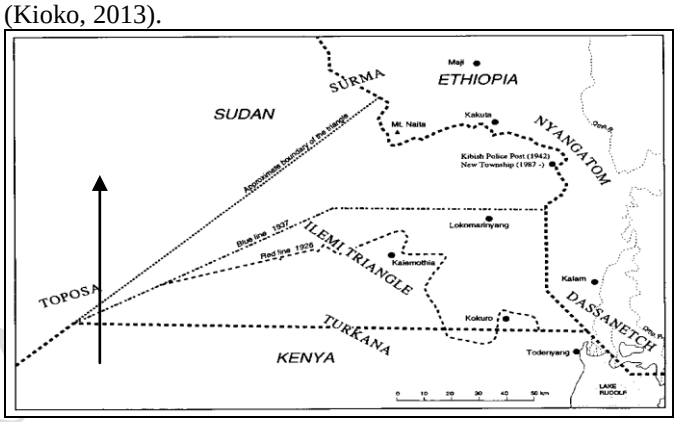
The study sites in Ilemi Triangle, Turkana County were Loruth in Kaaleng/ Kaikor ward on the west part of Ilemi Triangle and Napak in extreme North of Ilemi Triangle in the boarder of Ethiopia that practice primarily nomadic pastoralism. In Loruth, the households despite practicing nomadic pastoralism diversify livelihoods with charcoal, gum, Aloe and small business.



Source: NDMA (2016). http://apps.rcmrd.org/atlases/turkana/atlaspdf/turkana_county_atlas.pdf

Figure 3.1: Map of Turkana County Showing Drought Severity of the year 2009

The two study sites in Ilemi Triangle were preferred because the nomadic population has lived in the areas for a longer period to easily identify own coping strategies with recurrent droughts and these population has never abandoned their livestock livelihood strategy to change to another means of survival. It was also based on the variability of socio-economic activities of livelihoods they do for a living, the distance of case study sites from each other (to provide ecological and livelihood differences), existence/non-existence of outside interventions to reduce community vulnerability to droughts like non-governmental organisations and their absence. Government support and non-governmental humanitarian organisations (NGO) interventions that have an influence at the community level vulnerability, mitigating drought impacts and security/access of the study site (this is because of frequent inter-ethnic and cross-border conflicts related to access to water and pasture natural resources (Kioko, 2013).



Source : www.google.de/imgres?Imgurl=http:// conservation refugees. org/images/ Ilemi carte

Figure 3.2: Map of Ilemi triangle.

Ilemi Triangle region (Figure 3.1) is a triangular part in the extreme North of Turkana County, disputed among Kenya, South Sudan, and Ethiopia according to Melle (2016). According to Haskins (2010), the Ilemi Triangle has remained a conflict zone between different highly weapon equipped mobile ethnic groups living in and around the Triangle because of the water, pasture resources it contains and drought impacts. The conflict and the dispute between the neighbouring groups have never been resolved since the colonial period as the three countries claim the ownership of the Ilemi Triangle.

However, Kenya has remained the de facto controller of this Triangle (Melle, 2016). The Ilemi Triangle region according to Obero (2013) has remained characterized by the poor road network, the inadequate commitment of the veterinary services, poor health infrastructure with successive drought episode and an inadequate livestock market. These conditions heighten the impacts of drought on pastoralist's populations living in this belt.

The Turkana County is mainly made up of pastoralist communities with deeply rooted traditional customs and value systems (GOK, 2017). Customs and traditions include frequent migration, believe on traditional leader's advices, livestock borrowing and cattle rustling that often expose the vulnerable members of the community like women, and children to armed conflicts with the neighbouring communities (Haskins, 2010). These regular conflicts do

inhibit the Turkana pastoralists from accessing other important basic services like formal education, health care and other livelihood options. The Turkana County do experience high volatile levels of insecurity with frequent attacks from neighbouring countries and counties, such as the Pokot in Kenya, Karamojong from Uganda, Nyangatom and Dasanach from Ethiopia and Toposa from South Sudan.

Accordingly, Haskins (2010) has named the nomadic pastoral communities neighbouring each other inside Ilemi Triangle (Figure 3.2) to include Turkana of Northern Kenya, Jie, Dodos, and Karamojong of Uganda on the West of Turkana, Toposa of South Sudan and Nyangatom of Southern Ethiopia. All neighbouring ethnic groups inside this complex Ilemi Triangle region according to Owino (2016) form part of what is commonly known as "*Ateger"* who speak a similar language. These ethnic groups often migrate within Ilemi Triangle in search of pasture and water and have similar social-economic and cultural background. Their economy, therefore, revolves around livestock keeping according to Odhiambo (2013). This livestock includes camels, cattle, sheep, goats, and donkeys.

This complex region in the North West in Turkana County according to Melle (2016) has remained disputed since the colonial period. However, according to Melle (2016), Kenya has remained the de facto control of Ilemi Triangle though South Sudan has kept its contest unofficially. The principal cause of the contested ownership of Ilemi Triangle is the arbitrary delimitation of the Kenya and Sudan boundary according to Owino (2016).

GOK (2010) puts the total demographic population for the two divisions to be about 57,647 people while the two study sites at 7,051people. This comprised of Loruth (3,808) and Napak (3,243) households with 1,022 households in total for the 2 places. The GOK (2013) mentions that the Turkana household size is of about 6.9 higher than the national household size of 4.4. Given the study population of the two sites being of about 7,051 people, this produced 1,022 (552 for Loruth and 470 for Napak) households in the two study sites.

Kaikor was chosen as a pilot study site and the study was done in Napak, and Loruth areas as the two sites were in the news for being the most severely affected by a recent drought of the year 2011. The piloting in Kaikor did not only reinforced in testing the procedure but also provided the information about the response unpredictability and assisted in measuring the flow of information prior to carrying out the full study. Piloting also supported in evaluating each response aligned with the research question.

C. STUDY POPULATION

The study population were the adult head of the pastoralists households of the ages above18years living in the study sites, the key informants from the ministry of livestock and water, County officers for disaster management, the member of the County assembly of study sites, the community administrator (Chief), local community leader, sub-county administrator in Ilemi Triangle, Turkana metrological station officers, ward administrators, Security officers, Chief county executive dealing with disasters management and Turkana County disaster management director, Institutions including humanitarian Organizations working in Ilemi Triangle program managers to include Red Cross, NDMA, Lotus Kenya Development Organisation (LOKADO) and Turkana Pastoral Development organisation(TUPADO).

D. RESEARCH DESIGNS

The study utilized multiple research designs involving both qualitative and quantitative approach using Correlational Survey, and evaluation designs (Table 3.1). The study had chosen and utilized mixed designs for the reason that it addresses study questions and theoretical perspective at different levels that complement the strengths of a single design and overcome the weaknesses of a single design. Therefore, the mixed designs outweighed a single research design because they are easier to describe and are helpful in designing and validating study instruments according to Biddix (2016).

The quantitative method measured the determinants of the coping and mitigation strategies to drought disaster by the nomadic pastoralist by using numerical data and the study applied positivist epistemology approach that assumes that there is an external objective reality that can be measured without influence of the researcher (Naidoo and Wills, 2009). The descriptive research designs concerned with finding out "whom," and "where' of the variables while the qualitative approach utilized and applied to received data not captured quantitatively (Wagesho and Jain, 2013).

Specific Objectives	Measurable Variable indicator.	Research design
✓Establish factors causing vulnerability to drought for the Turkana nomadic pastoralist's population of Ilemi Triangle, Turkana County in Kenya.	Community initiatives, involvement, support to traditional coping strategies,	Correlational Survey
✓Examine the indigenous methods of drought early warning system in Ilemi Triangle, Turkana County in Kenya.	Indigenous Early warning system variables	Survey
✓Evaluate the community indigenous drought coping strategies in Ilemi Triangle, Turkana County in Kenya	Various indigenous drought Coping measures within Turkana population	Survey
✓Evaluate the drought mitigation strategies in Ilemi Triangle, Turkana County in Kenya	Relief food, early warning information, insurance and livestock health, promotion of livelihoods	Evaluation

Source: Researcher (2016)

Table 3.1: Summary of the Research designs, Specific objectives and Measurable indicators of the study

E. SAMPLING STRATEGY

a. SAMPLING METHOD AND SAMPLE SIZE OF HOUSEHOLDS

The multi-stage sampling method (Table 3.2) was used in selecting household respondents. The purpose of choosing this method was to avoid bias, saves cost, and ensuring an equal representative sample is selected and included in the study. This method of multistage random sampling according to Baraka and Litunya (2013) saves time, simple to use and lessens biases.

A combination of stratified simple random sampling and purposive sampling techniques were used. The purposive sampling according to Shibutse *et al*, (2014) enables the researcher to sample out key participants who were responsible for their departments and head of the community or elders and who have stayed in the sampled areas longest. The random sample size of the households was determined using Cochran's formulae as presented and recommended by fisher *et al*, (1998).

Study Population Unit	Sample Method	Sample Size
Pastoralists households from Loruth and Napak	Multistage random	424 (212 each location)
Local Community leaders for Loruth and Napak	Purposive	10 (5 each)
Community administrator (Chief) for Loruth and Napak	Purposive	2
Member of the County assembly of Loruth and Napak	Purposive	1
Sub-county administrator in Ilemi Triangle region	Purposive	1
County officers for disaster management	Purposive	1
Turkana County Chief executive dealing with disasters	Purposive	1
Turkana County national disaster management Authority director	Purposive	1
Turkana Metrological station officer	Purposive	1
Humanitarian Organization working in Ilemi Triangle program manager	Purposive	2
Officers from the Ministry of Livestock	Purposive	2
Officers from the Ministry of Water	Purposive	2
Focus Group Discussion (FGD)	Purposive	10 FGD per site
Observation	Purposive	To each site

Source: Researcher (2016)

Table 3.2: Summary of the Study Sampling Strategy

The Cochran equation formula

$$n = \frac{z^2 p`q}{D^2}$$ Equation 3.1

Where

n = the desired sample size population (respondents that were interviewed) <10000;

d = the degree of precision 0.05(sampling error the margin error (5%) that was accepted in this study.

Z = 1.96 (Z score corresponding to 95%confidence interval).

P= the proportion in the target population estimated to have a particular characteristic.

As it is unknown how many household's representatives will be available at home during the data collection because of frequent mobile nature of the nomadic pastoralist, the study used 50% of the given sample as recommended by Fisher *et al*, 1998. p = 0.5 which assumes maximum heterogeneity (i.e. a 50/50 split) was used for this study. Q = 0.5 (1-p) which equals the desired confidence level, e.g., 95%); that is the desired level of precision. Therefore

$$N= 1.96^2 \times 0.5 \times (1-0.5)/0.05^2 \quad \boxed{3.85 * 0.25/0.0025} = 385.$$ Equation 3.2

The sample size formulas provided 385 households to be obtained and the study added 10% to the sample size to compensate for the persons that the study was unable to contact and further compensate for the non-response especially in the self-administered questionnaires. This gave 423.5 samples (rounded to 424). The 424 were proportionally sampled to give 212 household's heads for each study sites.

The multi random sampling method was used in getting the samples for the study. Loruth and Napak area chief's records corresponded to the government population that showed about 1,022 households living in two-study site. This population was divided into five groups or clusters. In each of the study area, two clusters were selected randomly for the study. This was due to homogenous nature of the Turkana nomadic pastoralist's population in the study site.

The sampling procedures used to get the 424 households were:

✓ *Sampling stage one:*

The five clusters in each location were given numbers 1-5. Two of the numbers were picked at random at each location since two clusters were used for the study.

✓ *Sampling stage two:*

All the households in the two clusters in each study area were picked and registered separately to form a sampling frame. Numbers were then assigned to households in two selected clusters in each study area. The numbers were then written onto separate pieces of paper and folded. All the folded papers were thereafter put in a bucket that was shaken thoroughly. The numbers were then simply and randomly drawn from the basket, one after another until the sample size was reached. A random sample of 106 households was picked at each of the two clusters in the study site giving 212 households per study site.

This made 424 households sampled for the two study sites. All the sampled household's representative interviewed were perceived to be the head of the household, a Turkana

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nomadic pastoralist adult and a permanent resident of the area and practice pastoralism. The participants were provided with full information about the research to receive their consent. Outside these inclusion criteria were excluded to minimize errors and other household picked from the bucket cluster. This was especially for the household that the adult was not present.

b. THE SAMPLING OF KEY INFORMANTS AND FOCUS GROUP DISCUSSION PARTICIPANTS

The Focus Group Discussion (FGD) and key informants were purposively selected. This selective or subjective sampling was based on the characteristics of the study population. No sampling frame was prepared for the key informants and focus group discussion participants. Key informants and focus group members were people perceived to have huge understanding and opinions about the topic under study. The main criteria for selecting the key informants in this study included the participant with extensive knowledge of the cultural practices related to drought in the past, longer length of stay in the study site and a leader of the organisation they are representing. For focus group discussion, ten participants were chosen at the equal measure in the five clusters of each study area i.e. two participants from each cluster. Gender equity was also a consideration in that one male and one female was selected.

The twenty-four (24) sampled for the key informants comprised of one respondent from NDMA in Lodwar, two respondents from the County disaster department and line departments, one from each Community administrator (Chief) in Loruth and Napak, one Member of the County assembly each for Loruth and Napak, two from ministry of livestock and two from Ministry of Water, one from meteorological department, two NGOs representatives and five key informants from each of the two villages giving a total of 24 key informants. For focus group discussion members, ten for each study site were purposively selected and all the participants were provided with full information about the research to receive their consent.

F. DATA COLLECTION

Secondary and primary data were collected for this study. The primary data were collected using the questionnaire, key informant's interviews, focus group discussions, and observation checklist in Table 3.3.

a. PRIMARY DATA

The study sites were sensitized in writing and telephone before the seven research assistants went for investigation. These research assistants were trained in July 2016 to assist in data collection. The training targeted the reduction in biases and errors in data collection, and to familiarize the research assistants with the research objectives, the research protocol, questions, interactive ways to ask questions, data instruments to be used (observation sheet, informed consent, and questionnaires) and research rationale. The researcher with the seven research assistants translated the household questionnaire into the Turkana local language before collecting the data. The questionnaires were pretested to 50 households in Kaikor village and slight adjustments were made accordingly prior to data collection. The Data collection outline (Figure 3.3) indicates the steps and process involved in the collection of data.

The study collected primary data from the research study sites with the help of questionnaires (closed-ended), interview guides, key informant's interviews, focus group discussions, and observation checklists as study instruments. Primary data at research site according to Wagesho, Goel, and Jain (2013) do capture information that is right at the study place with guaranteed quality and appropriate for the research objective. Four hundred and twenty-four questionnaires (Appendix III) were administered to the households. Two hundred questionnaires were administered for each location and targeted household of ages between 18 to 50 years and above 50 years. These are the ages when one is considered the head of the household. These instruments collected data on the household social demographic characteristics to include data on education levels, age, gender, religion, and other relevant characteristics; data on factors causing vulnerability to drought, how drought get detected by nomads, the impacts of drought on nomadic population and data on community own drought coping strategies.

The procedure for collection of primary data is shown in Figure 3.3. Key informant interviews were conducted with representatives of relevant departments and or institutions (Appendix IV), community leaders, opinion leaders, youth and women group representatives and NGO (Appendix VI). Exposure of the interviewees and their respective level of education were considered in determining the interview's numbers. These self-administered interview guides on officials were closed-ended questions. The purpose of opting to self-administer the interview guide questionnaire was to achieve a maximum and an increased response and reduce the time of processing. The explanation to the officials was provided first before providing the questionnaire. They were informed not only about the study objectives, the importance of their own opinion on survey results but also on confidentiality of the information they provide.

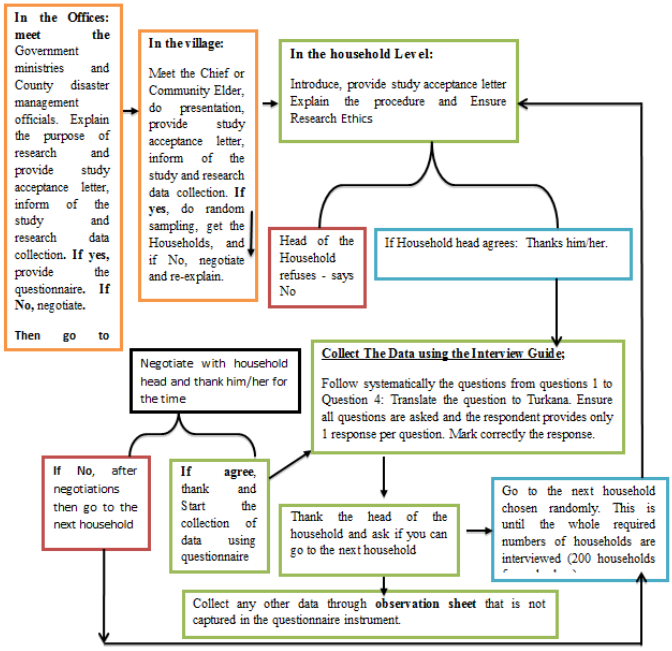
One group of Focus group discussions (FGDs) team per area (Appendix VIII) were used to capture other qualitative information that was not captured in the questionnaire and affirmed some of the information from a questionnaire, key informants, interviews, and observations. They were 10 members in the focal group per each location selected from the clusters and consisted of women leaders, community elders, and opinion leaders and other leaders of youth groups.

Study population unit	Sampling Method	Sample Size	Data Collection Instruments	Appendix Number
Pastoralists households from Loruth and Napak	Multistage random	212 each	Questionnaire	III
Local Community leaders for Loruth and Napak	Purposive	10 each	Key informant Interview Guide	IV
Community administrator (Chief) for Loruth and Napak	Purposive	2	Key informant Interview Guide	
Member of the County assembly of Loruth and Napak	Purposive	2	Key informant Interview Guide	
Sub-county administrator in Ilemi Triangle region	Purposive	1	Key informant Interview Guide	
County officers for disaster management	Purposive	2	Key informant Interview Guide	
Turkana County Chief executive dealing with disasters	Purposive	1	Key informant Interview Guide	
Turkana County national disaster management Authority director (NDMA)	Purposive	1	Key informant Interview Guide	
Turkana Metrological station officer	Purposive	1	Key informant Interview Guide	V
Humanitarian Organization working in Ilemi Triangle program manager	Purposive	2	Key informant Interview Guide	VI
Ministry of Livestock	Purposive	2	Key informant Interview Guide	VII
Ministry of Water	Purposive	2	Key informant Interview Guide	
Focus Group Discussion (FGD)	Purposive	10 each	FGD Guide	VIII
Observation	Purposive	10	Observation Check list	IX

Source: Researcher (2016)

Table 3.3 Study population units and corresponding data collection instrument(s)

Observations checklist (Appendix IX) was used to collect data on general characteristics of the area, economic activities available, and activities by nomads, a general problem is seen, solutions and options available and how nomadic pastoralists relate to outsiders. Photography was utilized to capture the data observed. Observation sheets were used to collect general and related information not captured in the other instruments. Figure 3.3 show the flow of how primary data was collected in the households and in different departments of the government when permission was to be received before data was collected, any household head that refused to be interviewed, the data collectors re-explained and if accepted data was collected and if refused then the data enumerators passed to the next household.



Source: Researcher (2016)

Figure 3.3: The Primary data gathering procedure for both the pre-test area in Kaikor and research areas of Loruth and Napak in Ilemi Triangle, Turkana County in the Northern Kenya

b. SECONDARY DATA

Secondary data involved reviews from Ministry of livestock, Ministry of water, National Disaster Management Authority (NDMA) and Kenya Meteorological Services. These departments were all located in Lodwar and data was collected to compare, validate, and strengthen the primary data. Supplementary relevant literature in scientific and peer-reviewed journals in the Internet and virtual library were further reviewed.

G. VALIDITY AND RELIABILITY OF DATA COLLECTION INSTRUMENTS

a. VALIDITY

According to Bowen (2009), validity is an ability of an instrument to measure what it is supposed to measure and it generally considers whether data obtained in the study represents the variable of the study. According to Wagesho *et al*, (2013), validity is vital in research because conclusions made in the study data are more precise and relevant. The study utilized content validity to measure the degree to which data collected using a particular instrument represents the population. The instruments were content analysed by the expert judgments. The instruments were thoroughly checked by the two supervisors at SDMHA/MMUST and improved, organized consistently with the research objectives and expected data. Their feedback was put into consideration.

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b. RELIABILITY

Reliability according to Keith *et al*, (2017) refers to a consistency of an instrument when applied to similar situations. Instruments reliability accordingly to Opiyo (2014) has been of major concern to the social scientist because the measuring instruments are rarely completely valid and in most cases, reliability is lacking in these instruments. It remains a degree to which an assessment produces stable and consistent results. The importance of evaluation of a measuring instrument by determining its degree of reliability. The reliability measures according to Wagesho *et al*, (2013) vary on a scale of between 0 and 1 with the former value indicating measurement involving nothing but an error and reaching 1 when there is no variable error during the measurement.

There are four methods of evaluating the reliability of an instrument: Split-Half Reliability: that determines how much error in a test score is due to poor test construction and is calculated by administering one test once and then calculate the reliability index by coefficient alpha, Kuder-Richardson formula 20 (KR-20) or the Spearman-Brown formula. The second one is Test-Retest Reliability that determines how much error in a test score is due to problems with test administration (e.g. too much noise distracted the participant). This is done by administering the same test to the same participants on two different occasions. Correlate the test scores of the two administrations of the same test. The third other methods of reliability are Parallel Forms Reliability that is to determine how comparable two different versions of the same measure are and lastly Inter-Rater Reliability: Determines how consistent two separate rates of the instrument are.

Split-Half Reliability or Likert Tests was chosen for this study because it easily determines the error in a test score that is due to poor test construction (Opiyo, 2014) and coefficient alpha (otherwise called Cronbach's alpha) was applied because if a statistician apply Likert Scale or have another measure that does not have just one correct answer, then this is the preferable statistic method. Mohsen and Reg (2011) provide the following reliability coefficient formula (Cronbach's Alpha Formula).

The formula for Cronbach's alpha is:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$ Equation 3.3

Where:

N = the number of items.

$\bar{c}$ = average covariance between item-pairs.

$\bar{v}$ = average variance.

However, coefficient alpha is difficult to calculate by hand and will not be accurate (Mohsen and Reg, 2011). Hence, the study used SPSS to calculate the reliability coefficient alpha (using reliability command for analysis reliability coefficient Analyse – scale –reliability). However, if you must calculate the reliability by hand, use the Spearman Brown formula which remains inaccurate though much easier to calculate. Spearman Brown formula is not as accurate but is much easier to calculate. Cronbach's alpha is not a statistical test it is a coefficient of reliability (or consistency). Cronbach's alpha can be written as a function of the number of test items and the average inter-correlation among the items Bowen (2009).

To ensure instruments reliability, the instrument was piloted in Kaikor village to ensure that the instrument could be replicated, relied upon and free of errors. Kaikor village was chosen as the pilot study area because it rests within Ilemi Triangle belt, inhabited by population practicing nomadism. The instruments errors were corrected after piloting. Using SPSS, Cronbach's alpha Test was done and analysis for reliability coefficient was attained. The reliability coefficient of 0.8 was used as the threshold level for the study instrument. This is because the figure that falls between 0 and 1 are considered to be within the good level while a reliability value of between 0.8 and 0.9 of Cronbach's' alpha is considered a more acceptable reliability according to Bowen (2009).

H. ETHICAL CONSIDERATION

In addition to proposal approval from the Masinde Muliro University of Science and Technology, the introduction respondents from MMUST letter, research permit was sought and obtained from the NACOSTI (Appendix II). All study participants were respected, appreciated, and informed of their participation is voluntary. The informed consent was sought from all participants before data collection with no citation or revealing of the participant's identity, to ensure involvement and confidentiality.

I. LIMITATIONS

The following were the limitations encountered in the field while collecting the data;

- ✓ Ilemi Triangle study area is very vast (400 km²) with a mobile population and the researcher took the multistage random sample and purposive sampling in order to capture the whole areas.
- ✓ Insecurity in Ilemi Triangle restricted the scope. To address this, the researcher employed the services of Turkana local police reservists in one cluster to collect data.
- ✓ The research was conducted during the dry period when the pastoralists were plagued by drought and living together to reduce attacks from neighbouring ethnic groups and possibility of providing right information in drought than during rainy season when festivals are many with heads of households absent leaving only young children at homes who do not have bigger knowledge about drought during happier season; there was a higher expectation from the respondents during dry season on the financial support. To overcome this challenge, the researcher with the help of the area Chiefs informed the respondents that the research was purely for academic purposes and for their own betterment.
- ✓ Data collection was done close to the 2017 Kenyan election period when political temperatures was high in Turkana County and there was suspicion of taking political information and the researcher, therefore with the help of the Chiefs assured the population that the information was purely for academic purposes and most of the information on people was to be kept confidential.

J. ASSUMPTIONS

The assumptions for carrying out this study were

- ✓ The intervening variables were assumed to remain constant during the study.
- ✓ Participants were willing to provide truthful information.
- ✓ Security and political environment were conducive to the completion of the study.
- ✓ The representatives of the households were at homes by the time of data collection.

K. DATA PROCESSING ANALYSIS AND PRESENTATION

Data was collected by the use of the data instruments. This included interview guides, observations, questionnaires and focus group discussions that were edited, coded and arranged, tabulated and entered into a Ms Excel spread sheet in a standard format to allow for analysis of both descriptive and inferential statistics where Statistical Package for Social Sciences (SPPS, version 21) computer software were used.

For the demographic data obtained, descriptive statistics were utilized to analyse data into means and median for continuous data such as geographic distance, different coping strategies etc. while frequency distribution, proportions and Chi-square for categorical data to include age, gender, marital status, employment status, education level etc. were utilized.

The inferential analysis took place to observe if the pattern in the data analysis was due to intervention effects or not. To compare the categorical variables mentioned, the Chi-square test was applied (Pohlert, 2016). In the analysis, a Chi-square P-value of less than< 0.05 (the significance level, 0.05), the null hypothesis cannot be accepted and therefore, there is a statistically significant relationship between the measured variables. The Chi-square test is intended to test how likely it is that an observed distribution is due to chance. It is also called a "goodness of fit" statistic because it measures how well the observed distribution of data fits with the distribution that is expected if the variables are independent (Bowen, 2009).

Pearson Correlation test was used for continuous variables according to Pohlert (2016) to assess the linear associations between different coping strategies and variables. Pearson's correlation coefficient is a statistical measure of the strength of a linear relationship between paired data. In a sample it is denoted by r, and is by design constrained as -1< r <1. Positive values in the analysis denote positive linear correlation while Negative values denote negative linear correlation and a value of zero denotes no linear correlation. The closer the value is to 1 or –1, the stronger the linear correlation between the measured variables. Therefore, when Pearson's r is positive, it means one variable increases in value, the second increases also in value and when r-value is negative it means one variable increases in value and the second variable decreases in value. Moreover, the closer the Pearson to 1, there are strong relations between the two variables while the closer to Zero, the weaker the relationship between the two variables.

A non-parametrical test for trends in the case of rainfall pattern in Turkana and temperature trends was applied. Mann-Kendall's statistical test was preferred over Spearman's (rho) rank order correlation coefficient. The choice of this non-parametrical statistical correlation test was because the distribution of Kendall's tau has better statistical properties, smaller values can be used with the interpretation of the probabilities of observing the agreeable (concordant) and non-agreeable (discordant) pairs being very direct (Pohlert, 2016).This Mann-Kendall's statistical test analyses trends in data over time has low sensitivity to abrupt breaks mainly due to inhomogeneous time series, the test does not require any assumptions as to the statistical distribution of the data according to Barbar and Ramesh (2013).

The Mann-Kendall Statistic (S) measures the trend in the data. Positive (+) values indicate an increase in constituent concentrations over time, whereas negative (-) values indicate a decrease in constituent concentrations over time. The strength of the trend is proportional to the magnitude of the Mann-Kendall Statistic (where large magnitudes indicate a strong trend). However, the data used for the Mann-Kendall analysis should be in a time sequential order. The MK statistic (S) is defined as the sum of the number of positive differences minus the number of negative differences (Libiseller and Grimvall, 2002) as follows formula:

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} \operatorname{sgn}(X_j - X_k)$$

Equation 3.4

Sign $x_j - x_k$ is an indicator function that results in the values -1, 0, or 1 according to the sign of $x_j - x_k$ where j>k, assuming that $x_j - x_k = \theta$, the value sign θ is computed as follows:

$$\text{Sign } \theta = \begin{cases} 1 & \text{if } \theta > 0 \\ 0 & \text{if } \theta = 0 \\ -1 & \text{if } \theta < 0 \end{cases}$$

As the formula was complicated and requiring a lot of time, SPSS was used to analyse the temperature and rainfall data.

The Standardized precipitation index (SPI) formula was used to calculate and analyse drought severity. The SPI was calculated for 12 months for the period between Jan 1950 and Dec 2015. In the analysis, the negative values of SPI are considered as dry or extreme dryness while the positive values show wet periods.

The SPI is calculated by dividing the difference between normalized seasonal precipitation and its long-term seasonal mean by standard deviation as follows formula

SPI = *Xij – Xim /σ).* Equation 3.5

Where *Xij is the* normalized amount of precipitation of the current annual, *Xim* an average of rainfall in a timeframe and σ indicates the standard deviation. A meteorological drought is said to happen when the SPI analysis values are negative and end when they turn out to be positive according to Huho and Mugalavai (2010). According to Opiyo (2014), normal precipitation is when the SPI values are at zero (0.00) while drought is extreme when the values are ranged from -2.00 and below, severe when they are at -1.5 to -1.99, moderate when the values are at -1.0 to -1.49 and finally mild drought when the SPI values are between 0 to -0.99. According to Huho *et al*, (2010), the help in identifying the severity of the drought; hence, a sound informative indicator that can support in alerts and informs on putting drought coping measures in place.

Qualitative data was triangulated. Triangulation was used during identification of the causes of vulnerability, early warning methods, the coping strategies used and mitigation strategies to improve the final list of causes from the FGDs. They were analysed thematically and integrated into the form of narrative. Triangulation was carried out by the researcher and research assistants to compile the list in various study objectives. Ten FGD members from each site who undertook the scoring and ranking later approved the list. To make the scoring easier for the ten FGD members, a twenty-point score was preferred by the FGD. Each of the four objectives were scored and analysed independently, with a maximum mean score of twenty (20) and a minimum score of one (1). Due to literacy challenge, stones were agreed by the FGD to represent a score on each of the questions and each participant was given and used twenty stones to score different questions and factors. Therefore, giving 200 scores for the ten FGD per location. Therefore. The Focus group discussion questions was used to guide the discussion. (Appendix V).

The correlation between the rankings was got by Spearman rank order correlation coefficient (usually referred to as Spearman's rho or Spearman ρ). This was used to compute a measure of association between the rankings of same variables in FGDS at Loruth and Napak.

The spearman rank order correlation coefficient formula was done according to Wakhungu (2016) formula as follows

$$\rho = 1 - \frac{6\sum D^2}{N^2(N-1)}$$ Equation 3.6

Where

ρ = Spearman rank order correlation coefficient

D = the difference between any paired rankings at Napak and Loruth FGDS

N =Number of the paired ranting between Napak and Loruth

When the variables are of ordinal levels ρ will vary between -1 and 1. Where ρ is close to -1, this implies negative correlation and where ρ is close to 1, it implies positive correlation.

The standard error (SE) for Spearman rank order correlation ρ =SEρ. It measures the precision of the estimate of ρ from the paired rankings. Its formula according to Wakhungu (2016) as follows

$$SE\rho = 1 - \frac{(1-\rho^2)}{\sqrt{N}}$$ Equation 3.7

Where

SEρ = S.E of the estimate of ρ

ρ = Spearman rank order correlation

N = Number of paired rankings

The probable error of ρ (PEρ) is used to gauge the statistical significance of the estimated ρ. It was observed by the formula: PEρ= 0.6745*SE

If ρ estimate is greater than 6*PEρ, then ρ is statistically significant according to Wakhungu (2016)

$$\rho\ 1 - \frac{6\sum D^2}{N^2(N-1)} = 1 - \frac{6\times1}{14^2(14-1)} = 1 - \frac{6}{14^2\times13}$$

$$= 1 - \frac{1}{424.67}$$

$$\cong 1 - \frac{1}{425}$$

$$= \frac{424}{425} = 0.99$$

Equation 3.8

Standard Error of ρ = SEρ

$$= \frac{1-r^2}{\sqrt{N}} = \frac{1-(0.99)^2}{\sqrt{14}}$$

$$= \frac{0.0199}{\sqrt{14}} = \frac{0.0199}{3.74} = \cong 0.0054$$ Equation 3.9

Probable error of ρ

$$= PE\rho = 0.6745\left(\frac{1-r^2}{\sqrt{N}}\right)$$

= 0.6745*0.0054

= 0.0036 Equation 3.10

Frequency tables generated from the variables, pie charts, and bar graphs were utilized to assist in the visual appreciation of social, demographic characteristics and different adaptability mechanisms used by the nomadic population.

IV. FACTORS CAUSING VULNERABILITY TO DROUGHT FOR THE TURKANA NOMADIC PASTORALIST'S POPULATION OF ILEMI TRIANGLE IN TURKANA COUNTY, KENYA

A. INTRODUCTION

The chapter reports on the social demographic data of the households that participated in the study in terms of gender, age, marital status, family responsibility, education level and reasons for migration. This chapter establishes the factors causing vulnerability to drought for the Turkana nomadic pastoralists of Ilemi Triangle.

B. SOCIAL –ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF THE HOUSEHOLD

Pastoral population household socio-economic characteristic plays a key role in determining not only the behaviour of the households towards drought vulnerability, drought effects, households coping strategies but also on the effect household structure and social and economic wellbeing make. It is, therefore, prudent to present data on the socio-economic variables (Table 4.1) in the study to include the gender, education level, household's type, marital status, and livelihood sources at the household level and how they are likely to help them to cope.

Characteristics	Categories	Loruth Number (N and %)	Napak Number (N and %)
Gender	Male	19(9)	97(46)
	Female	193(91)	115(54)
Age (in years)	18-50 years	198(93)	188(89)
	>51 years	14(7)	24(11)
Marital Status	Single	2(1)	9(4)

	Married	166(78)	175(83)
	Divorced	2(1)	9(4)
	Widowed	42(20)	19(9)
Head of the household	Male headed	188(89)	181(85)
	Female Headed	24(11)	31(15)
Level of education	None	208(98)	202(94)
	Primary	4(2)	7(3)
	Secondary	0(0)	1(1)
	College and University	0(0)	2(2)
Type of house	Temporary	149(70)	136(64)
	Permanent	63(30)	76(36)
House hold religion	Traditionalist	198(93)	180(85)
	Christian	13(6)	31(14)
	Muslim	1(1)	1(1)
Source of water for Livestock	River/spring/stream	8(3)	105(50)
	Water pans and dams	14(7)	5(2)
	Rock catchment	0(0)	0(0)
	Piped water	0(0)	0(0)
	Wells and Boreholes	190(90)	102(48)

Source: Researcher (2016)

Table 4.1: Socio economic and Demographic Characteristics of the Sample in Each (Location 212) in Ilemi Triangle, Turkana County, Kenya

a. GENDER

Most of the respondent in the households were female (91% (193) in Loruth and 54% (115) in Napak. The Pearson Chi-Square test value of association between gender and education in Napak was χ^2 (2, N= 212) = 0.125, p >0.05. This indicated non-significant (p >0.05) statistical association between the two variables while the Chi-Square p value between gender and age in Napak was χ^2 (2, N=212) = 0.040, p < 0.05 thus, indicated statistical association between the two variables

This result is similar to study findings by Aguilar (2009) mentioned that women were likely to be found at home because men are more proactive and are preferred to be employed than women. Accordingly, women according to Griffins (2016) are usually left behind at homes in nomadic pastoralists communities when the husband or male genders move in search of food and pasture for livestock. The study argues that women do bring exceptional experiences and skills to deal and cope with disasters, although their skills or other awareness drivers and opportunities are often not recognized in mobile nomadic pastoral population mainly because of cultural hindrances. Hence, the study reveals the banishment of women capacities in Turkana nomadic population in Ilemi Triangle in making key decisions even at the household level.

According to Ouma *et al,* (2012), understanding gender repercussions and facets of disasters are critical to effective risk mitigation practices because they will enable communities' and countries to be more resilient. Moreover, all gender categories that are women, men, girls, and boys do not face the similar needs and vulnerabilities in the face of natural disasters and climate change; there are differences within each group and between individuals regarding specific protection concerns and capacities according to Elmi and Birch (2013). According to Ouma *et al*, (2012), women-headed households are particularly vulnerable because women have poor customary rights to land in pastoral communities, and livestock ownership.

A woman, once married, belongs to the husband's clan, but in some cases finds that the clan is less forthcoming with assistance when her husband has died. This makes them more vulnerable. Additionally, the fact that the Turkana cultures allow the male to search for food and are greatly involved in the migration has made males to be perceived as less in the households. A cross-sectional study by Ouma *et al,* (2012), indicated that women must acquire permission from their husbands in order to move anywhere and so you would always expect mothers to remain at home when men move out in Turkana cultures. Gender does play a key role in the Turkana community in general as it determines how strong that household is in pastoral populations (Odhiambo, 2013). If a man heads the household, it is considered a complete house. Males do perform a key role as overall decision makers and remain as heads of almost all households. This has a great effect and discrepancy in decision making in households since women hardly make an important decision in the households.

Therefore, this makes females more vulnerable even to poverty especially those women who are not married because unmarried women in Turkana pastoral communities according to Opiyo (2014) cannot own livestock and have to consult for any issue and decisions that could be effective to any coping strategy. These decisions have to be made by a man of the household or a male relative for the unmarried woman (Lekapana, 2013). There is a great need to recognize the capacity of women and girls in pastoral communities especially in identifying and challenging factors that bring vulnerability to such pastoral populations.

b. AGE

More than half of the respondents from the research sites were of the ages between 18 to 50 years (93% (198) in Loruth and 89% (189) in Napak) with minority being of the ages above 51 years (7% (15) in Loruth and 11% (24) in Napak). These data correspond to Population census for Turkana of 1999 that puts the huge range of numbers of the people aged between 18 to 50 years and less also of older people. The Pearson Correlation between education level and age of the respondents in Loruth was at r=0. 999. This showed a strong relationship between the two variables as r-value was close to +1.

The findings of ages between 18 -50 years being the most respondents contradict the key informants from Napak that mentioned of young people being involved more in cattle

rustling, many killed in the process hence, not many can be found in households. According to the Key informants in the two sites, all males above 18 years assume the role of household heads in the absence of the father and women only assume the roles if the children are of below the age of eighteen years in the absence of their husbands. Above 18 years' age is targeted in the nomadic pastoralists as head of the household.

However, the study argues that because the data time was during the dry period, the activities of cattle rustling are minimal and this could justify why many younger respondents were available at home. Never the less, the age findings of this study matches the UNDP (2014) study that mentioned the need not to ignore young people as they remain potentials for change and to nurture effective local action by involving adolescent girls, boys, and youth in the decision making about disaster risk reduction and management that will affect their future. According to UNDP (2013), age is a factor in disaster risk reduction issues and older and younger groups of people remain the most vulnerable group in any given society.

c. MARITAL STATUS

Most of the respondents were married (78% (166) in Loruth and 83 %(175) in Napak) with a negligible number of who were single (1% (2) in Loruth and 4% (9) in Napak). The SPPS 21 Chi Square p value between marital status and education in Napak was χ^2 (2, N= 212) = 0.259, p >0.05 .The p > 0.05 showed anon-significant statistical association between the two variables while the Chi Square test value between marital status and level of vulnerability in Napak was χ^2 (2, N= 212) = 0.020, p < 0.05.This indicated significant statistical association between the two variables.

The findings correspond to Mureithi (2012) study in a similar setting that reported that 92.5% of the respondents were married, 5% were not married and 2.5% were separated. This corresponds to a study by Tuimur (2017) that mentioned that married or complete families manifest as strength among married couples during disasters while the widows, widowers, divorced and single families are hard hit by disaster shocks and losses.

Divorced and widowed families struggle to cope with drought impacts according to Taylor (2013) because they are not much recognized. This corresponds to the Turkana cultures that encourage women to get married. The marital status factor in Turkana culture plays an important role affecting fertility behaviour of the community. According to Opiyo (2014), the social relation of the Turkana is expressed partly through marriage relations within and outside the community. People's marital status plays key roles especially in decisions on coping strategies and continuing vulnerability if not well accommodated. Table 4.1 is the presentation of the marital status of the respondents.

d. HEADSHIP OF THE HOUSEHOLD

More than 85% (181), for Napak and 89% (188) for Loruth households were male headed the results indicate that husbands remained as the heads of the families and households. This study finding corresponds to findings by Situma (2013) who reported that male remains the head of families in nomadic pastoralists even when they are not present at the family at a time so long as they are alive. The Turkana Culture perceives a household as a house of a man and not of a woman; because women do not head families or rather women are not allowed to head families in Turkana.

The female-headed households in the data were mainly related to either those women who lost their husbands or male heads leaving the widow to take care of the family or heads migrated with livestock, increased separation and divorce and mothers who remain 'single' because most men cannot afford bride price due to loss of livestock brought about by drought effects. Female-headed households remain most vulnerable and marginalized and require support. According to Skjeflo (2013), women in the nomadic population remain the most vulnerable because of not only insecurity and conflicts related to loss of husband from neighbouring ethnic group's raids but also for being responsible for the children and they cannot flee during raids. Therefore, this has led to an increased number of women heading the households in Turkana. UNDP (2013) suggested that women and girls are less represented and contacted in disaster management processes compared to men even when they remain most vulnerable and affected.

e. EDUCATION LEVEL

The result in Table 4.1 showed an existence of very low literacy level among the pastoral communities in Ilemi Triangle. Nighty-eight 98% (208) of the respondents in Loruth and 94% (204) for Napak has never had a formal education including basic primary school level.

The Pearson Correlation (Table 4.2) between education level and age of the respondents in Napak was at r=. 997. This showed a strong relationship between the two variables as r-value was close to +1. The correlation between education level and the coping strategies showed r=. 974. This is also a strong relationship between the two variables. The Chi Square p value between education and causes of vulnerability in Loruth was χ^2 (2, N= 212) = 0.042, p > 0.05.This indicated a non-statistical significant (p>0.05) between the two variables while the Chi Square p value between education and gender in Loruth was similar χ^2 (2, N= 212) = 0.04, p > 0.05 that indicated a non-significant statistical association (p> 0.05) between the two variables.

Similarly, UNICEF (2018) shows that only a total of 15% of Turkana County residents have a primary level of education and as many as 82% of Turkana County residents lack formal education. Drought-like other disasters according to UNESCO (2017) have slowed down progress towards the achievement of Sustainable Development Goals (SDGs). Delaunay (2017) suggests that only a fifth of whole Turkana population knows how to read and write which according to the study is figures four times lower than the Kenyan national average of literacy level. Furthermore, UNDP (2014) suggests that basic primary education is the least level of education required for the nomadic populations to move towards modernity and achieving Sustainable Development Goals (SDGs) number four of ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all. This cannot be achieved as a majority of the population remained illiterate.

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The low level of education according to Aliow *et al*, (2017), could be attributed to the livelihood of the population in this area as nomadic pastoralism has made it hard for them to pursue education.

Nevertheless, achieving inclusive and equitable quality education for all according to UNDP (2017) requires increasing efforts, especially in sub-Saharan Africa and Southern Asia and for vulnerable populations, including indigenous people, women and poor children in rural areas. Hari (2011) suggests that women especially in rural areas are always left behind in education and play a second-class, especially in representation. This is believed to affect drought management responses.

Educational levels of a given population affect how quickly they can cope with drought. According to Lekapana (2013), education level affects the development of disaster preparedness, livestock management practices and its management. Delaunay (2017) argues this education within the pastoral need to be apriority to support in the knowledge of improving livelihoods and diversifying the economy that offers an opportunity beyond the sole livelihood of herding livestock across an ever-drier land. Moreover, disaster hit families often fail to send children to school (UNICEF, 2018). Due to the worsening economic conditions of the family, parents opt to withdraw their children from school to do manual work for instance, looking after cattle and doing house chores to supplement the family finances according to UNOCHA (2011).

According to UNICEF (2018), children are forced to drop out of school to move on with their flock in search of better pasture and water during drought. This view has been further shared by the Kenya Red Cross (2011) that mentioned that due to drought among the pastoralist communities, school dropouts do increase significantly with young men abandoning learning to become migrant herders. These trends have affected the retention of pupils in schools in Turkana County according to UNCEF (2016). The study revealed that the majority of the respondents do not take their children to school. They argued that children play critical roles in taking care of livestock and therefore they considered not taking them to school. Therefore, such communities, the study argues entirely dependent on their local knowledge coping mechanisms and resource management that may not be sufficient, elaborate and efficient enough in coping with the rapidly diminishing resource base with huge climatic changes.

One of the key informants regarding formal education posed:

> 'If I take my children to school, will you give me another child to look after my small remaining goats and sheep?'

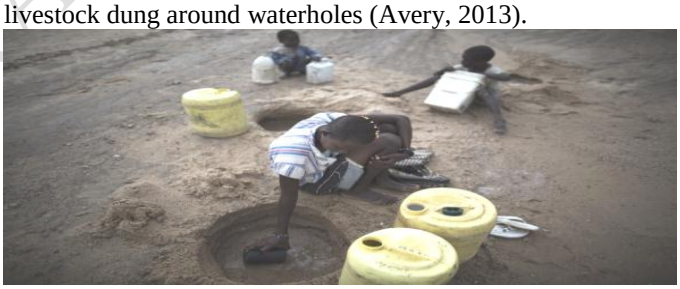
According to Ruto *et al*, (2010), during drought events, children help their parents to look after the few livestock left behind near the homesteads, while the warriors, teenage girls and the middle-aged roam with livestock to far distances. Despite losing most livestock to drought, respondents mentioned that households with girls are certain that through dowries, the livestock numbers will increase and taking them to school is like giving 'them to the government' and no dowries will be received.

f. SOURCE OF WATER FOR LIVESTOCK

Eighty-nine per cent, 89 % (190) of the Loruth respondents receive water from wells and boreholes while a majority of Napak pastoralist receive their water from seasonal rivers, springs and streams 50% (105). A negligible number of nomadic pastoralist in Ilemi Triangle receive water from water pans and dams (seven %(14) in Loruth and two %(5) in Napak) with no piped water in Loruth and Napak.

Water is crucial to sustaining the Turkana pastoral livelihood. Water is predominantly used by their herds and for domestic purposes. The study findings correspond to findings by Huho *et al*, (2010), which reported that the Turkana people collect their water from rivers, springs, rock pools, and waterholes, which they dig in dry riverbeds. Plate 1 indicates children from Ilemi Triangle fetching water from a near river but these streams dry up and increases in depth as drought continue to intensify. This also shows a problem of accessibility of piped water in the households in Ilemi Triangle thus not clean for consumption.

The key informants explained that during extreme dry seasons, waterholes *(akar*) may be dug up to 25meters below the ground, from which water is passed up in containers by human chains of sometimes up to 10 people. The depth of the '*akar'* increases as the season gets drier. Water fetching in Turkana has traditionally been the female and children role (Plate 1) while males fetch water mainly for their livestock. The groundwater is generally good from having been filtered through sandy aquifers, but it can become contaminated with livestock dung around waterholes (Avery, 2013).



Source: Researcher, (2017)

Plate 1: Children fetching water from the river waterholes in Loruth for small livestock, Turkana County, Kenya

According to Ombaka (2015), water plays a big role in pastoral communities, an absence of water leads to migration and eventual conflicts. Many watercourses in Ilemi Triangle flow only during the rains, which may be from a few hours to a few weeks per year and the rest of the time remain dry leaving nomadic pastoralists with either constructed water catchments – dams and underground wells or springs.

g. THE TYPE OF HOUSEHOLDS IN ILEMI TRIANGLE

Most of the observed pastoralist's shelters in the research sites and from the respondent's findings were temporary (70% (149) in Loruth and 64% (136) for Napak). This is a typical indication of pastoral lifestyle as they barely settle in a place permanently and constantly move. The study observed some houses in Loruth made of mud and flat iron roofed of which pastoralist's term them as permanent. Pastoralists translate the kind of one-room mud houses with iron sheets roof as

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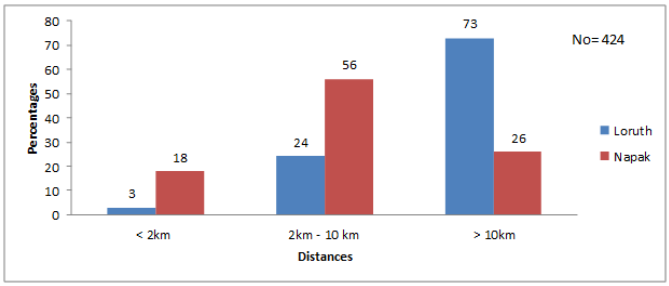
permanent. The pastoralists studied live in temporary shelters and it corresponded with findings by Serem (2012) that reported that pastoralists usually live in temporary shelters because they hardly settle in a place permanently, since pastoral lifestyle involves constant movements.

h. DISTANCE TO WATER POINTS

During drought, a higher percentage of households travel longer distance to access water. Figure 4.1 indicates that in Loruth 73% (155) access water from a distance of over 10km while in Napak the pastoralists cover more a distance of 5km to 10km (56%, 118). Pastoralists have to move in search of water and the further they move means the water sources near them are getting drier and drought are biting hard. The Key informants from Loruth complained of the non-existent nearer water points for their livestock, and that they have to travel a longer distance in search of the commodity.

The distance travelled in search of water form part of their routine activities especially dry season and it predisposes them to conflicts to wild animals and another warring neighbouring ethnic groups.

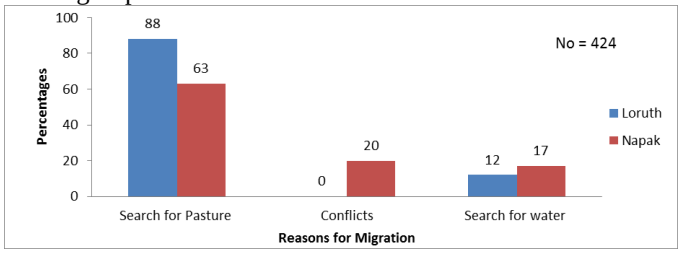


Source: Researcher (2016).

Figure 4.1: Distance livestock travel to access water in Ilemi Triangle, Turkana County, Kenya

i. REASONS FOR MIGRATION

The reason for migration of the pastoralists illustrated in Figure 4.2 from the two research areas showed that they migrate in search for pastures (88%, 186) Loruth and 63%, 133) for Napak) being the highest followed by search for water (12% (26) for Loruth and 17% (36) for Napak). In Napak, the reason for migration related conflict (20%, 53) was that Napak is close to the Ethiopian and South Sudan boarders. The observable mountainous topography and terrain, the FGD claimed, provided a good hiding place for enemies and accommodate them well. During the FGD session in Loruth, the group mentioned that Turkana is like the enemy of everything to include the wild animals that come close to human settlement during droughts and other neighbouring ethnic groups.



Source: Researcher (2016)

Figure 4.2: Reasons for Pastoralists Migration in Ilemi Triangle, Turkana County, Kenya

j. TYPE OF HOUSEHOLDS

More than 64 % (136) of the households in the two sites were all temporary and only less than 36% (76) were permanent. However, according to key informants what pastoralist mention as permanent is a single roomed iron sheet roofed house made of mad. Plate 2 typically shows how the households in the nomadic pastoralists look like as most of them are made of grass and not permanent ready to move once pastures finishes in one place.

Source: Researcher (2017)

Plate 2: Pastoralists Houses in Turkana County

Movement in search of pastures for most of the respondent is a typical indication of pastoral lifestyle as they barely settle in a place permanently and constantly move with their livestock in search of this product. This corresponds to the type of the households or shelter the respondent had. Most of the pastoralist's shelters were temporary (69 %, 146) in Loruth and 62% (132) for Napak). The key informants in Loruth explained that any house made of mud with flat iron roofed is termed by pastoralists as permanent. However, they were not observed in the study area. Melle (2016) study findings corresponds to the study findings and indicated that more than 90% of households in Ilemi Triangle migrate because of either water, pasture and or they have been attacked by neighbouring ethnic groups within Ilemi Triangle.

C. CAUSES OF VULNERABILITY TO DROUGHT ILEMI TRIANGLE

The first objective of this study was to determine the factors causing vulnerability to drought for the Turkana nomadic pastoralist's population of Ilemi Triangle, Turkana County in Kenya. The most imperative components of reducing vulnerability, managing drought and protecting nomadic pastoral communities from the impacts of hazards to include protecting the community's livelihoods from climatic change and strengthening indigenous coping strategies and supporting the pastoral economies.

These components have in time within Ilemi Triangle been neglected by the Government and humanitarian organisations that do not adequately support it, thus, enabling these populations to remain vulnerable even when drought is in a mild form. Moreover, having recurrent droughts in such unstable ecosystem environment, already vulnerable and neglected community make these pastoralists to move constantly, thus exposing them to other vulnerable hostile

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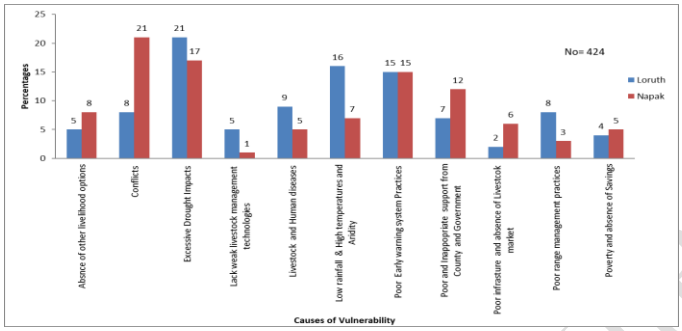
ethnic group across the international border that competes for the same commodity in Ilemi belt.

Figure 4.3 indicates excessive drought affects (21% (45) and conflicts 21% (45) as the top leading cause of vulnerability to drought in Loruth and Napak respectively. The other main causes of vulnerability to drought from the study included low rainfall, intense rainfall and aridity (16% (34) in Loruth and 7% (15) in Napak), poor early warning system practices (15% (32) in both Loruth and Napak), poor and inappropriate support from the government (7% (15) in Loruth and 12% (26) in Napak), Livestock and human diseases (9% (19) in Loruth and 5% (11) in Napak), poor range management practices (8%(17) in Loruth and 3% (7) in Napak). Other causes of vulnerability include Poverty (4% (9) in Loruth and 5 %(11) in Napak), weak livestock management technologies (5% (11) in Loruth and 1% (2) in Napak), Poor infrastructure and absence of livestock market (2% (4) in Loruth and 6% (13) in Napak) and absence of other livelihood options (5% (11) in Loruth and 8% (17) in Napak). The findings on the cause of vulnerability from the FGDs were coded, scored and ranked in the Table 4.2, 4.3 and Table 4.4.



Source: Researcher (2016)

Figure 4.3: The causes of Vulnerability to drought in Ilemi triangle, Turkana County, Kenya

The ten Focus group discussion members in Loruth identified the following causes of vulnerability to drought inadequate and seasonality of rainfall and recurrent drought, excess heat and aridity that is unfavourable for agriculture, dry winds and recurrent drought, loss of pasture, water and livestock, lack and late support from county authorities and the government, continuous supply of relief food, raids from neighbouring ethnic groups, lack of livestock markets, absence of hay conservation ,poor infrastructure of road and communication, traditional perception of resource and land ownership system, lack of knowledge of modern ways of coping ,absence of other livelihood option and practicing only nomadism, cultures and traditions plus beliefs and poor county management integration planning for the drought vulnerability causes.

S/No.	Factor identified in Loruth by 10 FGD Members in Loruth	Total Score	Mean	Rank
1	Inadequate and seasonality of rainfall and recurrent drought	182	18.2	1
2	Excess heat and aridity that is unfavourable for agriculture, dry winds and recurrent drought	176	17.6	2
3	Loss of pasture, water and livestock	174	17.4	3
4	Lack and late support from County authorities and the government	160	16.0	4
5	Continuous supply of relief food	147	14.7	5
6	Raids from neighbouring ethnic groups	145	14.5	6
7	Lack of livestock markets	139	13.9	7
8	Absence of hay conservation	126	12.6	8
9	Poor infrastructure of road and communication	73	7.3	9
10	Traditional perception of resource and land ownership system	37	3.7	10
11	Lack of knowledge of modern ways of coping	35	3.5	11
12	Absence of other livelihood option and practicing only nomadism	34	3.4	12
13	Cultures and traditions plus beliefs	30	3.0	13
14	Poor County management integration planning for the drought vulnerability causes	26	2.6	14

Source: Researcher, (2017)

Table 4.2: Focus group discussions on factors causing Vulnerability and their ranking in Loruth in Ilemi Triangle, Turkana County, Kenya

The ten focus group discussion members in Napak identified the following causes of vulnerability to drought. Inadequate, seasonality of rainfall and recurrent drought shocks, excess heat and aridity, raids from neighbour ethnic groups, continuous over-reliance on relief food, inaccessibility of the livestock market, absence of NGOs or government support, absence of water pans and dams, livestock diseases, lack of veterinary services and drugs and livestock loss, absence of drought early warning methods, poor soil for agriculture, continuous relying on relief foods aid, poor topography of land that is hilly and mountainous and far distance from main centres, poor cultural practices and traditional beliefs, lack of hay conservation and lack of knowledge of modern ways of coping and way of life . They were coded, scored and ranked in Table 4.3.

S/No	Factor identified in Napak by10 FGD Members in Napak	Total Score	Mean	Rank
1	Inadequate, seasonality of rainfall and recurrent drought shocks, excess heat and aridity	160	16.0	1
2	Raids from neighbour ethnic groups	160	16.0	1
3	Continuous over reliance on relief food	148	14.8	3
4	Inaccessibility of the livestock market	136	13.6	4
5	Absence of NGO or government support	124	12.4	5
6	Absence of waster pans and dams	112	11.2	6

7	Livestock diseases, lack of veterinary services and drugs and livestock loss	98	9.8	7
8	Absence of drought early warning methods	80	8.0	8
9	Poor soil for agriculture	78	7.8	9
10	Continuous relying on relief foods aid	64	6.4	10
11	Poor topography of land that is hilly and mountainous and far distance from main centres	62	6.2	11
12	Poor cultural practices and traditional beliefs	60	6.0	12
13	Lack of hay conservation	60	6.0	13
14	Lack of knowledge of modern ways of coping and way of life	36	3.6	14

Source: Researcher (2017)

Table 4.3: Focus group discussions on factors causing Vulnerability and their ranking in Napak in Ilemi Triangle, Turkana County, Kenya

Table 4.4 shows the ranking on the causes of vulnerability by the FGD of the two places. In summary, the FGD rankings in Napak and Loruth were having correlation coefficient 0.99±0. 0054. Thus it was statistically significant ($\rho < 0.05$). This implied that the FGD rankings in Napak and Loruth had a significant positive correlation. They were mainly the same or rather the communities of the two localities were experiencing the same events hence the same perceptions.

S/No.	Factor identified in Loruth by 10 FGD members in Loruth	Napak Rank	Loruth Rank	D	D^2
1	Inadequate and seasonality of rainfall and recurrent drought	1	1	0	0
2	Excess heat and aridity that is un favourable for agriculture, dry winds and recurrent drought	1	2	1	1
3	Loss of pasture, water and livestock	3	3	0	0
4	Lack and late support from County authorities and the government	4	4	0	0
5	Continuous supply of relief food	5	5	0	0
6	Raids from neighbouring ethnic groups	6	6	0	0
7	Lack of livestock markets	7	7	0	0
8	Absence of hay conservation	8	8	0	0
9	Poor infrastructure of roads and communication	9	9	0	0
10	Traditional perception of recourse and land ownership system	10	10	0	0
11	Lack of knowledge of modern ways of coping	11	11	0	0
12	Absence of other livelihood options and practicing only nomadism	12	12	0	0
13	Cultures and traditions plus beliefs	13	13	0	0
14	Poor County management integration planning for the drought vulnerability causes	14	14	0	0

Source: Researcher (2017) $\sum D^2 = 1$

Table 4.4 Ranking Correlations between Napak and Loruth Causes of Vulnerability, Ilemi Triangle, Turkana County, Kenya

The suggestions given by FGD agree with the study done by Mureithi (2012) and Opiyo (2014) in Turkana West, Kenya where they carried out focused group discussions to evaluate peoples' views on the causes and management of vulnerability to drought. Their study identified key causes of vulnerability like inadequate and seasonality of rainfall and recurrent drought, loss of pasture, water and livestock and excessive heat, aridity and recurrent drought and absence of early warning information sharing.

The findings therefore were implicative that households in Ilemi Triangle who are purely pastoralist are excessive vulnerability causes and repeated severe droughts not only adds burden to how they try to adjust but also it gives no time it allows the population to cope with drought. Thus, non-implementation of mitigation activities (Lewin and Fisher, 2010).

a. ABSENCE OF OTHER LIVELIHOOD OPTIONS

The pastoralist's dry land remains unfavourable to another form of production. The findings showed a (5% (10) in Loruth and 8% (16) in Napak) respondents indicating an absence of other livelihoods options as the main other causes of vulnerability. This finding corresponds to Mureithi (2012) study findings that mentioned that Turkana County is mainly dependent on pastoralism with marginal crop production along the big rivers that are rain dependent. Ilemi Triangle in the extreme north of Turkana County does not receive adequate rain and do not have larger rivers seen in other parts of Turkana County like South and Turkana West. Nomadic pastoralists of Ilemi Triangle maintain livestock as their main livelihood strategy and people transverse huge tracts of land looking for pasture and water.

Reduction of economic vulnerability in Ilemi Triangle through the support of other livelihood strategies will definitely depend on a shift of socio-political systems at pastoral community level while national governance systems play a facilitator's role. It will necessitate a transformation of productive assets from weather vulnerable to non-vulnerable. Provision of livestock insurance, loans to nomads, knowledge on diversification of livelihoods and livestock marketing will definitely play a great role in drought vulnerability reduction,

this concurs with findings by Zwaagstra *et al*, (2010) on the future of drought management in Turkana.

b. CONFLICTS WITH OTHER NEIGHBOURING ETHNIC GROUPS

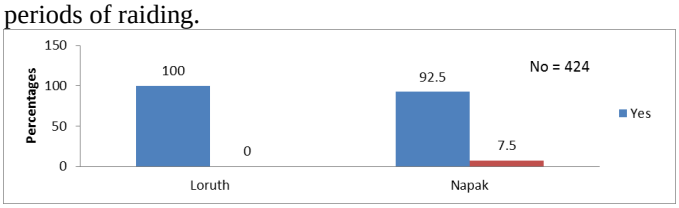
Climate change and resulting resource scarcity is one of the driving forces behind the escalation of inter-ethnic violence in Ilemi Triangle. This escalates during periods of drought when availability of water and forage from pasturelands shrinks, leading to extreme competition and stress for the same (Melle, 2016). This is compounded by the fact that livelihoods in the region are wholly dependent on these resources and there are no alternative livelihoods available.

The study findings indicated that 8% (17) for Loruth and 21% (45) for Napak conflict as the cause of vulnerability to drought. Conflicts among neighbouring communities, human and wildlife are bound to escalate during drought as livestock are moved from one area to another in search of pasture and water. Every drought incident according to Ombaka (2015) comes with its lessons and these have been documented. Conflict with other ethnic groups within Ilemi Triangle has been resulted by an urge to look for water and pasture for livestock. This is brought by drought impact.

Therefore, having drought and conflicts together, according to Cullen (2011) do intensify the suffering and the vulnerability of this nomadic pastoral population. This study finding corresponds to study by Haskins (2010) confirms these findings by elaborating that when drought intensifies, livestock is lost, hunger spreads and conflict over waters and pasture surges between different warring nomadic pastoral communities.

In Turkana, the conflicts are a result of several intertwined and intricate factors. Wealth, livestock, ethnocentrism and easy access to illicit arms are some of the leading causes of the cattle raids according to Melle (2016). Earlier pastoralist conflicts were organized, sporadic and communal ventures, which were guided by a designated set of rules, which limited destruction of life and property and were resolved through the community elders (Ombaka, 2015). The findings correspond to study findings by Schilling *et al*, (2012) that elaborated that the nature of raids and cattle rustling have changed due to persistent drought, the presence of firearms and is being increasingly compounded with road robberies, lawlessness along the borders and banditry.

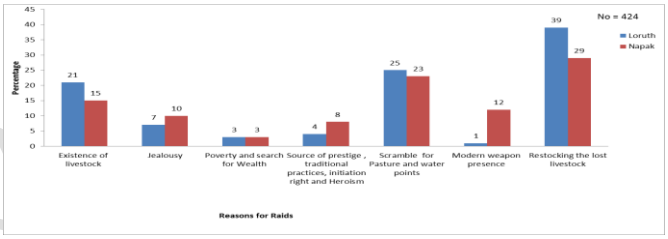
Raids and conflicts with other neighbouring ethnic groups were among the top cause of vulnerability among the households in Ilemi Triangle. The result from Table 4.4 shows that Ilemi Triangle population attack each other quite often. In Loruth, 100% (212) of the households have been attacked while in Napak remain also high at 92.5% (196). However, the study observed no attacks during the research period, these attacks when they happen according to the key informants causes a lot of vulnerability to the population. The finding also corresponds to a study result by Mureithi (2012) study that mentioned that, in the Kenyan ASALs area. The findings further correspond to a study finding by Mwangi (2010) who mentioned that the population around the Ilemi Triangle successful do attacks each other regularly during the search of pasture and water. According to Opiyo *et al*, (2014), old people, women, and children are particularly vulnerable to these attack and conflict because they remain at homes when their male adults migrate with livestock and cannot flee during periods of raiding.



Source: Researcher (2016)

Figure 4.4: Household raids in Ilemi triangle, Turkana County, Kenya

The findings shown in figure 4.5 indicate72.5percentage (145) of the Loruth and 44.5% (89) in Napak indicated that the population is frequently raided because of the existence of livestock. Droughts and restocking for lost livestock (23%, 46 in Loruth and 21%, 42 in Napak) were the second highest reasons for frequent raids. The computed SPPSS 21 Chi-square P value the association between the cause of raid and the solution for the raid in Loruth was at χ^2 (2, N= 212) = 0.243, p > 0.05.This indicated a non-significance statistical association between the two variables.



Source: Researcher (2016)

Figure 4.5: Reasons for raids in two research sites, Ilemi triangle, Turkana County, Kenya

Other traditional causes that lead to conflict according to Schilling *et al*, (2012) include heroism, drought, poverty and search for dowry livestock. One of the primary drivers of conflict is the resource competition within the region. These resources included water and pasture. Moreover, the recent discovery of water in Lotikipi in the boarder of Turkana County with South Sudan is also leading to the increased polarization among the ethnic communities, intensifying violent struggles over access to water, and grazing resources.

Moreover, because of insecurity arising from such conflicts, most of the grazing lands in the dry season grazing areas in Ilemi Triangle according to the key informants remain under-utilized, implying that livestock herds are confined to smaller and drier areas within the Triangle and thereby potentially contributing to rangeland degradation (Opiyo, 2014). When the two areas data were combined to find the top reasons for raids in the two sites in Figure 4.6, restocking for lost livestock (34%), scramble for pasture and water points (24%) and existence of livestock (18%) formed the top most reasons.

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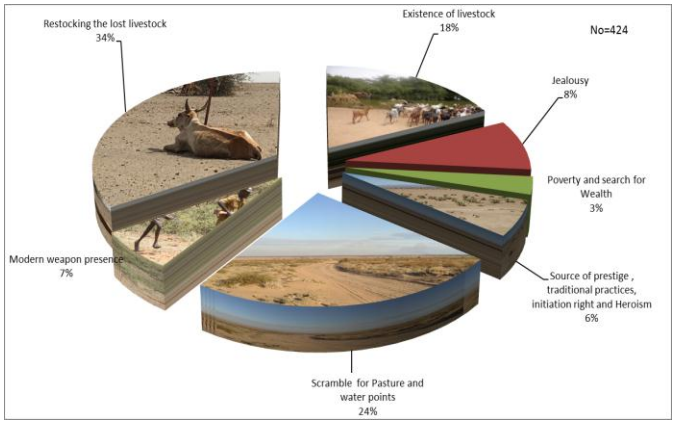
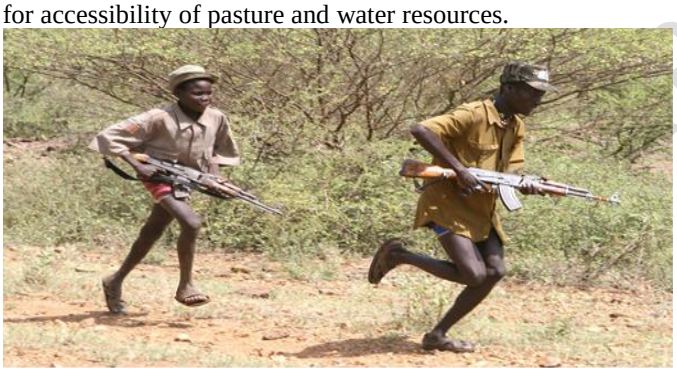


Source: Researcher (2016)

Figure 4.6: Top Reasons for raids in Ilemi triangle, Turkana County, Kenya

These findings of reasons for raids corresponds to Melle (2016) findings that mentioned that neighbouring ethnic groups in Ilemi Triangle have conflicts triggered largely by competition for pasture, water resources, and livestock restocking after droughts. Moreover, the presence of livestock provides urge to steal and a pathway for an initiation right for Dasanach ethnic group to kill an enemy for livestock in order to be considered a man. Such practices the study argues are redundant and the government should try support to eliminate this redundant cultural practices. Plate 3 shows how guns are common in Ilemi Triangle that are used during raids and men are involved in raids either to restock after droughts or fight for accessibility of pasture and water resources.

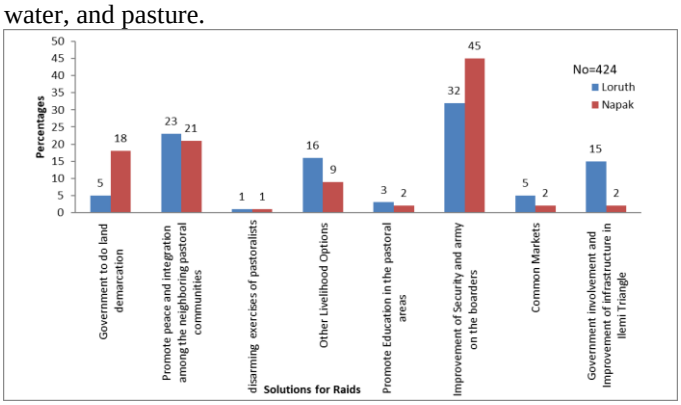


Source: Researcher (2016)

Plate 3: Raiding techniques in Ilemi Triangle, Turkana County, Kenya

Figure 4.7 informs that the top solutions for frequent raids in Ilemi Triangle to include improving security and ensuring army on the boarders (32%, 64 in Loruth and 45%, 90 for Napak), promoting peace co-existence among the warring ethnic groups (23%, 46 for Loruth and 21%, 42 for Napak), supporting and improving on other livelihood options (16%, 32 for Loruth and 9%, 18 for Napak), land demarcation in Ilemi Triangle (5%, 10 in Loruth and 10%, 20 for Napak) and working on improving the infrastructure within Ilemi Triangle (15%,30 for Loruth and 2%,4 for Napak). The Chi Square test value between solution for raids and education in Napak was χ^2 (2, N= 212) = 0.125, p > 0.05.This indicated a non-significant (p>0.05) statistical association between the two variables.

The findings correspond to study findings by Melle (2016) study that mentioned that the solution with raids in nomadic pastoral population is to have signed peace accord between warring ethnic groups, ensuring enough military presence along the borders, land demarking, encouraging neighbouring ethnic group integration and marriages, sharing and having common resources like markets, boarder schools, water, and pasture.



Source: Researcher (2016)

Figure 4.7: Solution to frequent raids in Ilemi triangle, Turkana County, Kenya

When military is ideally positioned to strategic places and communities live together these attacks get reduced according to Cullen (2011). Moreover, improved management of natural resources and adaptation to climate change, along with creation of livelihood alternatives, non-farm livelihoods, would ameliorate conflict conditions. Particular attention would need to be paid to times of drought, conflict management and or diffusing processes at such times.

This insecurity according to Melle (2016) is mainly related to porous uncontrolled boarders of Ilemi Triangle belt. The region topography facilitates excessive hideout for cattle rustlers'. Unfortunately, Turkana County has found itself among the vulnerable Counties who lag behind in many social-economic, developments and remain relying on relief food Oxfam (2011) because of conflicts. Annually, Turkana county has organised cultural and development promotion event named '*Tobungu Lore'* literally meaning coming back to build Turkana has brought together all other warring neighbouring ethnic groups. These neighbouring ethnic group in Ilemi Triangle form a cluster named '*Ateker'* to include the Karamojong, Toposa, Dasanach and Nyangatom who meet in Turkana County to celebrate the culture and ensure a discourse on peaceful co-existence among the neighbouring ethnic groups. This opportunity can offer a window of long-term engagement and agreements for peace and needs to be encouraged. The study advocates for a regular and proactive engagement between warring groups so that peaceful co-existence prevail and sharing of resources can exist within the uncontrolled boarders of Ilemi Triangle. Moreover, the local peace structures at the village level must to exist to support peace co-existence together with working with the *Ateker* community of the neighbouring government to observe, enforce and implement peace agreements.

However, the yearly Turkana County *'Tobungu Lore'*, '*Lokiriama'* Peace accord, '*Moru anayeche'* events according to Melle (2016) has kept attracting a lot of criticism because of perceived missed priorities; bigger share of funds has been allocated to the event that is thought to go for political mileage, mere exposure and exhibition than other important livelihood promotion programs that lessen population

vulnerability to drought to include drought mitigation and sustainable programs , working on food insecurity plus guarding populations from drought impacts. This event, the study contemplates, if funds are utilized correctly can not only bring positively warring ethnic group together in Ilemi Triangle on the peace narrative but also enabled communities to discussed development issues of their areas and expose them to learn from others.

Furthermore, to reduce these frequent attacks, the Turkana Ilemi triangle pastoralists have formed a strategy of migrating in groups of many households together; This is commonly known as '*Ngadakarin*' in Turkana local language and it dissuades the rival ethnic groups from attacking. These cattle rustling cultural practices according to Mwangi (2010) remain redundant should be eradicated. According to Ombaka (2015), pastoral conflicts occur mostly during the dry seasons when key resources (pasture and water) are scarce.

According to Opiyo (2014), the Governments in the East Africa region need to join forces to address cross-border issues like conflict and population migration, as well as opportunities for cross-border livestock marketing to reduce population vulnerability. Perhaps the most appropriate forum for negotiating the right mechanisms to find lasting solutions to these issues are the East African Community and the Intergovernmental Authority on Development (IGAD). Lessons can be learned from experience in West Africa where regional integration and cross-border livestock movement is easier than what is observed in East Africa (Oxfam, 2011).

Promoting peace co-existence among the warring ethnic groups according to Schilling and Akuno (2014) has been described as one of the solutions to raids, conflicts and these can be done by organising, and enforcing grazing patterns designed. The communities can form committees that can meet frequently and agree on how to allow livestock to move freely between water and pasture. This will support to prolong animal production to support households that would otherwise have suffered from malnutrition. Community peace committees need to be linked to the County Security Team to enable more rapid interventions by the authorities when conflict arises according to Melle (2016).

Moreover, Melle (2016) suggests that a sustainable peace would necessitate going beyond and strive for conflict transformation. This would involve dialogues and discourses for changing the structures and processes that sustain conflict. This conflict management must be supported at multiple levels to include Peace building and awareness and capacity development, Protection of vulnerable groups, relief and redressed for victims of conflict, measures to address the breakdown of welfare due to conflict and on a long term, improve natural resource and alternate livelihoods, and necessary community structures and processes need to be in place, critical gaps in institutions and infrastructure need to be bridged.

This will further include establishment of essential infrastructure such as roads, telecommunications, access to markets and credit, as well as development of critical Institutions such as the security agencies and legal system, of the State, as well as civil society and non-formal, community-based supports. This would help pastoralists and or marginalized population is mainstreamed into government plans that promote inclusion (Oxfam, 2017).

In addition to these, policies and National government action is required. Lacunae and injustices caused by the conflict as a result non-response from National government must be addressed. Advocacy, dialogue, would help sensitize to past injustices, current marginalization and critical needs of pastoral communities. Suitable policies and National government action need to be propelled particularly in issues such as land allocation, development projects and sharing of benefits, investments in infrastructure and welfare, etc. Attitude change may be wrought amongst the pastoral communities from the government when they feel part of the greater national fabric and their specific livelihood needs met (Lekapana, 2013).

The study agrees with Opiyo (2014) that suggests that potential measures like encouraging Community policing including regular surveillance of grazing lands and watering holes should be facilitated in order to avoid any conflicts. Moreover, there is a need for economic empowerment services and facilitating alternate livelihoods through addressing the entire value chain for niche-sector livelihoods with potential in the region (Mureithi, 2012). Drought contingency management is therefore, critical. This should include early warning of conflicts and ways of generating a sustainable reconciliation among the warring ethnic groups.

Conflict resolution needs to be fully incorporated into the 'drought early warning stages 'system in Arid and Semi-Arid Counties in Kenya according to Melle (2016) to trigger rapid interventions. Accordingly, measures to include instituting water harvesting and irrigation facilities by the National and County government to the pastoral population's areas in Ilemi Triangle should be considered for improving natural resource condition, for poverty reduction and to prevent outmigration (Opiyo, 2014). These water supplies will therefore, form an infrastructure that will be required for drought management in a pastoral population (Oxfam, 2011).

Nevertheless, conflict affected families need adequate support from the National and Turkana County government through compensation of lost livestock for remedial restocking. The study proposes sustainable development projects that improve the welfare status of the populations and creating a green zone along the border between warring communities. This could be form of and or use of common churches and schools, organizing inter-community cultural activities and sports for solidarity and peace and common market places for trading goods. Running inter-community border schools can help in forming higher tolerance among the children and may in turn reduce the number of conflicts.

The National and County government in advocating for the policies that ensure security rights, justice and welfare must assist the pastoral communities (Lekapana, 2013). This is especially necessary for land disputes and those relating to development projects. Timely intervention by the National government could help in recovery of stolen livestock in Ilemi Triangle and discourage revenge attacks. In resolving such conflicts, the traditional conflict resolution mechanisms must be strengthened and linked to formal police, court and government agencies.

While in the long and medium term, there must be an attempt to solve each cause of conflicts as much necessary (Opiyo, 2014). In shorter term, the pastoralists must benefit from the government and non-government organizations mediation and conflict prevention capacities that involve warring communities. The study agrees with study findings by Melle (2016) that in these organizations educate and develop constructive leaders from the pastoral groups. The leaders are trained on problem solving and conflict transformation skills.

The study agrees with the study findings by Helgeson *et al,* (2013) on management of warring pastoralist's that advocated for a benchmark involving conducting regular public meetings between warring communities and involving them in policymaking. Investments according to Mureithi (2012) should be delivered to peace promotion programs and sensitization on conflict and negative impacts of illicit arms. Moreover, provision of boarder schools that integrate children from all warrying ethnic groups and ensuring peace education in schools at early age for attitude change according to the study can likely strengthen peace coexistence among the warrying group. Accordingly, another most hopeful way forward is the 'peace and development' model, that can be based on activate involvement of all key actors on both sides of the conflict. This includes discussions and commitments from all stakeholders in Ilemi Triangle to discuss peace progress regularly. They embrace discussions with customary leaders, religious leaders, civil society groups, the local administration, police and army, and local members of parliament (Melle, 2016).

Collectively, FGDs and Key informants suggested sustainable strategies of managing insecurity in Ilemi Triangle and if implemented in the area it would see households remain secure. The FGDs and Key informants have further proposed installation of the army at the boarder points and common migratory routes and increase the number of Turkana police reservists by providing them with weapons, as they understand the context well. Moreover, the key informants have challenged the government disbarment exercises that favour other ethnic groups who their Countries do not conduct this exercise.

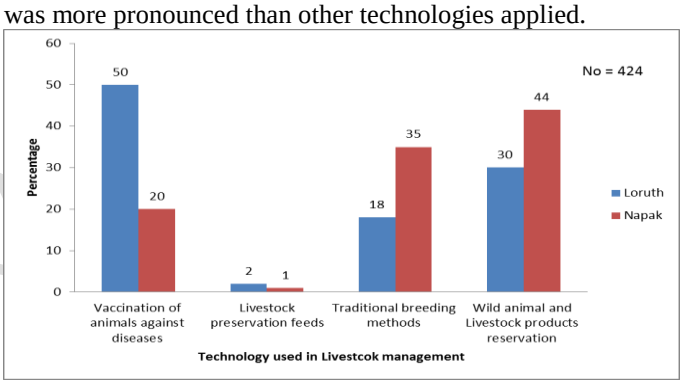
The key informants have further advocated for breeding and provision of non-indigenous livestock that do not run faster and will make it difficult for enemies to run away with them. The Informants have asked the Turkana County and the National government to work with other National governments in carrying out common disarming exercises and not only taking guns from Turkana only. However, for this approach the study suggests will only be effective if there is a good sensitization and mobilizations of all warring communities living in Ilemi Triangle and will require the National government investment.

c. THE ABSENCE OF LIVESTOCK MANAGEMENT TECHNOLOGIES AND KNOW-HOW

The findings revealed that the Ilemi Triangle nomads are affected by an absence of modern livestock management practices. Figure 4.8 gives the top technology used included vaccination of livestock against livestock diseases (50 %, (106) in Loruth and 20 %, (42) in Napak), Wild animal and Livestock products preservation (30%, (64) in Loruth ad 44%, (93) in Napak) and traditional breeding practices (18 %, (38) in Loruth and 35% (74) for Napak). The Pearson Chi-Square test value of association between different technologies in livestock management to be associated. The Chi square test value of association between the vaccination of livestock against diseases and livestock products reservation in Loruth was χ^2 (2, N= 212) = 0.092, p >0.05.This indicated significant (p >0.05) statistical association between the two variables. This showed a significant statistical association between the variable and therefore, the intervention has an effect or each.

There is a clear absence of hay reserved to be feeding livestock during drought. These findings tally with the study findings by Mureithi (2012) who provided that Turkana populations vulnerability is exacerbated by traditional livestock management practices, traditional livestock values that constrain livestock marketing, poor community initiatives, little knowledge in modern ways of life, and weak adaptation capabilities of the nomadic pastoral population.

Figure 4.8 further shows a differences in technology used in the two sites. As Loruth is closer to bigger town centres like Kakuma, certain specific technology like livestock vaccination was more pronounced than other technologies applied.



Source: Researcher (2016)

Figure 4.8: Livestock Technologies used in Ilemi triangle, Turkana County, Kenya

Inadequate knowledge, inadequate skills in drought vulnerability management, external over dependency, linked vulnerability to dependency on livestock, overstocking of livestock, internal dependency, erratic rainfall, and livestock diseases are other factors causing vulnerability to such population according to Opiyo (2014).The finding on livestock vaccination corresponds to a study finding by Thornton and Gerber (2010) that suggested that if there was no vaccination done, then, livelihood get destroyed because livestock diseases will continue to reduce the existing livestock. According to Scholtz, Maiwashe, Neser, Theunissen, Olivier, Mokolobate, and Hendriks (2013), the Turkana level of technology is relatively low because of lack of capacity and community were involved in many programs.

The suggestions given by FGD that they do traditional breeding practices agree with the study done by Opiyo *et al*, (2012) in Northwestern Kenya where they carried out focused group discussions to evaluate peoples' views on the resource-based conflicts in drought-prone areas. Traditional breeding methods have continuously been practiced in nomadic populations and have sustained the livelihood according to Oxfam (2011).

d. LIVESTOCK AND HUMAN DISEASES

The results showed that livestock and human diseases cause vulnerability (9% (19) for Loruth and 5% (11) for Napak). Collectively, FGDs and Key informants suggested that absence of pasture and water for their livestock results to malnutrition of both livestock and people and thus they get more susceptible to diseases. Livestock and Human diseases according to key informants in both sites are also caused by open water pans that are not protected and well secured. Accordingly, the water in these pans are used by livestock, wild animals use and defecate in the same pan and people use the same contaminated water for shower and drink and water related diseases are easily transmitted from animals to livestock, livestock to other livestock and even to people.

Plate 4 provides an observable livestock condition in Napak that an elder referred to the research team to indicate how drought has affected them negatively. This study finding corresponds to CRED (2010) findings that reported that of decrease of the food consumption because of drought in the household that leads to significant increases in illnesses. This is because livestock is the main source of livelihood of the population, any diseases brought about by drought because of an absence of pasture and water brings misery to such population.

This malnutrition does increase maternal child mortality in vulnerable and isolated populations like pastoralists. Additionally, other essential services like human and livestock health care are usually compromised and inadequate across the boarders where these pastoralists stay. Naidoo and Willis (2009) suggest that the community remain a patient in public health aspects and social science, thus, requiring adequate treatment and management. Therefore, when such communities are hit by drought and their coping strategies eroded by recurrent drought, then they get more vulnerable and therefore, requiring adequate support.

There is a further association between the communicable diseases and drought impacts, which increases with drought (Lekapana, 2013). Lack of water supply and sanitation services, malnutrition, displacement of people and livestock and higher vulnerability of the nomadic pastoral population all increase the risk of infectious diseases such as cholera, typhoid fever, diarrhoea, acute respiratory infections, and measles according to WHO (2018).

The drought in Ilemi Triangle has been found to be recurrent, has reduced air quality, and compromises the health of people with certain conditions, according to the Haskins (2010). Accordingly, during a drought, dry soils and wildfires increase the numbers of airborne particles, such as pollen and smoke. These particles can irritate the airways and worsen chronic respiratory illnesses, such as asthma. Poor air quality can also increase the risk of respiratory infections, such as bacterial pneumonia. There are excessive Increases in diseases transmitted by insects, such as malaria that is linked with drought. Drought shrink's bodies of water, and cause water to become stagnant, providing breeding grounds for mosquitoes while unhealthy eating because of lack of enough food is related to drought.

Repeated drought ensures continuation exposure to these diseases without recovery of a nomadic population. Moreover, during these lean times, livestock immune system is compromised due to inadequate feeds, leaving livestock weak, malnourished and susceptible to opportunistic diseases as seen in plate 4. According to Tuimur (2017), inadequate feeds forced the livestock to graze very close to the ground; this exposes them to anthrax and botulism. Other diseases common during dry spells according to Tuimur (2017) include foot-and-mouth disease. The reduced level of productivity of livestock because of drought renders most families in Ilemi Triangle vulnerable.

Source: Researcher (2017)

Plate 4: Livestock emaciated condition observed in January 2017 in Napak, Ilemi Triangle, Turkana County, Kenya

According to WHO (2018), drought does results in mass displacements of population, results in water and food shortages and therefore, long-term environmental, economic and health impact on the population is felt. Accordingly, drought induces mortality and morbidity because of reduced food intake and lack of varied diet that leads to malnutrition.

e. LOW RAINFALL, HIGH TEMPERATURE, AND ARIDITY OF ILEMI TRIANGLE ENVIRONMENT

The results in Figure 4.4 showed that low rainfall, high temperature and aridity as among the main cause vulnerability (16% (34) for Loruth and 7% (15) for Napak). Inadequate rain, excess heat and aridity that is unfavourable for agriculture, dry winds and recurrent drought, were mentioned as the top causes of vulnerability. The study findings correspond to study findings by Kansiime, Wambugu, and Shisanya (2013) that elaborated that insufficient rainfall, unfavourable weather conditions and environmental degradation together with overuse of grazing land in the nomadic population and excessive deforestation increases the vulnerability to the nomadic populations. According to UNDP (2013), lack of rainfall, high temperature and aridity do disrupt people's lives through the destruction of pastoral economies and livestock livelihoods options.

This hazard does retard years of development and therefore, pose a major challenge to the achievement of a Sustainable Development Goals (SDGs). The cyclic nature of natural disasters in Kenya especially recurrent droughts in Ilemi triangle has constantly eroded the recovery capacity of the nomadic communities, especially in the ASAL region, thus, affecting the economic development year in year out. Below, Artner, Siebert, and Sieber (2010) suggest that these frequent droughts destroy property, bring misery to the populations and loss of livestock.

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The key informants in both Loruth and Napak mentioned of unforgiving arid land of Ilemi Triangle (Plate 5) environment that has not rained for close to a year. This arid environment makes the pastoralists suffer. Collectively the FGDs of the two study sites discussed of the Ilemi Triangle as a sprawling arid land that has continued to be difficult place to survive in. Hence, drought has introduced an extreme instability into the lives of Turkana pastoralists and raised their inherent vulnerability to an unsustainable level, and to more aberrant forms of uncertainty for which they cannot plan because of recurrent and unpredictable weather patterns.

Therefore, the Turkana nomadic pastoralist's people of the northern Kenya represent an interesting example of how pastoralists cope within arid difficult environments and manage with a number of adversities that are profoundly affecting their livelihoods. This characteristics and assumptions, in Turkana, sometimes provide the perception that the Turkana nomadic pastoralists cannot survive without external help (Oxfam, 2017).

Source: Researcher (2016)

Plate 5: Shoats searching for Pasture in Loruth, Ilemi Triangle, Turkana County, Kenya

f. WEAK EARLY WARNING SYSTEM PRACTICES

The absence of early warning information sharing to nomads the findings indicated were among the top causes of vulnerability in Ilemi Triangle. The study findings showed a 15% (32) for each place. This finding corresponds to findings by Mosley (2016) that reported that inadequate information on drought management within the pastoral communities is a major contributor to poor drought risk minimization within the ASAL region. This is mainly because a less educated society remains a risk-averse and has a low level of adaptability to change will be. However, Mureithi (2012) further reports that ASAL region's literacy rate impacts negatively pastoralists on how to translate weather information when they receive and it requires improvement because illiteracy hindrance the decision making of individuals when they tend to make decisions.

The report from key informants was not any different from household heads. They reported that the pastoralists are not adequately supported with drought information. The traditional early warning systems have never been recognised, supported and integrated in to a wider early warning system management framework. Their knowledge can be integrated with the missing modern weather information and are shared to pastoralists to immediately adjust. Furthermore, absences of early warning information to the pastoralists make them vulnerable as drought traps them when they are not well prepared to counter repeated effects.

Moreover, the nomadic people in Ilemi triangle predictability knowledge on drought occurrence have further been weakened and their capacity to recover even though they experience mild droughts has been lost because of the weak early warning system and repeated drought. If they are not informed of coming drought to prepare themselves, then, the magnitude and the effect of the repeated drought will continue to introduce and possess huge pressure on the pastoralists' livelihood in Ilemi triangle (Mutua, 2011).

Turkana County has only one meteorological station in Lodwar that is far from Ilemi Triangle and monitors the weather. The Lodwar meteorological station sends weather and climate information directly to Nairobi with less feedback going to the local population because of absence of extension officers. This hinder the flow of drought information. Moreover, there is also a gap between information provided if it happens by the early warning systems about impending threats and the ability of government to act to reduce those threats. According to Lekapana (2013), some of the information is not adapted to the language and context of the pastoralists. There is an urgent need for attitude change towards early warning information.

According to Rogers and Tsirkunov (2016), the majority of the Turkana County present drought management apparatus is not capable of predicting drought and providing adequate information to ensure the pastoral population on the boarders are well prepared. This calls for attention of the National government to put in place a mechanism of weather early warning management framework in Ilemi Triangle. No other present networks of meteorological station in Turkana County other that of Lodwar (the capital of Turkana County) that is far from Ilemi Triangle. The Lodwar meteorological station is ill equipped with digital weather prediction parameters like the satellite and instead, it relies on old weather measuring instruments like rain gauge and wind vane that are not capable of predicting the weather correctly. The population either do not receive any information because of absent weather extension officers in Turkana County. This is supported by Opiyo (2014) that descried that the ratio of the early warning extension officers to the nomadic pastoralist's population in all ASAL areas including Turkana County is wanting. This is because of officers posted to such areas seeking transfer to less harsh areas and the low employment rate in the line ministries of the Government (Otieno, 2009). Therefore, the weather information does not reach the local people, as the station capacity remains low in terms of logistics.

According to Opiyo (2014), the provision of early warning information in Turkana County is usually untimely, in a language not adapted and understood by intended beneficiaries and in most cases, it is poorly disseminated. Moreover, there are weak adapted drought management and early warning policies (Appendix IX). There are weak policies that do not promote knowledge dissemination on drought particularly to pastoralists along the international borders. Some drought policies that are supposed to direct how various drought management components respond to be driven and they require being pastoralists. This brings back to the importance of having regional blocks like IGAD and East

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Africa community that will make policies and programs for the drought management among the migratory population along the common boarders of different neighbouring countries according to Shilenje and Ogwang (2015).

In absence of the modern technology, the indigenous knowledge systems used in crisis anticipation and response to droughts are very important in safeguarding the lives of the pastoral communities. Therefore, they should be recognised and are incorporated into conventional weather monitoring systems. According to Lekapana (2013), the indigenous knowledge has actually sustained pastoral communities' lives, and their continued usage shows how much trust has been invested in them. Indigenous knowledge therefore cannot be ignored in any study of the emergence of drought-related crises. Policies should therefore, support research and extension that responds to the needs and interests of pastoralists, and which draws on their extensive indigenous knowledge

Nevertheless, in order to manage and mitigate drought wisely, it will be better to predict, monitor and assess all the droughts parameter before they weaken the existing coping modalities. The suggestions given by FGD for the need for sharing weather information agree with the study done by Pearson (2012) that highlighted the need for shared weather information and having strong warning systems that can inform the population of the potential dangers. This is missing in Ilemi Triangle according to the key informants of the two sites.

g. POOR AND INAPPROPRIATE SUPPORT FROM COUNTY AND NATIONAL GOVERNMENT

The study findings revealed poor and inappropriate support from the County and National government as one of the major cause of vulnerability in Ilemi Triangle (Poor 7% (15) for Loruth and 12 %(26) for Napak). This finding corresponds to study findings by Mureithi (2012) that reported that many government interventions do arrives late, inappropriate and not meeting the need for the populations. This brings the question of investment by the government to the nomadic population.

The report from key informants was not any different from household heads. They reported that the pastoralists of Ilemi Triangle support if any do come late when they have suffered more than enough that their livelihoods are finished. The FGDs in both sites concluded that it is only relief food the government support them with without other options of sustaining livelihoods and promote development and or being involved in decisions affecting their livelihoods.

According to Oxfam (2011), pastoralist's ethnic groups for decades have been side-lined in decision-making processes in East Africa. This has resulted is chronic under-investment in pastoralist communities across the region, and the consequent increase in vulnerability. The FGD of the two sites suggestions of marginalization by the national government has been echoed by Mureithi (2012) that mentions that the Turkana Pastoralist Community have been marginalised on the basis of their geographical remoteness, and their livelihood. Opiyo (2014) elaborates that the Turkana pastoralists livelihood and lifestyle are still seen by many governments as an outmoded way of life that needs replacing with 'modern' livelihood systems. The study disagrees with this and suggests that Ilemi Triangle can produce a solution to their problems if they are adequately supported by national and Turkana County Government.

Because of adequate support, the Ilemi Triangle population are not aware of their rights and have no experience of making the government accountable. Therefore, they have been unable to defend their traditional land rights and request the improved provision of basic services. Services such as health and education according to Lekapana (2013) are not adequately provided nor adapted to the population of the dry lands of Ilemi Triangle (Plate 6). Absence of these services contributes to weak understanding of drought management and, thus, increasing vulnerability.

Furthermore, there has been a severe lack of either public or private investment in infrastructure and economic development in this arid area, making Ilemi Triangle a hard to survive area. Moreover, late responses during drought and the implementing of non-viable programs that do not aim to sustain nomadic pastoralist livelihoods remains a great defy to Ilemi triangle population according to Mureithi (2012).

From the findings, it was evident that the pastoral group studied does not have access to weather information and this kind of support that is required is missing. The key informant's response on importance of sharing information as a support from the government corresponds to study findings by Lekapana (2013) and Mureithi (2012) who have suggested that the government should put in place a communication channel, either through the local administration for the purposes of relaying weather information to pastoralists in areas where they occupy.

Source: Researcher (2016)

Plate 6: Dry area in Napak, Ilemi Triangle, Turkana County, Kenya

A study by Opiyo (2014) pointed out that there has been a lack of interest and investment from national governments since after independence to invest in arid lands (Plate 4.6) and in pastoral areas and this has retarded development. This lesser investment as seen in and support to the nomadic pastoralist's livelihoods consequently cause excessive vulnerability. Less effort has been channelled to the nomadic population and the major component of pastoralist's survival in such harsh environments.

The support on proper livestock management practices is lacking and insurance of livestock against drought is barely absent in Ilemi Triangle. Moreover, Otieno (2009) study suggested that provision of relief food in poverty and drought do not only affect knowledge of strengthening indigenous

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coping strategies, it ruins the market systems that grow economy of the population and also provides a weakness to a transition of opting for other livelihoods.

This was identified in the study as one of the cause of vulnerability. The study argues that other survival and livelihood options need to be explored so that over-dependency on relief, food is reduced and the community gets motivated to exploit and improve own traditional coping possibilities. Ouma *et al*, (2012), however, suggest that relief foods supply as a short-term remedy that can only fill the vacuum of emergency. Hence, the population should not over depend on it entirely because it does not assist in the reduction of vulnerability among the different population.

The suggestions given by FGD of relief food being the top of agenda by the national and County government and many humanitarian organisations agree with the study done by Lekapana (2013) on Socioeconomic Impacts of Drought on Pastoralists, their Coping Strategies, and Government Interventions in Marsabit County, Kenya that suggested that, relief food has been an answer to drought impact in Marsabit without finding other sustainable alternatives options. The study suggests that relief food will not only continue to make the pastoralists population more vulnerable but also will provide a no opportunity to contemplate other methods of survival.

The key informants have asked the national and Turkana County government to limit the continuous relief food provision (Plate 7) to emergency only and prefer sustainable development programs and or instead distribute it only during crisis while supporting the implementation of the mitigation measures. The study suggests for a targeted food distribution only to vulnerable population and reduction of the blanket feeding practices to only be applied if there are massive people affected.

The gap in support of the coping and mitigation strategies the study suggests is evidenced by rush for relief food provision. This rush on relief food option according to Schrepfer (2014) enables the continuity of weakened knowledge and capacity to adapt other options that are essential for developing and strengthening the pastoral economy and livelihood policies.

Source: Researcher (2019)

Plate 7: Relief food from Turkana County, Kenya

Additionally, Opiyo (2014) mentions that the Kenyan government, County governments and humanitarian organisation present in Ilemi triangle have both failed to implement viable drought management programs and frameworks of intervention in the region that bridge the gap of weak development in the region, ensure resilience and mitigation to drought and averts the extreme impacts of drought. These impacts brand the population miserable and more vulnerability to barely to any hazard of any magnitude.

The study argues that humanitarian organisations working in Ilemi Triangle have missed opportunity to implement viable strategies that mitigate drought risks and have continued to rely on relief food supply as shortcut to mitigation measures. These weaker drought management investments in Ilemi Triangle in absence of sustained funding for drought management activities in Ilemi Triangle has continued to encourage vulnerability at a wider margin.

According to Situma (2013), huge vulnerability pressure on to the population will remain persistent with present preferred relief food option than sustained options that the study suggests should not be on the top list for a sustainable opportunity. Much of the humanitarian organisation and national government in Ilemi Triangle choose short-term filling catastrophe solutions with relief food distribution without thinking of any contingency planning, response plans and long-term framework of sustainable programs according to Lekapana (2013), these has kept the population in ruins of poverty and total dependency on aid without working out on the long term modalities.

In the line of continued vulnerability to drought, the capitalist market in Turkana County has moreover encouraged vulnerability in Ilemi Triangle and Turkana at large. This market has allowed exploitation of the poor households by the local vendors who in them pursue of huge and maximizing food profits charge high retail shop food items prices when nomads come to buy non-livestock products. In this regard, the Turkana County should own up factors for food security, production and sustainability, enact County legislation and polices that will allow allocation of funding geared towards food insecurity , support farming services like seeds and tractors; kick start long term initiatives and support on local food production activities and community empowerment on ownership of food security programs to include more on tapping into irrigation schemes along the two main permanent water rivers in Turkana County (Turkwel and Kerio rivers) and preserve pasture or hay for livestock and any humanitarian organisations present need to join efforts to support the initiative.

The County of Turkana the study discusses must deploy teams that will work on this land, employ extension workers, pay them motivational fees and provide storage for these farmers' products. This team will work on land and produce food. This will increase food crop productivity, boost agribusiness opportunities, improve nutrition status in the community because of the availability of foods and ensure a climate smart agricultural venture in Turkana County. In addition to this revitalization of irrigation scheme from the conventional irrigation schemes from the two major rivers, the study suggests for greener houses and drip irrigation can applied for this lands along that contributes to food security in Ilemi Triangle and Turkana County at large.

The County government will buy these products and store them only to be used during crisis period and or sells at lower prices only to the vulnerable households during crisis. The buying of the farm products will create market; ensure that

food is available to the local population. Thus, no waiting for drought to strike to make the foods available for this vulnerable population. This will in turn empower the people to produce food, create population purchasing power that reduces the call for relief food, reduces the laziness among the populations and the elimination of beggary attitude.

Nevertheless, as drought remains cyclic, Ilemi Triangle and Turkana being in arid land that does not support farming, other option that the study considers and proposes includes buying land for food production from other fertile land Counties like Tranzoia and or Kakamega. The County of Turkana can invest in buying the productive land and cultivate it to produce foods that can used feed its population. This long-term investment in the model in the Figure 4.9 improves food security and need to be considered as the County of Turkana.

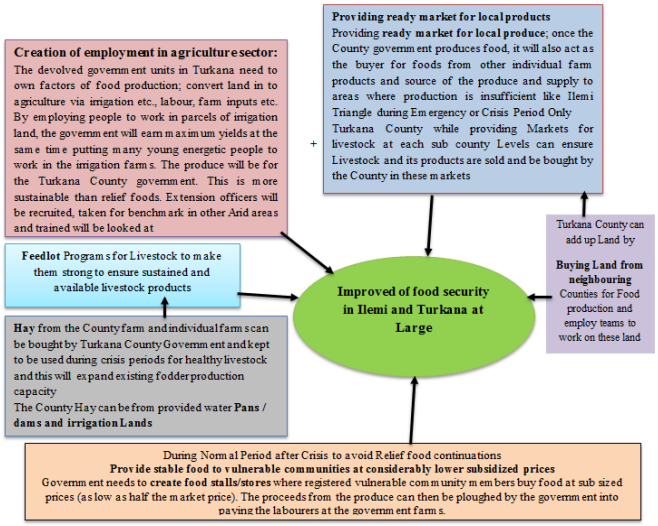
The County according to GOK (2017) has continued to receive enough funds from Kenyan national government and the funding can be invested and be used to improve food production. Together with a strong political commitment and administrative willingness, much improvement in food security in Ilemi Triangle will be seen. The County of Turkana can employ teams that will work on this irrigation land, extension workers and pay their salaries to motivate them work and produce food. This long-term solution will be a Turkana County land and County food that will be supplied to the population on need as relief food during emergency, crisis and or at lower prices to the local population instead of buying food from the Counties.

Figure 4.9 further shows a more sustained Model for food production in line with the cause vulnerability, population purchasing power and how to improve food security at the County government level of Turkana.

As livestock remain the main source of livelihood in Ilemi Triangle, this study proposes for an establishment of livestock fattening program. The Turkana County government should consider for an intensive livestock feedlot programs that can ensure livestock are intensively feed during crisis and be sold at a good price. The County after establishment of this feeding program can buy the livestock from the vulnerable households. The feedlot will not only help in reduction of slaughtering of n already emaciated livestock but also avert hunger among the vulnerable households.

Moreover, as the Turkana County remain a member of North Rift Economic Block (NOREB), with other Counties in ASAL region and in the North rift, Turkana County must tap into this opportunity for partnership with other neighbouring Counties. This can be for support to include

Farming and irrigation benchmarking and arid land management. The County can benefit from ASAL climate change and disaster management forums, trainings and dialogue and an opportunity to learn from each other and prepare the drought management framework for their Counties.



Source: Researcher (2017)

Figure 4.9: Proposed Sustained food security Model for Ilemi Triangle, Turkana County, Kenya

h. POOR INFRASTRUCTURE AND ABSENCE OF LIVESTOCK MARKET

The study findings revealed that poor infrastructure and absence of markets contributes to the vulnerability of the nomadic population (2% (4) for Loruth and 6% (13) for Napak. The report from key informants was not any different from household heads who mentioned that no single livestock market has been constructed in Ilemi Triangle and the national and county government has little on infrastructure and livestock market.

The FGD in Napak and Loruth described a situation of livestock being transferred to Kakuma on the extreme West part of Turkana County where livestock market has been built. The key informants mentioned that by the time livestock reach Kakuma they would have spent two weeks on the way by foot, got weak because of absence of pasture and water, and thus would be sold at a cheaper price. The findings rhyme with study findings by Otieno (2009) who reported that the government of Kenya has done little in terms of infrastructure in Arid and Semi-Arid areas; this has contributed to their vulnerability.

Melle (2016) further suggest that Ilemi Triangle belt has remained with poor infrastructure and absence of Livestock Markets for livestock. This makes the Livestock products are spoiled if no market is available to sell them according to Spadacini (2011). The study advocates for livestock market in Ilemi Triangle because access of market ensures pastoralists reduce livestock numbers and or sell livestock to lessen the risk of loss during droughts. Opening up the road network within Ilemi Triangle especially the presently proposed road towards Ethiopia in Turkana and the other towards Juba via Lokichokio will not only improve the accessibility to the livestock market, purchasing power of population and trade increase but will also reduce security within the borders and Ilemi Triangle.

Secondary information from the Turkana County Integrated development plan (CIDP) 2012 -2017 have listed some of the causes of vulnerability and put across some

measures on how to deal with them, however, most of the options provided in the document are over ambitious, non-adaptive to the context of Ilemi Triangle and that of Turkana County as a whole, a copy paste of other simulated situations and lacks basis of reference any drought mitigation measures for Turkana nomadic pastoralists. Therefore, this study argues that most elements in the document do not add up to reducing the vulnerability causes. The study argues that if this Turkana CIDP consults and integrates the indigenous Ilemi Triangle population's viewpoints on managing the drought vulnerability then, excess drought vulnerability bottlenecks can be deciphered and the prioritized drought management programs are achieved in a given period. The study argues that such an important document needs to be consultative, practical, and realistic and able to give drought management and underlying causes of vulnerability a priority it deserves and not just a matter of having a document that cannot help managing recurrent drought problem in Ilemi Triangle and Turkana County as a whole.

According to Mureithi (2012), lack of livestock markets has hindered livestock trade and marketing in Ilemi Triangle. Pastoralists are forced to sell their livestock at very low prices to intermediaries who then transport to areas as far as Lodwar and Kakuma. Moreover, poor road infrastructure in Turkana County as a whole impedes livestock trade and movement of people and livestock products sell. It further exacerbates the impacts of drought on pastoralists in Ilemi Triangle. The Turkana County must then support pastoralist framers to access markets via development of additional market infrastructure and market linkage support. This will benefit pastoralists through their livestock value addition and product differentiation.

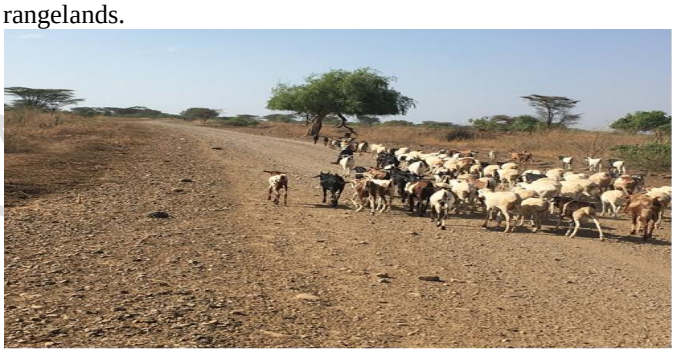
The government's developmental policies the study suggests should then support the marketing of pastoral livestock and livestock products, with emphasis on enhancing the development of marketing and roads infrastructure. Furthermore, policies should support the development of credit and financial services for pastoralists, drawing especially on private sector provision of livestock loans and insurance. This is not yet in Ilemi Triangle and the study suggests it will improve the population livelihoods and living.

i. POOR RANGE MANAGEMENT PRACTICES

The study findings revealed poor range management contributes to vulnerability of pastoralists in Ilemi Triangle (8% (17) for Loruth and 3% (7) for Napak). This finding corresponds to Lekapana (2013) study findings that suggested that pastoralists in northern Kenya remain vulnerable because of the missed opportunity of reorganising their grazing patterns and investing on range management.

The report from key informants was not any different from household heads. They reported that the pastoralist's livestock production systems depend entirely on natural pastures supported by rainfall with no knowledge on range management. The land in Ilemi Triangle and in Turkana County in general is communal and in Ilemi, there are no livestock ranches. However, some pasture enclosures in some parts of Ilemi Triangle and designated wet and dry seasons grazing areas are present. The study suggests for a County government or national government teams to support nomadic populations to work on rangeland mapping and management structures. According to Lekapana (2013), proper organisation and management of grazing zones, pattern and community conversations are important elements in ensuring vulnerability is reduced. It remains a vehicle through which concerns are in rangeland management according to Kigomo and Muturi (2013).

The FGD in both sites illustrated the need to management range to guard the nomads from conflicts with neighbouring ethnic groups and livestock health so that they remain stable until other cycle of rain starts (Lekapana, 2013). Plate 8 illustrates the shoats grazing freely without any control and the poor management of the rangeland is inhibiting the progress of these pastoralists. Weak Community engagement and grazing pattern management have brought the poor range management practice according to Opiyo et al, (2014). This is because the pastoralist communities are unable to distinguish between positive traditional grazing practices, such as controlled grazing to avoid livestock trampling and destroying grazing areas, and negative practices, such as letting livestock graze in the rainwater catchment area and damage the catchment capacity. The Turkana County need to support pastoralists to map and demarcate grazing corridors to safeguards grazing rangelands.



Source: Researcher, (2017)

Plate 8: Shoats observed grazing in January 2017 in Loruth area, Ilemi Triangle, Turkana County, Kenya

j. POVERTY AND ABSENCE OF SAVINGS

The study findings revealed that poverty and absence of saving remain a major cause of vulnerability in Ilemi Triangle (4% (9) for Loruth and 5% (11) for Napak). The Chi Square test value between savings strategy and causes of vulnerability in Napak was χ^2 (2, N= 212) = 0.043, p > 0.05.This indicated non-significant statistical association between the two variables.

Collectively, FGDs and Key informants suggested that Turkana nomad's pastoralists in Ilemi Triangle are poor and have nothing to save not because the banks are absent but because they cannot be able to afford even a single meal during drought. This findings rhyme with Opiyo (2014) findings that mentioned that Turkana population are usually poor and 88% of the population live below the poverty level compared with 45% nationally and have no money to save and remain poor

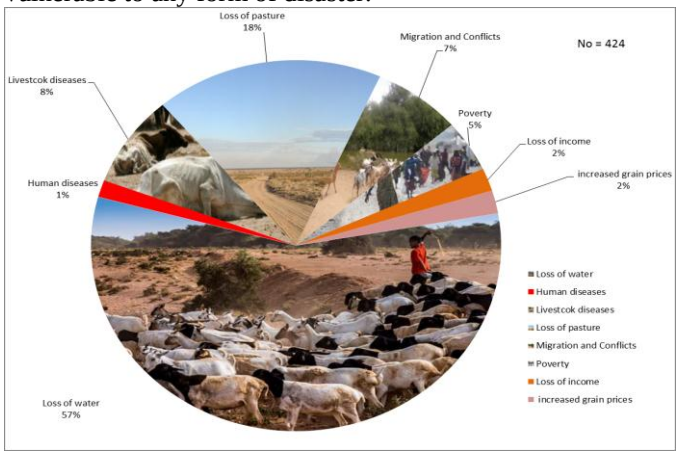
The findings on poverty being among the top cause of vulnerability correspond to the study findings by Miriri (2018), which suggested that the main cause of vulnerability

of disasters is poverty level among the populations. The key informants confirmed that no banks are available in Ilemi Triangle and it is mainly because the population are economically incapable to sustain themselves and minimize hazard impacts because of absent support from national and county government to uplift their standards. However, Sherwood (2013) argues that the huge disparity in the economic, fragile ecosystems and environment situations, social, unfavourable climate, poor infrastructure and historical marginalization make some of these populations more vulnerable than the rest who receive adequate support from their respective governments

k. UNMITIGATED DROUGHT IMPACTS

The results showed that drought vulnerability is caused by drought impacts in Ilemi Triangle (21%, 45, for Loruth and 17%, 36 for Napak) that has not been mitigated. The study findings are consistent with the results from a similar quantitative study conducted by Ayodele *et al*, (2014) in Fulani nomadic pastoralists of Niger that found that majority of this pastoralists remain the poorest in Saharan, remain vulnerable to drought impacts and do not have wealth to save. Pastoralists' high dependency on water and pasture to sustain their livelihoods means also that they are particularly affected by drought-related food insecurity (IFRC 2014).

Figure 4.10 shows loss of water (57%), loss of pasture (18%), livestock diseases (8%), migration and conflicts from other ethnic groups (7%) as the main impacts of drought that causes the vulnerability in Ilemi Triangle. Collectively, FGDs and Key informants suggested that the huge impacts of droughts have never been mitigated and when drought comes back, it finds the population already weak. These suggestions on the impacts of drought by the FGDs and Key informants rhyme with the study findings by Opiyo (2014) that elaborated those long lasting impacts of droughts on pastoral system create not only a long-term economic and ecological imbalance but also a non-resilient community that is vulnerable to any form of disaster.



Source: Researcher (2017)

Figure 4.10: Impacts of Drought in Ilemi Triangle, Turkana County Kenya

The ten Focus group discussion members in Loruth (Table 4.5) identified the following impacts of drought to include fall in fodder availability, fall in herd's productivity, fertility of the herd falls, milk output falls, weight of livestock falls and death rate rises, increased long distance-movement and conflicts with other neighbouring headers and ethnic groups, increased demands for grains and sale of stock and livestock in and out of Ilemi Triangle belt, change in wealth distribution, out-migration of labour and fall in efficiency of herds management, increased death due to change in diet and exposure to livestock and human diseases. They were coded, scored and ranked in Table 4.5.

S/No.	Identified impacts by 10 FGD members in Loruth	Total Score	Mean	Rank
1	Fall in Fodder availability	172	17.2	1
2	Fall in herd's productivity, Fertility of the herd falls, Milk output falls, Weight of livestock falls, Death rate rises and increased livestock disease	165	16.5	2
3	Increased long distance movement and Conflicts with other neighbouring headers and ethnic groups	165	16.5	2
4	Increased demands for grains and Sale of stock and livestock in and out of Ilemi Triangle belt	148	14.8	4
5	Change in wealth distribution	112	11.2	5
6	Out migration of Labour and fall in efficiency of herds management	80	8.0	6
7	Increased death due to change in diet and exposure to livestock and human diseases	75	7.5	7

Source: Researcher (2017)

Table 4.5: Ranking of the Drought impacts in Loruth by FGD, Ilemi Triangle, Turkana County in the Northern Kenya

The ten Focus group discussion members in Napak (Table 4.6) identified the following impacts of drought to include fall in fodder availability, excessive migration and conflicts with other neighbouring ethnic groups fall in herd's productivity, fertility of the herd falls, milk output falls, weight of livestock falls and death rate rises, increased demands for grains and sale of stock and livestock in and out of Ilemi Triangle belt out-migration of labour to Lodwar and Kakuma and fall in efficiency of herds management, increased death due to change in diet and exposure to diseases. They were coded, scored and ranked in Table 4.6.

Table 4.5 and 4.6 ranking indicates fall in fodder availability, excessive migration, and Conflicts with other neighbouring ethnic groups as the main top impacts of drought identified by the FGD of the two places. This is similar to findings by Lind *et al*, (2013) who reported that

meteorological drought could not be avoided, and its impact to include famines, migration, and poverty.

S/No.	Identified impacts by 10 FGD members in Napak	Total Score	Mean	Rank
1	Fall in Fodder availability	185	18.5	1
2	Excessive migration and Conflicts with other neighbouring ethnic groups	170	17.0	2
3	Fall in herd's productivity, Fertility of the herd falls, Milk output falls, Weight of livestock falls and Death rate rises	168	16.8	3
4	Increased demands for grains and Sale of stock and livestock in and out of Ilemi Triangle belt	152	15.2	4
5	Out migration of Labour to Lodwar and Kakuma and Fall in efficiency of herds management	62	6.2	5
6	Increased death due to change in diet and exposure to diseases	60	6.0	6

Source: Researcher (2017)

Table 4.6: Ranking of the Drought impacts in Napak by FGD, Ilemi Triangle, Turkana County in the Northern Kenya

Collectively, FGDs and Key informants suggested that drought in Ilemi Triangle results to diminishing pasture and forage, conflicts with neighbouring ethnic groups and livestock getting diseases from new areas the pastoralists migrate to in search of pasture and water. These findings correspond to the study by Opiyo (2014) that suggested that drought impacts on pastoralists" livelihoods resulting in their mortality because of drying of water sources, decline of pasture. Mureithi (2012) suggests drought increases food shortages and increased food prices and loss of income.

Nevertheless, according to UNDP (2013), the impact of drought essentially depends on societal vulnerability and coping capability at the time and place where drought happens. Therefore, drought-impacted societies, humanitarian organizations, and governments need to put drought near the centre of their sustainable development priorities. This is because not only more pastoralists are seeking outside support than ever before because of the drought affects but also many arid and semi-arid regions population remain dispossessed seeking for survival through multiple mechanisms (Opiyo, 2014).

The study finding of death of livestock because of drought impacts and the observed livestock condition in Plate 4.9 corresponds to some similar study findings by Huho, Ngaira, and Ogindo (2010) who elaborated that drought resulted in the loss of Maasai livestock in Mukogondo Division of Laikipia District due starvation for the absence of pasture. Therefore, since livestock is the main source of livelihood to pastoralists, their decimation will disrupt pastoral socioeconomic existence.

Lekapana (2013) study findings rhyme with this study finding that drought leads to the poor health of pastoral households and their livestock. Cases of malnutrition in Ilemi triangle have increased due to drought and a recent GOK (2016) nutrition survey conducted in June 2016 in Turkana County reported a very critical nutrition situation in Turkana north where Ilemi Triangle belong to have had a Global Acute Malnutrition (GAM) rate of 23.4% which is >20% rate in the WHO classification rates of being in the critical condition. This malnutrition according to Situma (2013) does affect mostly under 5-year's old pastoralist's children. KRCS (2013) indicates that over 200 of the under five years old children have suffered from acute malnutrition following the year 2011 drought, and there are increased drought episodes due to food insecurity.

According to the key informants interviewed in Napak, the livestock condition (Plate 9) informs how the drought spell is, its severity and how weak the existing drought coping strategies are. Therefore, the mitigation measures put across in Ilemi Triangle are not only working but also do not support the better drought coping strategies.

Source: Researcher, (2017)

Plate 9: Dead Shoats observed in January 2017 observed in Napak, Ilemi Triangle, and Turkana County, Kenya

Additionally, Solh and Ginkel (2014) have both elaborated that the common settings where conflict is derived from drought remain the arid and semi-arid regions. These regions according to UNDP (2013) are characterised by inadequate capacities, resources and are usually under significant ecological pressure. Therefore, in an already depleted resource setting like Ilemi Triangle, when drought strikes, the living conditions of these nomads and their livelihoods become very difficult.

One key informant, a 65-year-old man from Loruth village, summarised the impacts of drought and stated as follows

> Drought now and then bring us close to our enemies because of depletion of water and pasture; loss of livestock and reduction of prices of livestock even in the market; poor human health of livestock morbidity and increased food prices so we are always suffering and its only God who will help us (Key informant interview, 26th July 2016, Loruth Village).

The statement shows a sign of hopelessness the nomadic pastoralists of Ilemi Triangle have and the study understands that in settings is prone to conflicts and drought, the livestock population plays a key role to advocate for change of livelihood option or strengthen the existing ones and their coping strategies. The key informants in the ministry of

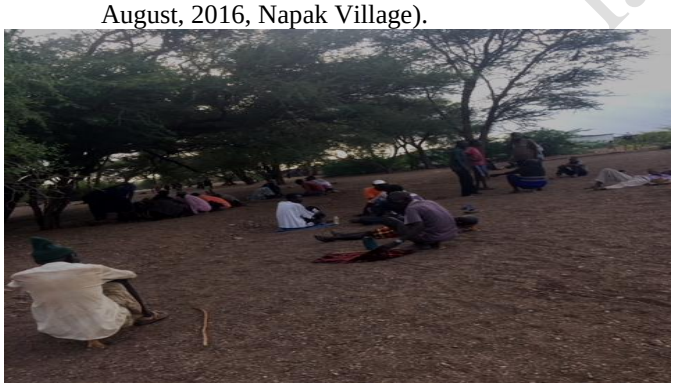
livestock in Turkana County mentioned that these Shoats are typically reared because they are easy to be sold for food and exchanged for money to complement food received from humanitarian originations during the drought period. However, the study argues that pastoralists do keep huge numbers of livestock as a sign of power and wealth.

In summary, the FGD rankings in Napak and Loruth were having correlation coefficient 0.99±0. 0054. Thus it was statistically significant (ρ <0.05). This implied that the FGD rankings in Napak and Loruth had a significant positive correlation. Thus, they were mainly the same. Thus, the communities of the two localities were experiencing the same events hence the same perceptions.

Data from the household survey on causes of drought vulnerability was corroborated and expounded by the key informant interviews and focus group discussions. The information from FGD (Plate 4.10) and Key informants were triangulated. Key informants recalled past droughts from their own experiences and through stories from elders. Drought occurrences in the last twenty years were easily remembered and freely discussed in the focus group discussion sessions, with middle-aged members also actively engage in the discussions.

According to the key informants, drought (*akamu*) is lack of rainfall for one or more seasons. One key informant in Napak stated that:

> I don't know what the monster that Turkana people did to God, every time neighbouring ethnic groups attack us, there is excess drought, tribal clashes for water and pasture, government is not supporting even when we are attacked and yet we are surrounded by enemies from all corners of the place (Key informant interview, 30th August, 2016, Napak Village).



Source: Researcher, (2016)

Plate 10: FGD Group in Loruth area, Ilemi Triangle, Turkana County, Kenya

Number	Factor identified in Loruth by 10 FGD members in Loruth	Loruth Rank	Napak Rank	D	D^2
1	Fall in Fodder availability	1	1	0	0
2	Fall in herd's productivity, Fertility of the herd falls, Milk output falls, Weight of livestock falls, Death rate rises and increased livestock disease	2	3	1	1
3	Increased long distance movement and Conflicts with other neighbouring headers and ethnic groups	3	2	0	0
4	Increased demands for grains and Sale of stock and livestock in and out of Ilemi Triangle belt	4	4	0	0
5	Change in wealth distribution	5	5	0	0
6	Out migration of Labour and Fall in efficiency of herds management	6	6	0	0
7	Increased death due to change in diet and exposure to livestock and human diseases	7	7	0	0

Source: Researcher (2017) $\sum D^2 = 1$

Table 4.7: Ranking Correlation between Napak and Loruth on the impacts of drought

On Raids and conflicts as the cause of vulnerability to drought. One key informant from Loruth mentioned that:

> Raids are common here, these ethnic groups from Toposa do not even wait until the drought ends before they come to attack and drive away our livestock…frequent raid discourages me and we will all die soon. These raids do happen mostly during rainy seasons when nomadic pastoralist's households are scattered, water is available for raiders, livestock is strong enough to move faster and the children remain the main people looking after livestock as men participate in many traditional ceremonies and they are absent in the household during greener seasons. During the dry period, our families come together, look water and pasture for livestock collectively. It is then difficult for our enemies to attack and spell any harm on us (Key informant interview, 27th August 2016, Loruth Village).

The question of the conflict along the border was explained by the key informants from Napak that since colonial times and independence, no clear Ilemi Triangle boarder has been drawn and different nomadic pastoralist have adapted techniques of manning it and the warring

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neighbouring ethnic groups roam cross over to Kenya to attack because the boarders are porous and are not manned and controlled. Moreover, the region also named '*Triangle of death'* by Napak key informant has remained disputed until present though the Turkana nomadic population occupies a majority of it. However, the Kenyan government since independence has been reluctant to invest and integrate the region into the mainstream of the Kenyan economy making it lag behind in development.

On the government support, the key informants in Loruth cited of an experience during his recent migration towards Karamojong land in Uganda. The informant mentioned that Uganda government has invested heavily on pastoralist's education, supporting drought coping strategies and drought mitigation programs especially along the pastoralist's migratory routes, that their livestock management policies have been modified with their pastoral drought management policies that have been pastoralists friendlier. Accordingly, the Ugandan government in Karamojong according to the key informant have taken over all illegal firearms from Karamojong nomadic pastoralists and instead have received total livestock livelihood support including their separate ministry that deals adequately with pastoral affairs. This support brings in the empowerment and other initiatives of improving livelihoods against drought. These are ideally missing in Ilemi Triangle.

The key informants of Loruth lamented that:

> Our Kenyan government and the County has done little to improve the population livelihood amid repeated droughts, improper mitigation measures and poor communication on early warning information is not provided and we have been left to manage the situation when problem of water and pasture resource and its management practices exist (Key informant interview, 27th August 2016, Loruth Village).

This elaborate description from the key informants of Loruth shows how weak the authority is in Ilemi Triangle in terms of handling drought. There is a clear lack of political will in dealing with vulnerability causes to drought despite the Turkana County receiving huge amount of funds from the government annually. The study challenges the authority to act on mitigating drought to reduce vulnerability.

On continuous relief foods, one key informant in Loruth lamented that it is good though it needs to be incorporated with other livelihood option and relief food alone promotes laziness. Accordingly, other methods of supporting livelihoods can be empowered. According to the key informants of both places, there are no observable, practical strategies and policies that have mitigated drought enough to lessen the vulnerability. Moreover, the Kenyan latest policy that led to the establishment of NDMA in 2011(GOK, 2013) laid out the risk reduction awareness and education, and coordinates the implementation of risk reduction programs, drought mitigation, and relief activities while generating, consolidating and disseminating drought management information. These roles according to the key informants interviewed in Napak are not practical bearing in mind the climate change with repeated droughts. Nevertheless, none of the strategies was observed in the areas because nomads do not receive any drought information to make them get prepared.

Furthermore, the key informants have elaborated on the need for provision of seeds to pastoralists who want to do irrigation on permanent rivers or during rainy season and on the migratory routes, working on food security, distribution of livestock especially bulls, encouraging rearing of drought resistant livestock like camels, bench marking in other ASAL areas to understand how they cope to adjust in Ilemi to reduce vulnerability, opting for livestock compensation Sacco & Insurances, boarder mega schools to reduce cattle rustling and encourage warrying ethnic groups children learn together and promote peace. This will help to reduce vulnerability.

One key informant from Loruth challenged the kind of bench marking the Turkana County team do for the drought management practices and food security improvement that help to reduce the vulnerability in the area. The key informant lamented the missed opportunity and absence of prioritization for bench marking where the Turkana County officials go for benchmark for intention of getting more allowances and areas that do have similar problem and finally nothing is learnt that benefit the population.

The research challenges the intention and asks for learning that is objective and targeted especially from other arid and semi-Arid like the County Makweni County that have reduced relief food aid and have grown own food and progressed in development. This can be a great area to do bench marking on reduction of vulnerability in arid areas according to Opiyo (2014).

D. SOLUTIONS TO THE CAUSES OF VULNERABILITY TO DROUGHT IN ILEMI TRIANGLE

Drought remains an important threat to nomadic pastoralists in Turkana to their livelihoods and food security. Drought is cyclic in nature in Ilemi Triangle, this study suggests for the development of sustainable strategies aimed at vulnerability management in Turkana County and they should include strong socio- political will, working on food security through irrigation along permanent rivers in the County and development of social infrastructure.

These should be considered as a matter of priority. A culture of disaster contingency planning, prevention and preparedness within the community must be installed in the population through proper integration of local population capacities in to drought management. This will reduce the bottlenecks that causes of vulnerability to drought among the population. A proactive approach that combines promising technological, institutional and policy solutions to manage the risks within vulnerable communities should be considered the way forward for managing drought variability.

The livelihoods in Turkana County and in Ilemi Triangle in particular have severely been affected by aridity and absence of water. These have caused excessive vulnerability. Provision and development of water resources will be paramount to this population. The County of Turkana need to provide this by digging more boreholes and this water will not only be used for livestock, greenhouses and or small kitchen garden for more food production but also a means to lessen

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conflicts with other neighbouring ethnic groups they migrate to and secure food security.

Moreover, communicating weather predictions and Integration of Indigenous Knowledge Systems into weather monitoring, and working on range management, boarder schools, restocking by providing drought resistant livestock, improvement of livestock health services to include fattening programs and establishment of livestock markets and Sacco's, improvement of road infrastructure will reduce nomad's vulnerability and must be considered a priority.

The County of Turkana must enact policies and legislations that will gear towards protecting populations from hazards, their risks and vulnerability to include allocation of funding by the County for livelihoods promotion and protection, social network supports and safeguard of populations from drought impacts programs and education of pastoralists on livestock management and drought.

V. INDIGENIOUS METHODS OF DROUGHT EARLY WARNING SYSTEM IN ILEMI TRIANGLE, TURKANA COUNTY, KENYA

A. INTRODUCTION

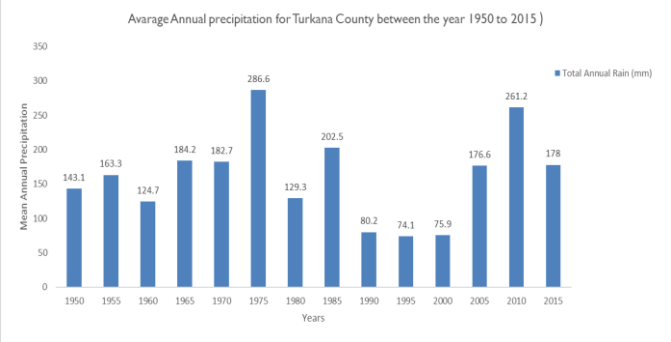
An effective early warning system is invaluable for timely implementation of drought mitigating and relief measures. However, for its effective implementation, they should be accompanied by an infrastructure. Turkana being in the remote and isolated part of Kenya, excessive drought challenges, lacks modern weather prediction apparatus and uncoordinated and weak information flow on drought early warning systems (EWS); they remain factors that hinder drought management programs. The chapter reports on the indigenous methods of drought early warning system in Ilemi Triangle, Turkana County in Kenya. It will answer the question of what methods of indigenous drought early warning system do Turkana nomadic pastoralists of Ilemi Triangle, Turkana County in Kenya utilise. In coping with different and frequent drought scenarios, the Turkana nomadic population of Ilemi triangle has been acclimatized themselves with different options of detecting drought eminence and this chapter investigated how they ensured they receive drought information to prepare their coping.

B. CHARACTERISTIC OF THE METEOROLOGICAL DROUGHT

Drought characteristic helps pastoralists to detect how drought will be whether it will be severe or fewer impacts and will enable them to adjust. According to Ginnetti and Franck (2014), meteorological drought happens when dry weather patterns dominate an area and the secondary data from Lodwar meteorological station (Figure 5.1) indicated that severe and extreme droughts were experienced for the year 1950 to 1955 in the study sites. However, the finding confirms that extreme and severe meteorological drought year matches well with the historical records of actual droughts observed by the key respondents (Table 5.1). Thus, statistical counts of drought spell from SPI values (Table 5.2) could be used to obtain the overall drought characteristics in the study sites.

a. YEARLY PRECIPITATIONS USED TO DETECT DROUGHT

Figure 5.1 indicates the Turkana County annual average precipitation between the years 1950 to 2015. The study revealed that there were fluctuations of rains and a period of severe to mild drought when rain had reduced. The secondary data collected from Turkana County NDMA records showed the first years from the year 1950 to 2005 were five yearly and after 2005 to 2016 were yearly.



Source: NDMA (2016)

Figure 5.1: Annual precipitation of Turkana County, Kenya from the year 1950 to 2016

Although some of the nomadic pastoralists in Ilemi triangle have tried to utilise yearly precipitation prediction to predict and manage drought effects effectively, most pastoralists according to Lekapana (2013) have remained unable to access modern methods of early warning system principally. According to Opiyo (2014), this is because of the poor early warning systems adapted to pastoralists, eroded drought predictability levels; weakened knowledge resulted from recurrent drought and misinformation on when the next drought occurs, lack of resources and greater vulnerability margins.

Lack of enough rains accordingly makes the pastoralists and their livestock vulnerable shocks. Drought results in loss of larger numbers of livestock, which leads to the surge of livelihood crisis among the nomadic pastoralist population. The drought in 2011 according to UNDP (2013) had seen pastoralists in emergency areas lose their livestock and reports indicate that up to 80% of the livestock, particularly the more vulnerable sheep and cattle were lost. In addition, many pastoralists migrated in search of water and pasture to that, this migration consequently often triggers conflicts with other ethnic groups. There is an urgent need to provide a proactive functioning early warning framework that will reenergise the early warning system in a pastoral environment, recognises, and integrates existing indigenous knowledge.

Standard Precipitation Index (SPI) in Table 5.1 showed extreme negative values in the years 1950, 1960, 1980, 1990, 2000 and the year 2009. All these values were below -2 and it indicated Turkana County having an extreme drought. Table 5.1 provides not only a framework of understanding of when the government and the Turkana County should have acted to help the vulnerable population but also a clear predictive pattern of when eventual drought can happen.

The meteorological drought happens when the SPI analysis values are negative and ends when they turn out to be positive according to Huho *et al*, (2010). Normal precipitation according to Opiyo (2014) occurs when the SPI values are at zero (0.00) while drought is extreme when the values are ranged from - 2.00 and below, severe when they are at -1.5 to -1.99, moderate when the values are at -1.0 to -1.49 and finally mild drought when the SPI values are between 0 to -0.99. According to Huho and Mugalavai (2010), SPI help in identifying the severity of the drought; hence, a sound informative indicator that can support in alerts and informs on putting drought coping measures in place.

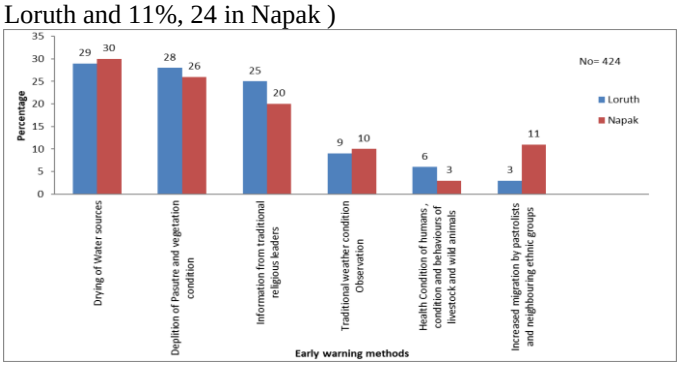
Year	Annual Total Rainfall(mm)	Standard Deviation (σ)	Drought severity index (SPI-Standardized Precipitation Index	Drought Category
1950	143.1	24.7	- 2.86	Extreme
1955	163.3	20.2	- 1.94	Severe
1960	124.7	15.4	- 3.37	Extreme
1965	184.2	31.0	- 1.16	Moderate
1970	182.7	26.2	- 1.22	Moderate
1975	286.6	35.7	2.62	wet
1980	129.3	22.5	- 3.19	Extreme
1985	202.5	26.2	- 0.49	Mild
1990	80.2	8.10	- 5.01	Extreme
1995	74.1	8.60	- 5.24	Extreme
2000	75.9	12.7	- 5.27	Extreme
2005	176.6	24.3	- 0.18	Mild
2006	369.8	44.0	5.70	Wet
2007	388	31.1	6.37	Wet
2008	130.2	16.7	- 3.16	Extreme
2009	160.8	30.5	- 2.03	Extreme
2010	77.3	8.80	- 1.00	Moderate
2011	75.6	12.8	- 5.21	Extreme
2012	420	38.2	7.60	Wet
2013	304.4	33.9	2.62	Wet
2014	177.2	13.8	- 0.64	Mild
2015	178	28.6	- 0.28	Mild
2016	239	44.2	1.12	Wet

Source: Researcher (2016)

Table 5.1: Drought Severity Index in Turkana between 1950 and 2016 and calculation using Standardized precipitation index

C. INDIGENOUS DROUGHT EARLY WARNING SYSTEM IN ILEMI TRIANGLE

Figure 5.2 shows the main early warning methods of drought detection to include drying of water sources (29%, 62 for Napak and 30%, 64 in Loruth), depletion of pasture and vegetation condition (28%, 60 for Napak and 26%, 55 for Loruth), Information from traditional community leaders information from their gods, tobacco and shoes observation (25%, 53 for Loruth and 20 %, 43 for Napak), Traditional weather observations like birds movement, sky stars and intestines observations, and wind and temperatures rise (9%,19 in Loruth and 10%,21 in Napak) , poor health conditions of livestock and animal behaviour (6% ,13 for Loruth and 3% ,7 for Napak) , increased migration (3% 7 for Loruth and 11%, 24 in Napak)



Source: Researcher (2016)

Figure 5.2: Indigenous early warning methods in Ilemi Triangle, Turkana County in the Northern Kenya

The ten focus group discussion members in Loruth identified the following indigenous early warning methods to include observation of shoats intestines and tobacco, information from *'Emuron'* the traditional religious leaders , decreased water level from wells, spring, boreholes and water pans, change of soil colour, excess heat change, and diminishing pasture, increased distance to search water, strong dusty winds blow from east to west, change of livestock and reptiles behaviour, wild animals moving towards people habitation and increased conflicts between wild animals and people because of water and increased birds movement towards areas where is available and disappearance of leaves and fruits from trees. They were coded, scored and ranked in Table 5.2.

S/No	Identified impacts by 10 FGD members in Loruth	Total Score	Mean	Rank
1	Observation of shoats intestines colour and tobacco	190	19.0	1
2	Information from '*Emuron'* the traditional religious leaders using dreams and traditional shoes	185	18.5	2
3	Decreased water level from wells, spring, boreholes and water pans and Increased distance to search water	178	17.8	3
4	Change of Soil colour, excess heat change, and diminishing pasture and Strong dusty winds blow from East to West	165	16.5	4
5	Decreased number of traditional ceremonies like marriages and increased migration	138	13.8	5

6	Change of livestock behaviour, white frogs colour appearance, reptiles behaviour of looking up and down	130	13.0	6
7	Wild animals moving towards people habitation and increased conflicts between wild animals and people because of water and increased birds movement towards areas where is available	80	8.0	7
8	Disappearance of leaves and fruits from trees	65	6.5	8

Source: Researcher (2017)

Table 5.2: Ranking of the Indigenous early warning methods by Loruth FGD, Ilemi Triangle, Turkana County in the Northern Kenya

The ten focus group discussion members in Napak identified the following indigenous early warning methods to include observation of shoats intestines and tobacco, information from *'Emuron'* the traditional religious leaders , change of livestock, frogs, reptiles behaviour of raising their heads and tails, increased distance to search water decreased water level from wells, spring, boreholes and water pans, strong dusty winds blow from east to west, change of soil colour, excess heat change, and diminishing pasture, increased distance to search water, wild animals moving towards people habitation and increased conflicts between wild animals and people because of water and increased birds movement towards areas where is available . They were coded, scored and ranked in the Table 5.3.

S/No.	Identified impacts by 10 FGD Members in Napak	Total Score	Mean	Rank
1	Observation of shoats intestines colour and tobacco	178	17.8	1
2	Information from '*Emuron*' the traditional religious leaders using dreams and traditional shoes	140	14.0	2
3	Change of livestock behaviour, white frogs colour appearance, reptiles behaviour of looking up and down	138	13.8	3
4	Increased distance to search water, Decreased water level from wells, spring, boreholes and water pans	136	13.6	4
5	Strong dusty winds blow from East to West and Change of Soil colour, excess heat change, and diminishing pasture	98	9.8	5
6	Decreased number of traditional ceremonies like marriages	72	7.2	6
7	Wild animals moving towards people habitation and increased conflicts between wild animals and people because of water and increased birds movement towards areas where is available	50	5.0	7
8	Disappearance of leaves and fruits from trees	30	3.0	8

Source: Researcher (2017)

Table 5.3: Ranking of the Indigenous early warning methods by Napak FGD, Ilemi Triangle, Turkana County in the Northern Kenya

Table 5.2 and 5.3 indicates the ranking of the Indigenous early warning methods by FGDs in Loruth, and Napak in Ilemi Triangle, Turkana County Kenya. Observation of shoat's intestines and tobacco, Information from '*Emuron* 'the traditional religious leaders, decreased water level from wells, spring, boreholes, and water pans and change of livestock condition and behaviour, white frog's appearance, reptile's behaviour were ranked among the top early warning methods used in the two places by the FGD.

Following instructions from the traditional systems of traditional leaders and religious leaders according to Masinde and Bagola, (2012) study is vital for early warning information among nomads and it has helped them go through different droughts. In summary, the FGD rankings in Napak and Loruth were having correlation coefficient 0.99±0. 0054. Thus it was statistically significant ($\rho < 0.05$). This implied that the FGD rankings in Napak and Loruth had a significant positive correlation. Thus, they were the same. Thus, the communities of the two localities were experiencing the same events hence the same perceptions.

S/No	Factor identified in Loruth by 10 FGD members in Loruth	Napak Rank	Loruth Rank	D	D^2
1	Observation of shoats intestines colour and tobacco	1	1	0	0
2	Information from '*Emuron'* the traditional religious leaders using dreams and traditional shoes	2	2	0	0
3	Decreased water	3	3	0	0

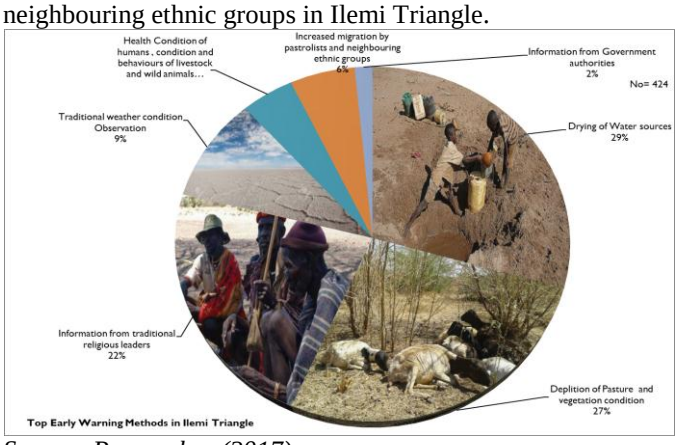
	level from wells, spring, boreholes and water pans and Increased distance to search water				
4	Change of Soil colour, excess heat change, and diminishing pasture and Strong dusty winds blow from East to West	4	4	0	0
5	Decreased number of traditional ceremonies like marriages	5	5	0	0
6	Change of livestock behaviour, white frogs colour appearance, reptiles behaviour of looking up and down	6	6	0	0
7	Wild animals moving towards people habitation and increased conflicts between wild animals and people because of water and increased birds movement towards areas where is available	7	7	0	0
8	Disappearance of leaves and fruits from trees	8	8	0	0

Source: Researcher (2017) $\sum D^2 = 1$

Table 5.4: Ranking Correlation between Napak and Loruth on the Early warning system methods

a. DRYING OF THE WATER SOURCES

The study showed that drying of water sources (29 %, (62) for Napak and 30%, (64) in Loruth) was one of the top early warning indications of the eminence of drought. When the river wells get dry up and get deep then drought is approaching. Figure 5.3 shows that water remains the first notifiable resource for a drought indication and an important element in the pastoral population. The study findings agree with Mutua (2011) findings that mentioned that absence of rains, drying out, drying of surface water collection points like water pans and wells plus a misty and high-speed dusty windy storms symbolize drought. Water is a critical element and a determinant of pastoral production systems in the ASALs and the Turkana pastoralists like other pastoralists follow water sources for their livestock and always dwell near water points. An absence of water commodity ensures these pastoralists migrate and these makes they exposed to other volatile neighbouring ethnic groups in Ilemi Triangle.



Source: Researcher (2017)

Figure 5.3: The top drought early warning indicators in Ilemi Triangle, Turkana County in the Northern Kenya.

b. DEPLETION OF PASTURE AND CONDITION OF THE VEGETATION

Pasture presence remain the backbone of livestock livelihood and absence of pasture weakens this preferred pastoralist's livelihood option. Figure 5.2 indicates pasture depletion and vegetation remain among the top most recognisable element for early warning to drought among the pastoralists in Ilemi Triangle while Plate 11 taken during data collection period in Loruth, one of the study sites shows a complete absence of pasture. The findings showed that pastoralists in Ilemi Triangle observe pasture presence as an indication of the eminence of drought (28%, 60 for Napak and 26%, 55 for Loruth). This study corresponds to studies by Ichara (2012) that showed that pastoralists first thing they notice as a sign of drought is pasture and will inform them to migrate or not.

Source: Researcher (2016)

Plate 11: Depleted Pasture in Loruth, Ilemi Triangle, Turkana County of the Northern Kenya

Moreover, the conditions of vegetation according to Mosley (2016) provide signals of a looming drought. Respondents mentioned that gradual disappearance of grass and shrubs, change of their colour from greenish to brown, coupled with continuous grazing leave bare grounds and stumps of grass and shrubs clearly indicate 'bad years'. Secondly, when mature trees such as '*Esekon, Etiir, Edung, Engol,* and *Ebei* 'lose leaves and fail to flower and produce fruits and berries then, this is a clear signal of a severe drought looming.

The suggestions given by FGD that during drought, all pasture is wiped away and livestock become miserable agree with the study done by UNDP. (2016) in ASAL regions in Kenya mention that pasture depletion in nomadic pastoral environment is, an indication drought is imminent.

c. INFORMATION FROM THE TRADITIONAL COMMUNITY LEADERS

Traditional community leader's information from their gods, tobacco and traditional shoe observation (25%, 53 for Napak and 20%, 43 for Napak), Reduction in number of traditional ceremonies like marriages, respect of order from traditional religious groups form active part of early warning in Turkana and any lack of respect for traditional leaders is reciprocated by calamities like drought according to Mureithi (2012). Moreover, Knowledge about past disasters and climate in Ilemi Triangle are the accumulated experiences that have been handed down to generations through oral traditions and the traditional leaders have this knowledge library. The communities rely upon them.

The Focus group discussions in both areas articulated the importance of including traditional leaders in the drought early warning process affirmed the findings. They mentioned the importance of the traditional religious leaders named "*Emuron"* in Turkana who provides instructions and information on drought, enemy eminence and on instructions on when to migrate. Therefore, they play a key role in the early warning and coping strategy to drought. These traditional religious leaders observe tobacco, rely on dreams from gods and use traditional shoes named "*Ngakaap*" to predict drought and instruct on migration.

This study finding corresponds to study by Makwara (2013) on exploring the Linkages between the Indigenous Knowledge Systems and Modern Weather Forecasting and mentioned that elderly male community leaders formulate hypotheses about seasonal rainfall by observing natural phenomena, such as the appearance of certain birds, mating of certain animals and flowering of certain plants, while cultural and ritual specialists draw predictions from divination, visions or dreams.

According to the focus point discussions and key informants, during the dry season, the traditional religious leaders do a lot to try predicting the weather. This is done through observation of tobacco, sky observation, observation of small livestock intestines colour and playing with traditional shoes according to Lekapana (2013). These practices are done alternatively and different traditional leaders have own preferences. Tobacco is put on a flat service and the specialized traditional religious leaders recite some words to their gods to provide them with information and feedbacks. The same is done with traditional shoes named *"Ngakapeta"* and" and intestines observation.

According to the Key informants, the shoat's intestines colour when looking dark indicates heavy clouds for forthcoming rain while clear intestines show hunger and a danger that is looming. Moreover, the key informants elaborated that when the shoats stool arranges itself on one part of the intestine, it indicates that conflicts with other neighbouring groups will happen soon, thus informs immediate migration.

The observation of intestines according to the key informants in Napak are real and believed the information is always correct and they act as weather sign board for traditional practitioners in predicting meteorological conditions and informs them of eventualities. A traditional leader named *'Emuron lo aangamuk anajuom'* who uses their traditional shoes made of goatskin named *"Ngakapeta''* to predict the weather conditions does this by shaking and throwing the shoes on a flat surface. The traditional leaders shake the shoes several times while praying for their gods. When the shoes persistently continue to face the west part of their area when shaken, then it shows the wind and good things are coming and when they face all east then they have no sign of hope for rains. However, each traditional leader has won speciality between the traditional shoes, shoats intestines reading and observation of tobacco. Most of the key informants believe the most powerful that predicts correctly are the latter two (Tobacco and intestines) and traditional shoes do lie sometime and not always forthcoming.

Prediction is cemented by the traditional religious leaders who informs nomadic pastoralists of how to cope. It is expected that the gods of traditional religious leaders provide these nomads with enough information on drought eminence, rain information and if the enemy is approaching or not. Nomadic pastoralists follow these traditional religious leaders' instructions (Mutua, 2011) and therefore, these traditional leaders play a key role in early warning of the nomadic population. However, with the absence of modern early warning monitoring tools and hardly a network of the meteorological station in Ilemi Triangle, nomadic pastoralists have to rely on these close leaders for any information on weather. According to Lekapana (2013), the government has not invested in recognising the traditional religious leader's knowledge in the early warning system and it has clearly been left out and has not been recognized at all.

In addition, involvements of the local communities' people-cantered early warning systems rely on the direct participation of those most likely to be exposed to hazards (Dube, 2018). Without the involvement of local authorities and communities at risk, government and institutional interventions and responses to hazard events are likely to be inadequate. A local, 'bottom-up' approach to early warning, with the active participation of local communities, enables a multi-dimensional response to problems and needs. In this way, local communities and traditional structures can contribute to the reduction of vulnerability and to the strengthening of local capacities according to Cannon (2004).

Moreover, with an absence and lack of integration of modern early warning network in Ilemi Triangle, lack of extension officers, absence of drought information amid non-inclusion of nomadic pastoralists in the management and coordination of drought information in Ilemi Triangle makes the nomads to consider any drought management initiatives as foreign.

Traditional leaders and the pastoral institutions therefore, are essential in drought mitigations according to Opiyo (2014). They play a key role in implementation of traditional coping strategies and in inter-community conflict resolutions.

Drought policies that affect pastoralists should recognise the importance of traditional institutions of pastoral communities and integrate their livelihood strategies into policy implementation plans and activities (Mureithi, 2012).

d. TRADITIONAL WEATHER OBSERVATIONS

The findings indicate that traditional means like observations of bird's movement, sky and stars movement, moon shape and intestines observations, strong dusty wind, excessive dryness of land and excessive temperatures rise (9%, 19 in Loruth and 10%, 21 in Napak) remain among the relied means of weather prediction in Ilemi Triangle.

The focus group discussions and key informants generally lamented that when birds named *'Elele'* in Turkana language migrate and soar very high in the sky it is an indicator that the rains are far (drought) and when they fly low it gives an indication that rains are approaching. Moreover, the singing of some such birds is said to be a good omen as far as rainfall is concerned. In particular, if wild pigeon's birds named in Turkana "*Akuuri na Emoru"* are heard singing, it is believed to be a very good sign of an approaching good rainy season.

Moreover, the Turkana nomadic pastoralists observe that the moon shape and stars to detect how the season will be as shown and the direction of where the stars moves is believed to be the direction where good pasture and water is available. Moreover, one old key informant in Napak illustrated that if a new moon rises and the crescent is directed to the North (left) it shows drought and if the Crescent is tilting right - this symbolizes a sign of wet season/rains and therefore the coming season is hoped to bring good fortunes.

This finding corresponds to the study findings by Mutua (2011) and Mosley (2016) that found out that movement of stars to a certain direction, colour of moon changing from brown and dark according to the Turkana pastoralists symbolizes a bad omen and or drought while when the new moon rises, the shape of the moon in the tilting position like asymmetrical shape symbolizes no rain that month.

Furthermore, the change of wind direction is used in the study area to detect drought and according to Lekapana (2013), when the wind is moving from East to West consistently for more than three months according to shows the drought is occurring. Nevertheless, the Northern winds and winds from the West winds in Loruth bring good tidings and rain for livestock (Mureithi, 2012). Plate 12 indicates how dry and clear sky the Ilemi Triangle environment is and it is a traditional indication of drought.

Source: Researcher (2016)

Plate 12: Shoats grazing in Napak Dry Riverbed, Ilemi Triangle Turkana County, Kenya

Moreover, as there are no modern networks of the meteorological stations in Ilemi Triangle, any increased temperature named '*Eron'* gives an indication of drought. Any increase in temperature from the average temperature in Turkana gives an indication of drought and or a bad year that pastoralists have to prepare themselves either to migrate or apply other coping strategies.

Table 5.5 shows normally expected temperatures in Turkana County and accordingly if temperatures go beyond the limits the nomads believe it is evidence that drought is coming. This is especially for higher temperatures according to the FGD of the two areas.

Months	Temperature		
	Normal	Warmest	Coldest
January	28.7°C	35.5°C	21.9°C
February	29.6°C	36.2°C	23.0°C
March	30.1°C	36.2°C	24.0°C
April	29.6°C	34.8°C	24.4°C
May	29.7°C	34.8°C	24.5°C
June	29.1°C	34.1°C	24.1°C
July	28.4°C	33.2°C	23.7°C
August	28.7°C	33.6°C	23.8°C
September	29.6°C	34.9°C	24.3°C
October	30.1°C	35.4°C	24.8°C
November	29.1°C	34.5°C	23.7°C
December	28.5°C	34.8°C	22.3°C

Source: Ingrid Støver Jensen and Anton Eliassen (2016) metrological information. Available; https://www.yr.no/place/Kenya/Turkana/Lodwar/statistics.html

Table 5.5: Temperature and precipitation per month in Turkana County in the Northern Kenya

Figure 5.4 show that Turkana County do receive long rains in the month of March and April and again between the month of August and September. The corresponds to the Turkana County Meteorological department opinion that Turkana County receives yearly long rains in the month of April to June, and short of this according to them is a sign of bad year with no rains thus disaster looming. It is expected that during the month of long rains, calving rates and milk yield increases and any short of this is a danger sign of drought. Lack of rain in the expected month shows hard times and a sign of drought according to KMS (2010). Nevertheless, there is a serious wearing of traditional observation as an indigenous knowledge on predicting drought because of recurrent drought in Ilemi triangle, Turkana County has further affected nomads coping strategies and the government should play a role in early warning information.

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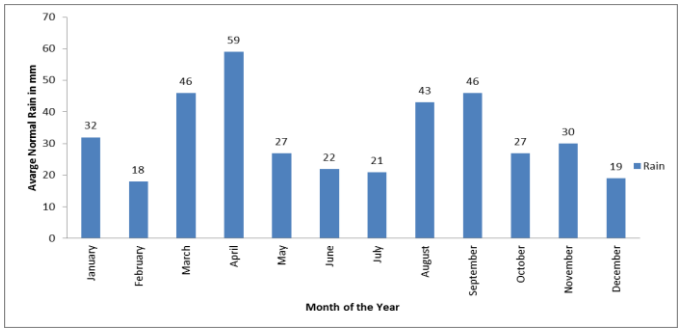

Source: NDMA Turkana data (2017)

Figure 5.4: Normal average monthly rainfall for 2017 in Turkana County, in the Northern Kenya

However, key informants from both Napak and Loruth lamented that they do not follow this average monthly rain pattern and rely on traditional weather prediction patterns. Nevertheless, some rain drizzle seen received during dry season according to key informants in Napak indicates a sign of completed cattle rustling attacks by the neighbouring warring ethnic groups and that the dead people crying and their tears are coming out inform of rain and the stolen livestock are desperate to return from the cattle rustlers. This kind of rain according to key informant is named '*Ngakiyo an Ngitunga'* and it is not counted as normal rain, it is a form of danger that will motivate both migration to other areas and a start of organising a retaliatory attack to the other ethnic groups. The authorities and peace initiative organisations can use this indicator to search for peace among the warring ethnic groups.

e. LIVESTOCK CONDITION AND BEHAVIOURS OF LIVESTOCK, WILD ANIMALS, REPTILES AND INSECTS

The findings indicated that poor health conditions of livestock and their behaviour (6%, (13) for Loruth and 3% (7) for Napak) remained among the top early warning signs in Ilemi Triangle. Furthermore and collectively, FGDs and Key informants suggested that if livestock folds the tails more than twice, starting to feed on dry bones and droppings of other livestock and when livestock refuses to obey herder instructions of making them follow a certain direction provided by the herdsman when gathering them and instead livestock runway scuttling in opposite direction, this is a bad omen and denotes a terrible upcoming drought that could clear the whole livestock and it will definitely inform immediate migration. These findings correspond to study findings by Gupta and Singh (2011) who discussed that such bad omen in nomadic pastoralists enables them to immediately migrate to evade imminent danger.

According to the key informants in Loruth and Napak, wild animals condition and livestock behaviour do include wild animals living close to human habitat and increased conflict between wild animals and human for water resources, increased water consumption behaviour by livestock to try to adapt if they will miss in the next dates, increased behaviour change of monitor lizards and big reptile named '*Anaknak'* in Turkana language especially in raising their heads more up believed in Turkana to be praying for rains and only lowering them down when rain season approaches and appearance of white frogs indicates drought is approaching.

Appearances of white frogs and reptiles' behaviour are traditionally believed to be a sign of danger and drought is approaching according to the key informant in Loruth village. This finding corresponds to Mutua (2011) findings that indicated that wild animals do migrate close to human habitation when drought strikes and this increased conflicts between human and wild animals show excessive drought in hibernation areas of these wild animals in Ilemi Triangle.

The study observed an emaciated camel (Plate 13) in Napak during the data collection period from one of the livestock water point and the livestock emaciated condition makes them difficult to move. Observed emaciation is because of absence of pasture. According to Lekapana (2013), livestock emaciation due absence of pasture is evident in drought stricken areas and it is then important to provide relief pasture to safeguard such livestock from death. The livestock condition in pastoral populations informs drought level and malnutrition of livestock according to the key informants that drought is severe; they become lethargic and lose vigour to walk for longer distance even to have water and pasture. This lack of stamina restricts livestock movement especially sheep, the young and the aged livestock to shades, denying them an opportunity to feed on few available pastures. This eventually will accelerate their death (Ichara, 2012).

Findings corresponds to Mutua (2011) and Opiyo (2014) studies that concluded that when drought is approaching, livestock behave strangely and become highly infested by animal pests especially ticks and lice; herders witness an abnormal increase of shoats calving twins; there is an outbreak of livestock diseases even from migrating neighbours, young goat kid suckling while lying down or crouching and or an even putting a one foreleg around the head. Moreover, an explicit description of livestock behaviour in nomadic pastoralism lifestyle plays a key role in the continuous survival of nomadic population according to Lekapana (2013).

Source: Researcher (2016)

Plate 13: Livestock condition in Napak area, Ilemi Triangle, Turkana County, Kenya

According to the Key informants in Napak, the daily or continuous night strange sounds and or noises named "*akiruko e emong a lodwarat*" in Turkana language made by the main household big bull according is believed of a bad omen coming and a danger approaching. The danger can be an enemy approaching; an eminent drought or an attack by neighbouring ethnic group that could happen anytime and the owner of the bull might be killed by neighbouring ethnic

group enemies. This will automatically inform an immediate migration of the Turkana nomadic pastoralists to other areas. The findings correspond with Mureithi (2012) study's findings that suggested that when drought approaches, people and livestock behaviour change, there is a reduced livestock product sell in the market and livestock body condition changes, livestock market prices do change immediately and pastoralists to increase the cost of livestock and their products.

One other most important animal indicator is the behaviour of insects according to Makwara (2013). These insects' behaviour has a great influence on weather decisions. Accordingly, when many crickets are observed on the ground, a poor rainy season is expected. By contrast, when sun spiders are visible in the area, they signal the imminent arrival of a wet spell and a sign of good hope for livestock according to Mawere (2010).

According to Key informant the top five animals and livestock behaviour signals that are more indicating the danger and a looming drought in the order of the top most common to include increased water consumption behaviour by livestock , livestock becoming malnourished , lack of stamina and restricts movement, daily or continuous night strange sounds and or noises named "*akiruko e emong a Lodwarat* " and increased behaviour change of monitor lizards and big reptile especially in raising and lowering their heads down and appearance of white frogs indicates drought is approaching , livestock behaviour change and livestock refuses to obey herder instructions of refusing to follow a certain direction.

Moreover, the number of traditional ceremonies and raids reduces. According to Melle (2016), raids' do increase in number to gain more livestock to compensate the lost livestock during drought or do restocking. This increased conflict shows stress for resources and or the neighbouring ethnic group have been impacted badly by drought impacts. However, raids or cattle rustling does happen mostly in the wet season and not during drought because livestock gets weaker or are in poor health during drought and can die easily during raids.

When key informants from the two study sites were probed, on which of the animals and livestock behaviour signals more danger for a looming drought. The ranking was done from the top most common and serious behaviour to the least as shown in Table 5.6 and they were similar.

S/No	Livestock Condition, wild animals and Reptiles Behaviour by 10 Key informants in Ilemi Triangle	Total Score	Mean	Rank
1	Increased water consumption behaviour by livestock	179	17.9	1
2	Livestock becoming malnourished , lack of stamina and restricts movement	175	17.5	2
3	Daily or continuous night strange sounds and or noises named "*akiruko e emong a Lodwarat* "	168	16.8	3
4	Increased behaviour changes of monitor lizards and big reptile especially in raising their heads more up believed in Turkana to be praying for rains and only lowering them down when rain season approaches and appearance of white frogs indicates drought is approaching.	165	16.5	4
5	livestock behaviour change and livestock refuses to obey herder instructions of refusing to follow a certain direction and folding tails	120	12.0	5
6	Livestock start to feed on dry bones and droppings of other livestock	85	8.5	6
7	Wild animals moving towards people habitation and increased conflicts between wild animals and people because of water and increased birds movement towards areas where is available	80	8.0	7
8	there is a reduced livestock product sell in the market and livestock body condition changes	65	6.5	8

Source: Researcher (2016)

Table 5.6: Ranking of the Livestock Condition, wild animals and Reptiles behaviour by FGD in Ilemi Triangle, Turkana County in the Northern Kenya

Moreover, on the behaviour of livestock as an indicator of drought, one key informant in Loruth described this indicator and mentioned that

> Though drought recurrence and its unpredictability has eroded our traditional knowledge to predict certain degree of drought, our livestock behaviour helps us to predict drought yearly and from experience as an elder of this village, Cattle precisely, is our signboard that provide us with a clear signals of an imminent disaster and we follow these signs to signify a specific hazard. Our cattle feeding habit changes tell us there is a problem and when they expel stool and excrete frequently while squatting than standing, fold tails more than twice and feed on dry bones then there are a problem and danger is looming. In fact, the year 2010 drought, we predicted drought following the misery conditions of our cows that started grazing while lying, refusal to be grazed in a certain direction, started taking urine of other cows and making peculiar sounds at night, but no government help was forthcoming until we

heard of Kenya Red Cross coming to help. (Key informant interview, 26th July 2016, Loruth Village).

This corresponded to the drought incident that happened in Turkana County in the year 2011 and the most affected was Ilemi Triangle to check if they use past experience in predicting drought, three different key informants (an elder of about 80yrs) in Napak and Loruth were able to name different drought season (Table 5.3) since the year 1925. The increasing severity and frequency of drought occurrence is an indication that the region is getting drier reflecting the observed changes in arid northwestern Kenya. This observation concurs with Thornton and Gerber (2010) who notes that the climatic condition of northern Kenya is getting drier. Additionally, failure to have the expected amount of rainfall according to OCHA (2010) have led to several droughts in Kenya during the last 25 years mainly 1975, 1977, 1978, 1984, 1992, 1997, 2005 and lately 2008; 2009.

With regard to livestock, the key informants mentioned that drought occurrence is indicated by deterioration of body condition of livestock to include the sheep; goat, donkey and even camels (Figure 5.5) reduce body weight accompanied by protrusion of ribs, loss of hair in their skin. The situation is evident when lactating livestock produces almost no milk to fill the 300ml cup for shoats and or even to support the young suckling livestock who eventually succumb to such difficult condition. Livestock mortalities remain an important indicator of drought incidence. In severe and prolonged drought, livestock mortalities become evident. First, the young and aged sheep succumb to drought and then kids and mature sheep followed by goats. However, where no early warning information is provided to the population by the meteorological department, then drought impacts can be severe.

In Napak, one key informant mentioned that

In the drought of 2008 – 2009 and 2011, I saw it coming rapidly…I saw it from our religious leader tobacco and our special traditional shoes. The Tobacco informed us of danger coming and it never took long for the drought happened and the situation became miserable. (Key informant interview, 30thJuly 2016, Napak Village).

This exact prediction showed how strong the relationship between the traditional method of weather prediction and modern method was for the drought of the year 2009 and 2011. The study argues that even with repeated drought and the weakened drought knowledge of the pastoralist's, there was a strong relation in the prediction of the drought of 2008 - 2009 by the traditional leaders to the eventual drought of 2008 -2010 that was not taken any serious by the authorities. This traditional prediction was not taken in because of absence of community engagement and coordination of weather information. This was a missed opportunity to act before crisis and the Turkana nomadic pastoralists were left to bear the impacts of drought without any early proper mitigation practices.

Data collected and Observation from Lodwar meteorological data indicated some certain similarities between the traditional indigenous weather prediction methods and conventional methods. The relation between indigenous (Traditional) EWS and conventional methods (Table 5.7) has been that they both relied upon by their users and assist populations to make decisive decisions to cope with drought impacts. As the scientific and or modern weather apparatus are missing in Ilemi Triangle and or even when indigenous methods are built upon experimental learning and on accumulated knowledge passed orally from generation to generation and rarely recorded in a written format, they play a key role in modern world and an important knowledge for decision making for communities.

Number	Identified Traditional Early Warning Methods	Conventional Methods (Scientific)
1	Used biophysical indicators of the Environment (stars, wind, sun and heat, moon, reptiles movement, birds, animals & Livestock behaviour) as well as spiritual methods (Shoes, tobacco, Intestines)	Use of weather and climate models of measurable meteorological data
2	Nothing documented Forecast methods are seldom documented	Forecast methods are more developed and documented
4	Application of forecast methods and their output is less developed	Application of forecast output is more developed
5	Communication is usually oral and directed by community traditional leaders	Communication is usually written and scientific oriented
6	Most of these methods are qualitative with many variable that are just qualitative and are based on local language of the population	It is quantitative , not based on local context and are more numerical
7	Explanation is based on spiritual and social values	Explanation is theoretical and Not existing in Ilemi Triangle
8	Identified methods are only taught to the generations through observation and experience of the locals	These methods are taught schools in lectures and through reading
9	Most of the identified strategies are adapted to the needs of the local population- conditions and needs	No local relevance with no social context
10	When Key informants explained of drought, they refer more of rainfall pattern, duration and distribution and vegetation cover	Refers to rainfall quantity at more global regional level

Source: Researcher (2016)

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Table 5.7: Comparison between identified Ilemi Triangle Indigenous Early Warning (EWS) methods and Conventional Methods Drought Forecasts

i. 5.3.6 Increased pastoralists migration

Human behaviour changes during drought and an increased inward migration by other ethnic groups is an indication of drought affecting them that is leading to their migration. The study findings showed that (1%, 2 for Loruth and 10%, 21 for Loruth). Increased sending of family members to the relatives is an also an indication of drought according to key informants.

Moreover, the behaviour of people was also considered indicators of a looming or occurring drought. One man summed this up in a focus group session in Loruth who mentioned that women go and gather fruits, roots, berries and tubers from trees around the dry rivers to be used as food for the family during drought. Men and women have resorted to collecting firewood, send more family members to Kakuma to work in the refugee camp and to the relatives in big towns like Lodwar to eat, making charcoal and transporting to Kaikor to sell or exchange for cereals, maize, and other foodstuffs. This usually does not occur during good seasons. Men will learn to do many visits to relatives to borrow foods and women go back to their parents to look for food (Mutua, 2011).

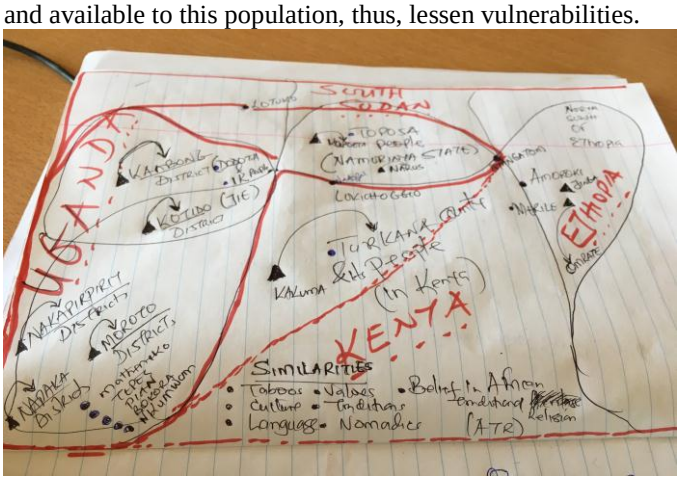
The study findings rhyme with study findings by Mureithi (2012) who reported that inward migration of neighbouring ethnic group is a big indication that drought is hitting hard the neighbouring. Accordingly, resources used by pastoralists have heavily been affected by instability created by migrating ethnic groups conflicts related to water and pasture resources according to IFRC (2014). Otherwise, if drought is approaching many of these pastoralists move (Plate 14) close to each other and conflicts results (Mureithi, 2012). This is a major feature in the Ilemi Triangle due to drought.

Source: Researcher (2016)

Plate 14: Observed migration of pastoralists in Napak, Ilemi triangle, Turkana County, Kenya during data collection period

Key informants recalled past droughts from their own experiences and through stories from community elders. Drought occurrences in the last twenty years were easily remembered and freely discussed in the focus group discussion sessions, with middle-aged members also actively engage in the discussions.

Key informants concurred that in the past especially in the 1950s, 60s, and 70s, the area was rich with varieties of vegetation, people were healthy and wealthy, and food shortage was unheard-of. They also recalled that water and pasture were in plenty and livestock suffering was minimal. The drought and climate change has brought a lot suffering. This has led to frequent migration. Turkana nomadic population like other ethnic groups in Ilemi Triangle (Plate 15) are known to follow a certain migratory pattern, the County government can link other social services like education, and veterinary services for livestock and population health care to these routes and areas where pastoralists migrate and pass through. They will ensure the social amenities are accessible and available to this population, thus, lessen vulnerabilities.



Source: Researcher, 2017

Plate 15: Sketch map of Ilemi Triangle with ethnic groups, Turkana County, Kenya

f. DROUGHT INFORMATION FROM BOTH THE NATIONAL AND COUNTY GOVERNMENT AUTHORITY

This is non-indigenous method of early warning system used in Ilemi Triangle; however, the key informants from the two sites mentioned that they sometime transmit information about eminent drought to the nomadic pastoralists. The National and County government sources of early warning is mainly through the Chiefs, the administrators, the County commissioners and other government bodies like NDMA (GOK, 2013). This information is from meteorological station located in Lodwar town. There are no network of meteorological stations and weather field officers in Ilemi Triangle, thus a translation of poor coordination of weather information and absent modern weather technology.

The key informants have expressed concern of absence of modern equipped meteorological station in Ilemi Triangle and Turkana County as a whole. Turkana County only meteorological available station is in Lodwar town and it is more analogue and misses much modern weather prediction apparatus to include the satellite. This modern meteorological station would support in providing accurate weather information to pastoralists on impending drought and enable nomads to immediately adjust. Moreover, there is a clear absence of active early warning system in Ilemi Triangle, poor collaboration, information sharing and poor weather coordination between traditional intelligent weather knowledge and modern technology.

The study agrees on importance of sharing weather information and according to Opiyo (2014), information is power and by ensuring that the local communities have access to a tailor-made information on impending droughts is one way of giving them power to protect themselves from their negative effects of drought. Therefore, the huge gap in

information sharing remains a threat on how Ilemi Triangle pastoralists cope to drought. Moreover, drought indigenous knowledge and its intelligence are under serious threat from events such as climate variations, frequency and severity of drought and modernisation according to Melle (2016).

Blending this traditional Knowledge with the scientific forecasts, the study suggests, can mitigate some of this. Conversely, incorporating indigenous forecasts into the seasonal climate forecasts will improve its relevance and acceptability, hence boosting its utilisation among the nomads (Lekapana, 2013). This is because an effective drought early warning system (DEWS) has a high potential of making a greater contribution towards tackling the cycle of droughts (Oxfam, 2011). This is by way of providing timely, relevant and comprehensible information on impending droughts that could be used to mitigate droughts' effects and therefore reduce their negative impacts on the fauna and flora. However, successful DEWS rely on weather forecasting systems that should be active and in place, proactive to disseminate information and well equipped. However, the network of meteorological stations is not available in Ilemi Triangle. This study calls for an immediate implementation of the modern meteorological stations networks across Turkana County and especially in Ilemi Triangle.

The study advocates for improving traditional weather early warning methods by assessing the desirable properties of indigenous knowledge indicators to include their reliability, robustness, and relevance through monitoring and verification with observations. The effectiveness of the traditional methods has been reduced by anthropogenic influences according to Opiyo (2014) and the climate changes have reduced the predictability level, thus, need for use of modern weather methods. Table 5.8 indicated that the drought of the year 2010 -2011 and the year 2011-2012 had severe impacts with many livestock mortalities due to severity of drought.

Year	Local (Turkana) name	Local description	Estimated Livestock mortality rate
1925	Ekwakoit(Abokor), Aribokinet	Bad hunger	61%
1930	Abrikae,Amugekimiet	Drought and bad hunger.	70%
1942	Lolewa	Bad Livestock disease and people starving and with diarrhoea	80%
1943	Ekowom Loyang	Drought and famine.	70%
1947	Ata Nachoke, Eteregege	Animal disease and famine.	70%
1949	Ngilowi, Ngakipi Arengak	Animal disease.	70%
1952	Lotira, Ekuwom Arengan	Animal disease, drought and famine.	61 %
1953 –1954	Lokulit, Emase , Ekaru a Lojaa	Bad years, famine continued.	65%
1960	Namotor, Ekaru ka Areman ka Achaka Ekipul (Epot pot)	Drought and famine	55 %
1966	Etop lo Ekosim, Ngaanei akwaak	Serious but short drought.	65%
1969 -1970	Kimududu,puuru, akura Ejore	Drought	54%
1971 -1972	Kibebek	Drought and famine.	75%
1973	Lolewa	Cholera epidemic, many deaths.	60%
1976	Ibore Akwaan	Small death of livestock after big rains	40%
1979	Atanayanaye, kiyoto Atangaa ,Loukoi	Animal disease (CCPP, anthrax) and a lot of dead livestock	70%
1980-1981	Lopiar / Epocho Nyang	Drought and Animal disease (CCPP, anthrax), security problems, migration of Kwatela to Kaaleng and back to Kaikor	65%
1984	Kilejok, Kidirik	Minimal rain, animal raiding.	70%
1990-1992	Akalkal	Skins and bones of dead livestock everywhere	73 %
1993	Lokwakoyo	Severe Drought	74%
1994	Ngakalalio/Nanyeye	South Sudanese migrated to Ilemi after drought, serious but short	60%
1997	Etop	A very Serious but shorter drought.	80%
1998	Itaok ka Akimiet, Abunet Erupe a Munyes	Small drought as milk was available, minimal rain	50%
2000	Logara / Epompom	Drought with livestock death	63%
2001	Kidirik	Excessive migration because of drought	65%
2004	Kanyangiro	Drought that resulted to Migration to Kanyangiro in Uganda	60%

Year	Local (Turkana) name	Local description	Estimated Livestock mortality rate
2005	Kimududu	Drought and bad hunger.	60%
2006	Lomoo	Named after animal disease PPR in Turkana	65%
2007 –2008	Ngasaja	Pastoralists migrating with flock of donkey with harness	70%
2009 -2010	Abakuli, Epoo, Lokwarasmoe	Skins everywhere, many livestock death, dry pasture	75%
2011-2012	Ekusiya Deu /Ekaru a Red cross	Drought that led to Kenyan for Kenya initiative	85%
2015 -2016	Namugielach	Drought that resulted to excessive death of livestock and lice infestation to both livestock and people	70%

Source: Researcher (2017)

Table 5.8: Drought Occurrences in Ilemi Triangle presented by the key respondents from Loruth and Napak since the year 1925

All these years, Ilemi Triangle according to key informants have never had any modern method of predicting weather and only relied on the traditional methods of intelligence. This calls for the National and County government to work on a long term plan of allowing coordination and participation of local population into weather management, erect modern meteorological station in Ilemi and work on polices that strengthen pastoral livelihood and development of pastoral traditional institutions in Arid and Semi-Arid areas in Kenya according to Opiyo (2014).

D. DEALING WITH WEAK INDIGENOUS EARLY WARNING SYSTEM IN ILEMI TRIANGLE

To address the problems of weak indigenous early warning system in Ilemi Triangle, this study proposes and advocates for an incorporated model named '*ilimi*' that bridges, integrates Indigenous Knowledge Systems into modern weather monitoring structure and promptly communicating weather predictions (Figure 5.5). This Ilimi in Ilemi Triangle will deliver systematic drought early warning system (DEWS) in nomadic pastoral setting. This information will be composed of indigenous drought knowledge base, enhanced and integrated drought monitoring with modern knowledge and prediction levels and finally delivering early and proactive dissemination of drought information.

ILIMI acronym for Indigenous and Localised Intelligent Knowledge with Modern Technology Information together forms a bridge that integrates scientific drought forecasting approach into the indigenous drought forecasting approach known by the population to boost predictability levels. The modern weather apparatus in Lodwar should be able to support nomads with drought early warning information and the information must be shared.

ILIMI was conceptualised from a Turkana word *'ilimilimi'* a name used by the Turkana people of the Northern Kenya to indicate some raindrops, and marks an end of drought and a beginning of rain season thus a bridge between two seasons. The study proposed Ilimi model will ensures pastoralists are adequately supported and prepared before the next cycle of drought begins.

The Turkana nomadic pastoralists migrate with their livestock to the areas that have rained also known as '*Akop na ilimi Akiru'*. This study supports building, conceptualisation, deployment and evaluation of *ILIMI* model and initiative within pastoral population framework because bridging will not only provide a much-needed link between the scientific and indigenous drought forecasting approaches but also ensures the pastoralists are well prepared to drought.

Nevertheless, the study acknowledges that predicting droughts alone cannot eradicate droughts in Ilemi Triangle; access to relevant and accurate information on impending droughts in timely fashion and comprehensible formats however could go a long way in assisting all the stakeholders plan for and mitigate effects of the droughts according to Ichara (2012). This precisely is the contribution of *Ilimi* model (Figure 5.5). Therefore, this study strongly recommends the testing of this model in Ilemi Triangle and or in Turkana County at large.

The presence of weather sensors in *ilimi* will enable capturing of the micro weather data and hence, improved prediction accuracy. Indigenous knowledge on the other hand helps in cultivating relevance (both culturally and locally), acceptability and sense of ownership of the forecasts among the Turkana nomadic pastoralists. Moreover, the systematic capture and storage of Turkana indigenous knowledge (IK) on weather that requires implementation is phenomenal step towards the much-needed conservation of the endangered IK.

The main contribution of this research is a framework for drought prediction that creates the missing link (bridge) between the scientific and indigenous drought forecasting systems. Looking on application of *Ilimi* model in Ilemi Triangle, the National and County government should put in place this non-existing model to stress on implementing a mechanism of retaining indigenous weather information library that will act as a knowledge base for reference and built indigenous practices.

According to Gupta and Singh (2011), the knowledge and appropriate technology transfer from the modern technology information from the apparatus will be important to equip the pastoralists with information on drought and livelihood management within their own local environment and social structure. This will increase capacity to cope and lessen drought impacts according to Lekapana (2013).

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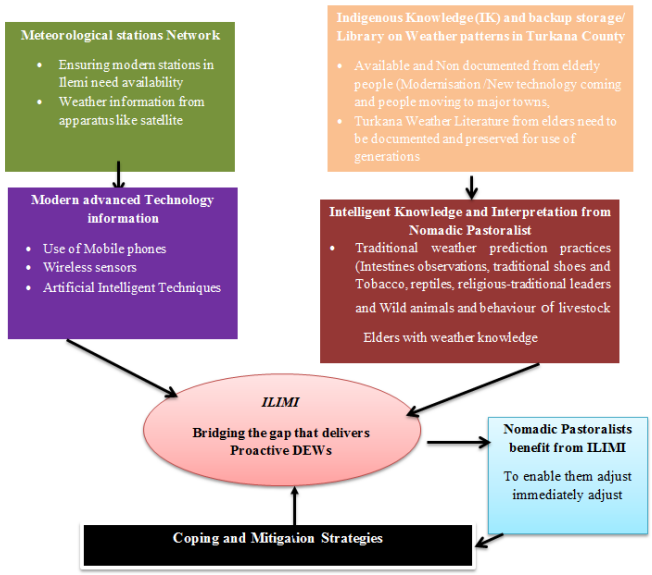


Source: Researcher (2017).

Figure 5.5: Proposed Ilimi Model to deliver effective DEWs in Ilemi Triangle, Turkana County, Kenya

VI. INDIGENOUS DROUGHT COPING STRATEGIES IN ILEMI TRIANGLE, TURKANA COUNTY, KENYA

A. INTRODUCTION

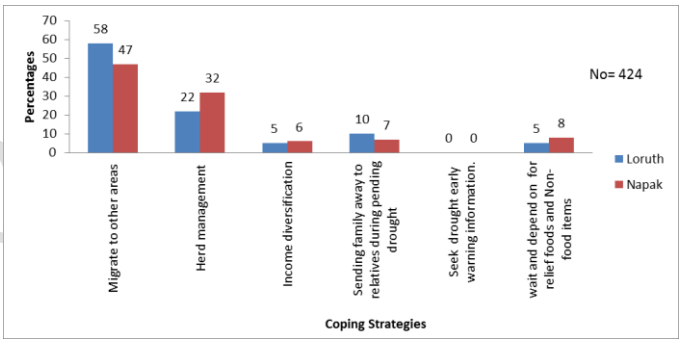
Drought is not a new event to the nomadic pastoral population in Kenya and the horn of Africa in general because such populations have suffered numerous droughts that have not only affected their livelihood option but also retards their development plans. The nomadic population survival in such a difficult environment is, therefore, attributed to the coping strategies they implement in order to maintain their survival, livestock livelihood and alleviate themselves from drought effects. Understanding and tapping community own experiences on coping plans they do apply during drought will not only assist in planning and managing predictable disasters but also support community own solution to drought management and traditional coping strategies. The chapter reports on the community drought coping strategies in Ilemi Triangle, Turkana County in Kenya. This answered the question on which community drought copings strategies options are utilized by Turkana nomadic pastoralists of Ilemi Triangle and will identify different constraints that hinder these drought coping strategies.

B. INDIGENOUS DROUGHT COPING STRATEGIES IN ILEMI TRIANGLE, TURKANA COUNTY, KENYA

Coping form, a vital component in the survival of the nomadic population, therefore, drought management tactics employed that ignores such plans and strategies according to Masendeke and Shoko (2013) will not encourage vulnerability but weaken measures that encouraged. Indigenous coping factors inform the need for understanding the root cause of nomadic population suffering through recurrent droughts, a framework for understanding how the nomadic population of Ilemi triangle, Turkana in Kenya cope with drought and what input and experience the research can bring to change the life of this vulnerable population.

Figure 6.1 shows the top most indigenous coping strategies as migration (58%, 122 for Loruth, 47%, and 100 for Napak), herd management (22 %, 47 for Loruth and 32 %, 68 for Napak), and sending part of family to relatives (10%, 21 for Loruth and 7%, 15 for Napak) and wait for use of relief foods (5%, 11 for Loruth and 8%, 17 for Napak). The Chi Square test value of association between gender and coping strategies in Napak was χ^2 (2, N= 212) = = 0.202, $p > 0.05$; association between age and coping strategies χ^2 (2, N= 212) = 0.202, $p > 0.05$; between marital status and coping strategies χ^2 (2, N= 212) = 0.67, $p > 0.05$ and association between level of education and the coping strategies χ^2 (2, N= 212) = 0.202, $p > 0.05$. All of them indicated a non-significant statistical association between the two variables meaning the data provide little or no evidence that the null hypothesis is false.

The Chi Square test value of association between coping strategies practices in Napak showed a statistical difference. The association between migration and herd management was χ^2 (2, N= 212) = 0.092, $p < 0.05$.This showed a significant statistical association between the variable and therefore, the intervention has an effect or each.



Source: Researcher (2016)

Figure 6.1: Indigenous Drought Coping Strategies in Ilemi Triangle, Turkana County in the Northern Kenya

The ten focus group discussion members in Napak(Figure 6.1) identified the following strategies as the coping strategies to include Migrate to other areas within Ilemi Triangle, Herd splitting, small business enterprises and Income diversification, livestock management adjustments (changes in feed, water, grazing land use), conserving animal products and wild fruits and hunting, Sending family away to relatives during drought, Access to extension services for knowledge of livestock farming during droughts and Livestock diversification and keep different species dominated by female livestock.

S/N	Indigenous coping strategy for10 FGD members in Napak	Napak		
		Total Score	Mean	Rank
1	Migrate to other areas within Ilemi Triangle	190	19.0	1
2	Herd management (splitting, changes in feed, water, grazing land use)	175	17.5	2
3	Small business enterprises and Income	148	14.8	3

	diversification			
4	Conserving animal products and wild fruits and hunting	60	6.0	4
5	Sending family away to relatives during drought	40	4.0	5
6	Access to extension services during droughts	30	3.0	6
7	Livestock diversification and keep different species dominated by female livestock	20	2.0	7

Source: Researcher (2017)

Table 6.1: Focus group discussion on the indigenous coping strategies in Napak, Ilemi Triangle, Turkana County in the Northern Kenya

Similarly, in Loruth, the ten focal group discussion members in Table 6.2 identified the following strategies as the coping strategies to include Migrate to other areas within Ilemi Triangle, Herd splitting, and Access to extension services for knowledge of livestock farming during droughts, keeping herds dominated by female livestock and use of savings kept to buy grass from government reduced prices during drought periods.

S/N	Indigenous coping strategy for 10 FGD members in Loruth	Loruth		
		Total score	Mean	Rank
1	Migrate to other areas within Ilemi Triangle	195	19.5	1
2	Herd management (splitting, changes in feed, water, grazing land use)	165	16.5	2
3	Small business enterprises and Income diversification	98	9.8	3
4	Conserving animal products and wild fruits and hunting	75	7.5	4
5	Sending family away to relatives during p drought	56	5.6	5
6	Access to extension services during droughts	54	5.4	6
7	Keeping herds dominated by female livestock	50	5.0	7

Source: Researcher (2017)

Table 6.2: Focal group discussions on the indigenous coping strategies in Loruth, Ilemi Triangle, Turkana County in the Northern Kenya

The findings of the key informants and focal group discussion correspond to Below *et al*, (2010) study findings that mentioned that nomads have to migrate to the neighbouring areas when drought continues to ravage. However, Opiyo (2014) suggests that relying on social networks and gathering of information on the areas inhabited by other ethnic groups, areas concentrated by high-quality pasture and areas where enough water is available, carefully manage this migration by pastoralists. They do this in Turkana nomadic pastoralists community by use of *"Ngirototin or loperokok and or ngisoowa"* meaning people sent to investigate, watching over other neighbouring communities grazing methodology and places they move to and discover other areas of potential settlements or even during cattle rustling.

In summary, the FGD rankings in Napak and Loruth were having correlation coefficient 0.99±0. 0054. Thus it was statistically significant ($\rho < 0.05$). This implied that the FGD rankings in Napak and Loruth (Table 6.3) had a significant positive correlation. Thus, they were mainly the same. Thus, the communities of the two localities were experiencing the same events hence the same perceptions.

According to Birkland (2009), drought has increased in frequency and severity in the last three decades with the number of people affected increasing exponentially according to as the climate continues to change the most vulnerable population remain the pastoralists will continue to suffer from chronic food shortage from livestock products. Therefore, they migrate and try to cope with other ways according to Ford (2013).

S/No.	Factor identified in Loruth for 10 FGD members in Loruth	Napak Rank	Loruth Rank	D	D^2
1	Migrate to other areas within Ilemi Triangle	1	1	0	0
2	Herd management (splitting, changes in feed, water, grazing land use)	2	2	0	0
3	Small business enterprises and Income diversification	3	3	0	0
4	Conserving animal products and wild fruits and hunting	4	4	0	0
5	Sending family away to relatives during p drought	5	5	0	0
6	Access to extension services during droughts	6	6	0	0
7	Livestock diversification and keep different species dominated by female livestock	7	7	0	0

Source: Researcher (2017) $\sum D^2 = 1$

Table 6.3: Ranking Correlation between Napak and Loruth on the coping strategies, Ilemi Triangle, Turkana County, Kenya

More and more out migrations from arid lands is expected during drought, which will, in turn, jeopardize agricultural production in ASAL environment according to Ogato (2013). The coping strategies employed are therefore, quickly becoming unsustainable and increasing the number of people vulnerable to food insecurity in Ilemi Triangle. This requires urgent need for adaptation of long-term solutions to drought.

a. MIGRATION

This is the main and top method of coping in Ilemi Triangle (58% (122) for Loruth, 47%, (100) in Napak). Collectively the focus group and Key informants suggested that migration is their top coping strategy for drought. These findings correspond to Lekapana (2012) and Mureithi (2014) study findings that suggested that during dry period's pastoralists must migrate, split livestock and send some part of their family members to their relatives. Accordingly, dry periods remain the most demanding and challenging times for the pastoralists in many arid and semi-arid areas since the shortage of forage and pasture for livestock will automatically make the nomadic pastoralists move in order to minimise livestock losses. The findings match with the study findings by Ayodele *et al,* (2014) that mentioned that poor availability of water and pasture resources is the main driver for dry season migration among the pastoralists population.

However, in the Ilemi Triangle the study contemplates that the international boundaries created during the colonial period and kept by independent African nations are not usually respected by migrating pastoralist communities. This brings excess conflicts according to Opiyo (2014). Community leaders need to negotiate peacefully on common grazing zones (Omondi *et al,* 2013). Ruto *et al,* (2010) study findings correspond to the discussion that there is a need for a strong County Steering Group (DSG) to advocate and negotiate for peace, grazing the land and carry out advocacy among the nomadic pastoral population during emergency times.

The importance of this movement (Plate 16) is for not only moving away from drought but also helps pastoralists to advantage of the ever-changing diversity of dryland ecology and therefore, restricting the movement of nomadic population will have negative implications for the viability of their herds and increase vulnerability according to Lambert (2013). The movement however, according to Bryan *et .al,* (2013) do depend on environmental conditions, the state of resources, livestock species managed and a size of livestock owned by pastoralist at the time of need for migration.

Source: IRIN/Gwenn Dubourthoumieu (2015). https://www.hhrjournal.org/2015/10/cop21-the-impact-of-climate-change-on-the-worlds-marginalized-populations-turkana-county-kenya/

Plate 16: Women and children migrating in Loruth, Ilemi Triangle, Turkana County, Kenya

A study by Bryan (2013) found out that mobility by the pastoral population in many Kenyan arid and semi-arid locations assisted in managing forage resources through dividing household stock into home-based and satellite herds. The mobility pattern of many nomadic pastoralists in the Horn of Africa according to Mureithi (2012) do follow a cycle of transhumance where during rainy season pastoralists move their cows towards the ephemeral ranges and when surface water is exhausted and annual plant decline in nutritive quality and they move back to dry season.

However, the key informants in Napak mentioned that they do follow a kind of epicyclical movement that is mainly not well defined and does not follow any seasonal pattern. The decision of such type of movement to move according to Lambert (2013) is based on the context few fixed parameters that include the conflicts, advice from traditional leaders, the distance of the water, and pasture resources, proximity to volatile pastoral neighbours and degree of drought.

b. FOOD CONSUMPTION ADJUSTMENT AND SENDING FAMILY MEMBERS TO RELATIVES

The food sharing within families is a concept that has been practiced by the Turkana pastoral community for a long time and the focal group discussion in the two areas mentioned it as it has reduced the burden of drought effects. The concept is thought that, if the other households share food, the drought affect risks are spread to the whole families who can collectively work towards alleviating suffering therein. This food sharing enhances not only cohesion in the community values and social unity, but also promotes a sense of belonging and unison.

It is through long experiences of environmental uncertainty in Turkana according to Mureithi (2012) that makes the pastoralists to develop a highly flexible social system and an elaborate set of both individual and collective-based clan's survival strategies. This is practiced widely in Turkana and observed by the study in the research villages. The findings correspond to Huho *et al,* (2010) study finding that suggested that coping by sending part of families to relatives reduces the food being eaten in the household. Therefore, the family consumes the small portion of food, skip meals, give only most vulnerable like small children, pregnant and lactating mothers and those working in watering livestock and eat only one type of meal. Pastoralists do send part of family members to relatives to reduced food usage, frequency in one household and reduce risks (Ichara, 2012).

Adjustment of feeding is through either skipping two meals particularly breakfast and lunch and preferring dinner for the family and maintaining lunch for the vulnerable members of the family like small children, the old and pregnant mothers. Women in the FGD in Napak explained that when food is scarce, they themselves skip meals, distribute it first to children and members of the family who mostly

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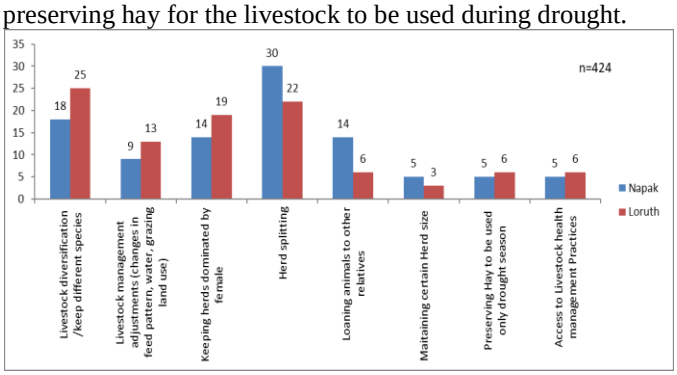
undertake heavy tasks to include taking the livestock to the mountainous grazing zones for the whole day and livestock watering. As a result, women remain in the group vulnerable to drought.

c. HERD MANAGEMENT

Figure 6.1 indicates that nomadic pastoralists cope by diversifying their herds. These practices include diversifying livestock and keeping different species, change of feeding pattern, keeping herds dominated by females, herd splitting, loaning of livestock, maintaining certain herd sizes and preserving hay for the livestock to be used during drought.



Source: Researcher (2016)

Figure 6.2: The Herd Management practices for Drought coping strategy in Ilemi Triangle, Turkana County, Kenya

Herd diversification and keeping different livestock species

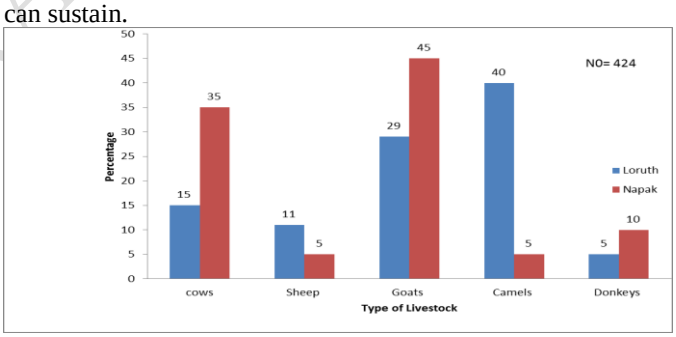
Turkana Pastoralists manage both grazing and browsing livestock species to optimise different range resources and ensure the conservation of rangeland ecosystems. The study indicated that 18% (38) in Napak and 25% (53) in Loruth diversified their livestock. This corresponds to Oxfam (2011) that mentioned that East African pastoralists stock their herd with a mixture of cattle, camels, goats, and sheep. Herd diversification is a common practice among the Turkana nomadic pastoral community. By maintaining several species of livestock, the herders are sure of the full use of the area of grazing than a single species alone and can reduce the risk they face from a particular event.

According to Masendeke and Shoko (2013) different livestock species have both ecological and economic implications and diversification assist much and because each kind of livestock species prefers to graze to certain plant species and certain types of topography then the diversification will be good for ecological niches. Bryan (2013) explained that camels and goats are considered browsers, although they may be grazers at certain times. Cattle and sheep, however, are largely grazers. An area especially in Ilemi triangle, that contains both grasses and shrubs, may be utilised better with a combination of different ruminant species employing different grazing habits.

The topography of Napak because of it being mostly mountainous does not favour camel rearing than Loruth that is more or less flat. Moreover, keeping diversified stocks support also as an insurance against drought losses and because most pastoralists are largely isolated from another form of a cash economy, then more different livestock is required to meet the basic food requirements. Different surplus stocks during drought according to Lekapana (2013) can be sold to buy food grains to supplement livestock products like milk and meat.

However, Ogato (2013) further suggest that the high prevalence of diversification as a coping strategy signals efforts by the Turkana to actively manage vulnerability by increasing the reliability of livelihood assets. Nevertheless, pastoralists' involvement in many coping strategies is also a sign of distress in Turkana livelihood systems. There is a risk of misinterpreting diversification and market activity for a thriving local economy and robust community and household livelihoods according to Ford *et al*, (2013). A high level of livestock sales in pastoral populations indicates distress. Due to the effects of drought, the Turkana have to diversify their livelihoods. However, the process has been hastened not only by the conflicts from neighbouring tribes but also from livestock raids according to Melle (2016).

Additionally, to cope with drought, the Turkana nomadic population prefers to keep certain types of livestock. Figure 6.3 indicates the type of livestock preferred by pastoralists during the drought in Ilemi Triangle. Loruth is mainly lowland and Napak is more mountainous. In Loruth pastoralists preferred mainly camels (40%, 85) followed by goats (29 %, 62), cows (15%, 32) then sheep (11%, 24) and finally (5%, 11). Napak respondents preferred goats (45%, 96) followed by cows (35%, 74) then donkey (10%, 21), and sheep and camels (5%, 11) as their last preferred livestock because of the mountainous topography of Napak that these livestock type can sustain.

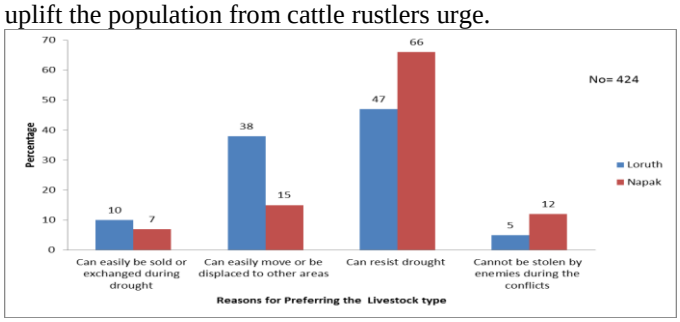


Source: Researcher (2016)

Figure 6.3: Type of preferred livestock during drought Ilemi Triangle, Turkana County, Kenya

The main reasons for preferring different types of livestock (Figure 6.4) were based on whether they can resist drought (66%, 140 in Napak and 47%, 100 in Loruth), can easily be moved to other areas (15%, 32 in Napak and 38%, 81 in Loruth) and cannot be stolen easily by warring ethnic groups during cattle rusting (10%, 21 in Napak and 5%, 11 in Loruth). Shoat is valued for milk, blood, and hides while donkeys and cows are kept for transportation besides the meat and milk, which they supply. One Key informant in Napak mentioned that distribution of livestock species that are resistant to the drought and not easily stolen by warrying ethnic group will always be preferred. The non-indigenous breed of livestock that do not run when taken away by warrying ethnic groups according to Mureithi (2012) can always be good option to rear and to be used in this context of Ilemi Triangle that is predisposed to conflicts from cattle rustlers. The study urges the County government of Turkana

must invest on this non-indigenous species of livestock to uplift the population from cattle rustlers urge.



Source: Researcher, (2017)

Figure 6.4: Reasons for preferring to keep such type of livestock in Ilemi Triangle, Turkana County, Kenya

Herd Splitting

Splitting livestock remained a major herd management strategy applied during drought coping period. The study showed that 30 % (64) in Napak and 22 % (47) in Loruth split their livestock. They practice splitting and merge livestock together for many families. The study observed a large number of livestock together, but, when the herders were asked about the owners of the large livestock they said that they belonged to a group of people and not for one person that is brought together to graze. This finding matches with a study finding by Sherwood (2013) who revealed that the nomads have encouraged herd's merging and diversifying by splitting their livestock species in order to minimize drought effects.

Splitting the herd into smaller groups and moving them to different areas is used to prevent over-grazing and maintain the long-term productivity of the range. However, against all odds of stocking more livestock without splitting will result to negative consequences to nomads. This urge and theory of stocking larger numbers of livestock even in greater drought intensity are dangerous when more livestock are wiped out during a severe drought. The focus group discussion and key informant's suggestion of importance of herd splitting during drought corresponds to study findings by Sherwood (2013) and Bryan (2013) that suggested that nomads divide their herds in the aim of maximizing the risk, and the scarce range resources. Families are separated during herd splitting and members of the families are provided key responsibility to care for certain type of livestock according to key informants in Napak.

Livestock adjustment in feed pattern, water and grazing land use

During drought, Turkana pastoralists of Ilemi Triangle according to the data adjust the feeding pattern of livestock. This involves arranging for water days for livestock by skipping days and maintaining daily for weak livestock. In Napak, 9% (19) of respondents and 13% (28) in Loruth mentioned of the having this arrangement when drought happen. Plate 17 shows sheep resting under the thorny tree taking a rest from the scotching sun in Loruth on a day when they were not getting water. This arrangement of skipping days for water according to Mureithi (2012) ensures water and pasture is kept for a longer time.

Source: Researcher (2016)

Plate 17: Weak Sheep observed in Loruth, Ilemi Triangle, and Turkana County, Kenya

The Key informants from Napak and Loruth have suggested that this practice of adjusting the feeding pattern of livestock remain among the last call for support and it indicate they have implemented other coping strategies and less options for saving existing water and pasture is available. According to Mureithi (2012) and Lekapana (2013), pastoralists turn to change of feeding pattern when water and pasture resources is getting finished completely.

Access to livestock health management practices

Both human and livestock diseases can increase during periods of stress, particularly floods. Preventative measures include avoidance of areas known to be particularly susceptible to disease; migration; and hygienic practices. The study showed that 5% (11) in Napak and 6% (13) in Loruth preferred to use the extensive livestock veterinary services.

Plate 17 indicates how livestock miss extension services and become weak amid extreme weather condition. The key informants and focus group discussion suggestion of access to extension services and vaccination is not different from the head of household's response that they play an important role in coping with drought. The study findings are similar to findings by Lekapana (2013) who suggested that vaccination is an important activity that support pastoralists cope with drought impacts and guard them against livestock diseases brought about during migration of these pastoralists.

The key informants and FGDs discussion and suggestions are similar to the households' head response. However, the key informants questioned the timing of livestock health practices and suggested that livestock should regularly be vaccinated and before drought. They should form part of mitigation plans and waiting until when drought happens to start the process of vaccination of livestock. This corresponds with study findings by Erasmus *et al*, (2012) that reported that livestock management practices must be supported in lessening impacts of drought.

Accordingly, the National and County government should provide and improve livestock health services by conducting livestock disease surveillance, vaccination and deworming in routine basis in the whole Ilemi Triangle. Moreover, pastoral community members to include community animal health workers who should be identified and trained on livestock disease identification and treatment. However, Opiyo (2014) discusses more of making these practices routine and rolling out destocking programs

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Keeping Herd dominated by Females

Keeping of the herds dominated by females (14%, 30 for Loruth and 9%, 19 for Napak) was shown among the top coping strategies for herd management during drought. This is preferred especially when rains are approaching and when the pressure for breeding stocks is high and population wants to replenish the herd after loss from the drought. Nomadic pastoral households do prefer to consume milk for subsistence and this has an important impact on the livestock structures with a predominance of females rather than beef animals (bulls and steers) according to Dai (2013).

The key informants and focus group discussion suggestion of keeping herd dominated by females is not different from the head of household's response, the female herd in the family play an important role in coping with drought. Accordingly, pastoralists change male livestock with female in the hope that if female livestock remain after drought, they can reproduce and add the numbers the study findings are similar to findings by Fraser (2011) who suggested that rearing more female livestock a significant preference pastoralists adapt to cope with drought impacts. According to Oxfam (2011), the Turkana nomadic pastoralists can do all sell male livestock and prefer to keep only females livestock.

A study a finding by Fraser (2011) on vulnerability to climate change in drylands corresponds to this study finding by indicated that many pastoralists preferred to keep a structure of livestock dominated by females because of future reproduction. However, the study did not find this information of livestock repartitioned by gender in Turkana Country ministry of livestock as the on livestock population was missing and not complete.

Loaning livestock to other Relatives

The study indicated that 14% (30) of Napak respondents loaned their livestock to their relatives while 19% (40) in Loruth did this practice. Sharing, loaning, and giving of livestock as gifts: Sharing, loaning, and gift giving among pastoralists are year-round activities, forming an integral part of the communal way of life.

According to the key informants in both sites, poorer families merge their livestock for collective grazing and loan each to support during drought. The main reason for this is to enhance accretion and survival of livestock through breeding and reproduction. The suggestion by the FGDs on loaning of livestock as a drought coping strategy correspond to a study finding by Lekapana (2013) that mentioned that loaning of livestock during drought helps to maintain a social network and strong family ties and livestock merging permits members particularly of the poor households to engage in other productive and income-generating activities as their livestock is taken care of by other people or rather staying together of other people's livestock. Sharing of livestock among families and clan members, friends and relatives during drought is much common in pastoral population according to Melle (2016) and Opiyo (2014) is done to spread the risks among families and ensure a supply of herding labour. Livestock is borrowed for reproduction and for survival reasons according to Lekapana (2013).

The Turkana community social system, on the other hand, is built on friendship, family relations and strong clanship network systems according to Melle (2016). This relation ensures strong and cemented survival strategies during a hard time. Therefore, the Turkana nomadic population use this network to accumulate lost livestock during and after droughts.

Maintaining Certain Herd size

The study indicated that 10% (21) of the respondents in Napak and 9% (19) for Loruth managed their livestock by keeping certain herd sizes. Building up the herd size in recovery periods between droughts protects against total loss of the herd during drought. An urge to keep a large number of stocks as a sign of prestige, sell during drought to receive grains, cereals, legumes, tea leaves and sugar, and non-food stuff like blankets and tobacco and help in building strong social associations and friendship. This is especially depicted when transferring livestock to friends and kin as loans.

The urge to keep larger numbers of livestock according to the key informants and FGD conclusively helps to minimise drought risks because not all livestock can be washed away during drought and at least some remain over to the next cycle of rain. This finding corresponds to study findings by Oxfam (2011) and Lekapana (2013) that mention that nomadic pastoralists always have urge to keep large sizes of livestock in view that some livestock will remain if the drought will be severe and they will ensure survival. Any advice to reduce the size before drought is not always taken in by pastoralists. This study advocates and encourage the Turkana pastoralists in Ilemi Triangle to offtake and dispose livestock during acute drought and the County can support in restocking efforts during recovery phase.

Moreover, restocking activities to maintain a certain number and as the livestock management practice have been carried out in different pastoral communities according to Mureithi (2012). This practice is excellent to compensate lost livestock and lessen vulnerability among the poor pastoralists, unfortunately, it is not systematically provided to Ilemi Triangle nomads and the poor communities remain same even when they lost all livestock from drought and wait for relief food when it arrives.

C. LIVELIHOOD DIVERSIFICATION

Diversification is important strategy given the stresses on pastoral communities and the growth in population. Some pastoralists in the study area have shifted to other livelihood options either as supplementation of pastoralism or as a permanent shift away from pastoralism. In response to impacts to drought making the livestock productivity low, pastoral households suddenly, find themselves in a situation where they have to seek an alternative to sustain their families. This situation has forced pastoralist so seek temporary income and subsistence bases in order to continue to survive and supplement the falling supply of animal products. This practice is common in the Turkana community.

Livelihood diversification with trade, farming, and sedentarization practices (5%, 11 for Loruth and 7%, 15 for Napak) was mentioned by households as one of the methods they cope with drought. The start of a small business according to Melle (2016) increases on income opportunity for the nomadic population. This practice according to Lekapana (2013) is more practiced in the sedentary type of pastoral population. Moreover, in sedentary, pastoral household's populations commonly cope through farming as a temporary measure, with crops providing another source of subsistence and a possible source of income or a kind of business that is surplus with which the pastoral rebuild their herd (Ogato, 2013).

According to the key informants of the two sites, livelihood diversification options like the burning of charcoal, collecting Aloe and selling of gum are commonly practiced especially in Loruth that is nearer to the towns than Napak. Ouma *et al,* (2012) have further encouraged pastoralists to adopt sedentarization by settling in a place and adopting farming as a temporary measure to cope with drought effects. However, sedentarization is not practiced in the Ilemi Triangle because of excessive aridity of the land that can withstand any crop farming and the population purely practice nomadic pastoralism.

Nevertheless, permanent settlement of pastoralists tends to follow excessive poverty lines in the case of poverty, measured in loss of livestock; pastoralists are forced to settle to start cultivation according to Otieno (2009). In Loruth, some households have adopted sedentarization and they are poor people who entirely depend on relief aid, therefore, they conglomerate to be easily accessible to the food aid. The study argues that sedentarization is not a bad practice especially to the majority poor Turkana population along the rivers in Ilemi instead of entirely depending on relief food; they can do in conglomeration with sedentarization, to lessen their vulnerability and improve living standards.

This study finding agrees with Turkana CIDP(2018) that proposes for diversifying livelihoods through working on improving food security to include working on irrigation schemes to support pastoralists to adopt appropriate farming practices, provide drought resistant seeds, identification of extension farmers services, exploring on drip irrigation on areas where water is more available in Ilemi Triangle, engaging pastoralists in improving their welfare and entrenching drought cycle management among pastoralists.

D. DEPENDING ON RELIEF FOODS PROVISION

Waiting and depending on relief foods and other non-food items (5% in Loruth and 8% Napak) has commonly been done and provided in Turkana Ilemi Triangle region. According to Schrepfer (2014) study, receiving relief food from humanitarian organisations and government has become a new means of economic activity. Relief foods to drought-affected pastoralists have come to be treated as a form of economic diversification. These relief foods in the pastoral population according to Mureithi (2012) support to relieve hunger and have enabled herd owners to minimise livestock sell and search for wild fruits from the bushes. Nevertheless, relief foods have been argued to make people more dependent and only support immediate coping instead of a long-term program for alleviating the huge effects of drought.

Turkana pastoralists according to Solh and Ginkel (2014) have considered receiving relief food from humanitarian organisations and government a new means of economic activity. Relief foods to drought-affected pastoralists have come to be treated as a form of economic diversification. These relief foods in the pastoral population according to Lekapana (2013) relieving hunger have enabled herd owners to minimise livestock sell and search for wild fruits from the bushes. Relief foods (Plate 18) have been argued to make people more dependent and only support immediate coping instead of a long-term program for alleviating huge effects of drought.

Key informants were asked of their opinions on the usefulness and adequacy of the government support through relief food aid. This question educed mixed responses. Few respondents mentioned that this support is very useful since it prevents starvation, but decried its adequacy in terms of quantity provided, timing and type of food items. Other respondents stated that the support is not useful and inadequate since it is not provided always, while a number of respondents alleged that it perpetuates a culture of over-dependence. Most respondents concurred that more sustainable interventions are required to support their livelihood and not relying only on relief food always.

Source: Researcher (2016).

Plate 18: Relief food distribution in a nearby centre in Kakuma within Ilemi Triangle, Turkana County in the Northern Kenya

The key informant is asked for support in water resource development, restocking, purchase of their livestock during drought at good prices and provision of security in Ilemi Triangle. Other respondents stated that the support is not useful and inadequate since it is not provided always, while a number of respondents alleged that it perpetuates a culture of over-dependence. Most respondents concurred that more interventions are required to support their livelihood and not relying only on relief food always.

The key informants interviewed from the government ministry of Livestock, water and respondent from the Turkana County disaster management authority (NDMA) mentioned that migration, rely on relief foods, provision of purchased grass to the nomads, collection and sale of firewood, wild fruits collection to increase food in the household, skipping some meals in the day and sending of families to other relatives, sharing of livestock and foods among families and

clans, together with reserving meat and milk to be used during dry periods are precautions taken in Ilemi triangle to cope with drought.

Furthermore, there is an observable evidence of a huge existing gap in the support that this nomadic population receives both from the government, County government and from the humanitarian organisations available in the revival of the indigenous coping strategies in Ilemi triangle. According to key informants in both areas, this non-support have contributed not only to continuous vulnerability but to also weakening of the knowledge that is essential for developing and strengthening the pastoral economy and livelihood policies.

Additionally, the humanitarian organisations and the government drought management plans in Ilemi Triangle have not been adequately adapted to comprehend the need for sustaining pastoral livelihoods. This according to Mureithi (2012) is because lesser investments have been channelled to this population and the major component of pastoralist's survival in such harsh environments has not been dealt with for decades and instead relief food comes first as option and continued without other livelihoods promotion options.

The community based humanitarian organisation interviewed to include Turkana Pastoral Development Organisation (TUPADO) and Lotus Kenya Development Organisation (LOKADO) discussed of engaged increased dependence on natural resources such as search of wild fruits, sell of skin, keeping livestock dominated by females, firewood collection especially by women, burning of charcoal, gravel, sand harvesting and stone collection in the quarry. These were used to supplement food in the households and the study observed in Napak. These findings from NGOs correspond to Opiyo *et al,* (2014) studies that mentioned the use of wild fruits during drought and sale of the skins and hides by Turkana pastoralists has been used to increase family income.

However, the study understands that the skin and hides sell is mainly done during the severe drought when many livestock are dead and skin is plenty. This was not observed in the research areas during the study period.

The key informants from Napak on this indicator said

> Migration, splitting livestock, sending part of my family to my brothers in towns to eat, accumulating livestock before drought, searching for relief food and milk preservation named "*Edodo"* during `rainy seasons when livestock produce a lot of milk and meat preservation called "*Ngatosa or Arukot*" used only in dry seasons are our main coping strategies (Key informant interview, 30th July 2016, Napak Village).

Asked about the adjusted meals, the key informants explained that during a wet season, when food is available and livestock strong and healthier with enough milk, they prepare themselves by drying livestock milk that takes a week and two to dry. The process involves storing milk in a gourd for about a week to ferment and coagulate. The milky water after the process will be separated from the coagulant then the coagulant is put on goat's skin or on a sack in the sun to dry. The dried coagulant is then put on a flat stone known as "*Akiries"* in Turkana language to be pounded using a fist-sized spherical stone to make it powder milk. The other dry coagulant is stored in the form of granules and then stored in traditional bags made from goat's skin. This powder milk is mostly given to small children while adults consume the one granular form during the drought period. Meanwhile, either meat preservation is done by drying in the sun or dipping already dried or fried meat into sheep's fat.

Just before the onset of drought, key informants group in Napak mentioned that if the household has accumulated some wealth, households slaughter a number of sheep and goats, then the flesh is removed from the bones; some parts of the flesh are made into strips and dried in the sun. After that, they are wrapped on a goatskin for storage to be used during dry seasons or difficult periods while others will be cut into pieces, fried, cooled and preserved by dipping it into a traditional gourd of sheep's fat.

The key informants in Loruth further mentioned of large livestock (Cows and camels) being slaughtered also and meat preserved in a similar method but mainly by rich families. These two are prepared during the wet season when milk is available and many livestock have reproduced. The community leaders in the two areas mentioned that this practice is no longer observed because of climate changes and the severe effect of recurrent drought. When probed on other coping strategies employed by other neighbouring tribes, the key informants in Napak mentioned of buying grains from Nyangatom and Dasanach ethnic group of Ethiopia to diversify their livelihood.

One key informant of Napak mentioned that,

> Nyangatom and Dasanach store enough food because their government support the diversification of livelihood and they have strong policies of livestock and drought management Key informant interview, 26th July 2016, Loruth Village).

Therefore, the fact that the drought is increasingly affecting many households simultaneously means that many of the informal drought coping strategies remain at risk and become further ineffective according to Lekapana (2013). Development agencies and the Kenyan government must then play a greater role in reducing vulnerability and enhancing the capacity of pastoralists to cope with drought. The nomadic pastoral population requires adequate survival, preparedness, and sustainable drought coping strategies.

E. INFLUENCE ON THE CHOICES OF THE COPING STRATEGY IN THE ILEMI TRIANGLE REGION

Figure 6.5 reveals that of the traditional leader's influence (26%, 52), previous drought relief and mitigation measures (19%, 38), availability of pasture and water (13%, 26) and present numbers of livestock and their mortality during drought have a greater influence on the choice of the coping strategy. This finding corresponds to study findings by Lekapana (2013) who suggested that community leadership remain a binding element that has maintains the Turkana values and this is used to support each other during difficult times of drought.

Accordingly, the Turkana culture, livelihoods and way of live, rotates around traditional leader's decisions and

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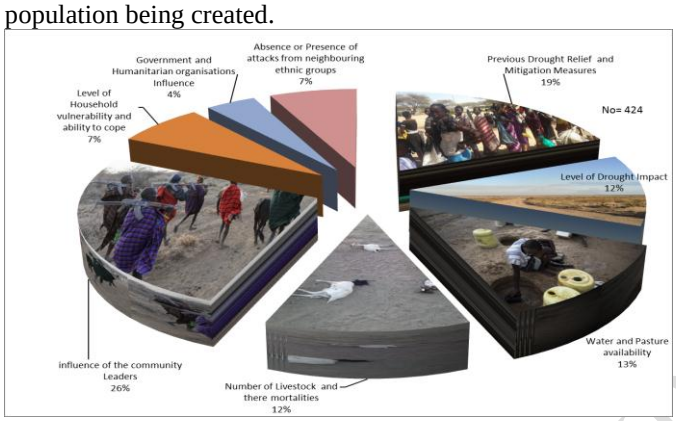
populations have to follow their advices when it comes to how to cope. This is confirmed by the key informants and focus group discussion together who lamented that the Turkana traditional coping strategies like migration is influenced and controlled only by the traditional religious leaders known as *'Emuron'* and community leaders. They have right to influence the coping strategies of migration and share early warning information that population must follow. The study argues that the government must tap in to their experience of this group and work with such group to increase their knowledge to ensure vulnerable populations are safeguarded from disaster shocks. Moreover, previous disaster shocks management and mitigation strategies implemented have a greater influence on the choice of the coping strategies. If there were no previous sustained measures put in place, the high level of vulnerability according to Mureithi (2012) will always remain the same with a creation of dependency to the population being created.



Source: Researcher, 2017

Figure 6.5: Influences of the coping strategies choices in Ilemi Triangle, Turkana County, Kenya

A major consequence of the drought was the reduction in availability of water and pasture and these important pastoralism dependants' commodities if missing will force the population to move close to each other and or conflict with other neighbouring pastoralists in Ilemi Triangle to get these commodities. Additionally, when drought occurs, it is expected to reduce livestock holdings both directly through mortalities and indirectly through distress sales at lower prices and if no market available like in Ilemi Triangle according to the key informants in Napak.

In search of the absent water and pasture resources during drought in Ilemi Triangle, the nomadic population come close to each other and conflict. The choice of coping strategy will entirely depend on if they have been raided or not, the capacity of the households to withstand drought shocks to include level of economy of the family and number of livestock they possess after drought shocks.

F. STRENGTH AND WEAKNESSES OF IDENTIFIED INDIGENOUS COPING MECHANISMS

Though most of the indigenous drought coping strategies are well known, some of them have been absconded due to recurrent climate variability, weaker unpredictability levels, and excessive vulnerability. The coping strategies are not adequately supported, promoted by the government to protect livelihoods and cannot be sustained. The study argues that if these coping strategies are adequately supported, they can contribute not only to the empowerment of the nomadic pastoralist, sustained livelihoods, promotion of poverty reduction and better life but also help in the reduction of vulnerability. The coping mechanisms have ensured retained and continued social-cultural cohesion among the Turkana community members because a strong family ties continue to be practiced during the time of difficulties. This is because relatives have to come together to support each other during drought times. The community members and families migrate together in search of pasture and water during drought and support each other even during raids.

The traditional coping mechanisms have further promoted peace building among the warring neighbouring populations, as all migrating communities in Ilemi Triangle have to negotiate to share these unavailable resources of water and pastures. Thus, they live in harmony and create peace. The key informants who elaborated of the peaceful engagement illustrated this and mentioned of the practices between the Karamojong and the Turkana in the West part of Turkana County where the communities have come together to share the insufficiencies of water and pasture resources and conflicts have never happened between them. Moreover, the strategies of borrowing and loaning livestock to and from relatives have relatively led to accumulation of the wealth during difficult drought periods thus reduction of vulnerability.

However, as people get to copy the traditional coping strategies, recurrent drought and of great intensity in its impacts have severely eroded many of these traditional coping strategies that are not adapted or get out-dated to the changing climatic patterns. The study findings show that there is excessive outcry due to increased vulnerability because of the coping strategies that are not supported by the National government, the County of Turkana and present humanitarian organisations.

Moreover, these traditional coping strategies according to Lewa (2015) have been left redundant because of the long-term investments they require, recurrent drought and weak community capacity. Absence of community involvement in weather management practices, chronic under investments in Ilemi Triangle region, the absence of evidence-based methods of strengthening pastoral economies and livelihoods, excessive conflicts for scarce water and pasture resources, poor infrastructure and weaker considerations to the pastoral population areas have all contributed to weakening the existing capacity of the Ilemi Triangle nomadic pastoralists and thus, continue to render nomadic pastoralists vulnerable.

Therefore, fewer humanitarian actors have supported nomadic pastoralist's livelihood promotion of such vulnerable mobile populations. Additionally, the major traditional coping strategies are winded up not only because of recurrent droughts but also unavailable and weak resource management; that may not only be sufficient, elaborate but also inefficient in coping with the rapidly diminishing resources based on huge climatic changes (Lekapana, 2013).

Therefore, there is a need for all partners and the government in the Ilemi triangle to develop a robust sustainable framework in increasing drought coping capacity and resilience among the Turkana nomadic pastoralists of Ilemi Triangle by enabling a good environment for pastoralists

economy growth, understand and analyse the situation in their own areas and come up with adapted approaches on drought coping mechanisms and management.

G. CONSTRAINTS HINDERING THE INDIGENOUS COPING STRATEGIES

Key informants and FGDs conclusively provided the major constraints hindering the traditional coping strategies. These extreme challenges (Table 6.4) have faded the Ilemi Triangle coping capacities and diminish the aptitude of any mitigation practices that ensure resilience to drought and its effects. They were not different from vulnerability causes that have hindered the progress of nomadic population.

Ilemi Triangle Coping strategies	Effects of Drought to Ilemi Triangle Turkana Population	Constraints to Cope with drought	Options of dealing with Coping constraints
Migration	Diseases for livestock	Conflicts, diseases ,	Peace building, common markets, water dams/ Pans along migratory Routes , infrastructure improvement , Boarder schools, range management
Seek for Early warning information	Low knowledge and absent preparedness	Unpreparedness and poor knowledge	Integration of Modern and traditional methods of Early warning systems
Wait and Depend on Relief Foods and Non-food Items	Malnutrition and non-development	Non progression and lack of initiatives and development	Safety Nets programs start and reduction of Relief foods only for crisis and emergency and not first options, Food security strengthening
Livelihood Diversification option	Rangeland degradation, disruption by extreme events	Weak asset base, lack of financial resources to start and technological knowhow/poor skills	Credit facilities and transfers for nomads, provision of other livelihood options to this vulnerable populations and strengthening livestock livelihood and opting for sedentarization for those who do not want to move with livestock and work on food security
Herd Management: Livestock off-take, splitting and sharing of livestock among relatives, Diversification of herd composition and species in Ilemi	Heat stress, and low productivity	Poor market infrastructures, low livestock prices and few livestock split	Develop livestock infrastructure-markets, livestock fattening, livestock offload, regular veterinary services for mobile population plus provision of pre-bought hay to livestock to nomads by Government services including Feedlot, Livestock insurance and compensation etc.
	Shift of rangeland herbaceous biomass to woody vegetation.	Decrease in cattle, high financial inputs	Government to Invest in livestock species heterogeneity in Ilemi triangle populations and ensure vaccination
Food sharing: Sending part of the family to other relatives and skipping meals	Low economy Investments shortened	Too much dependency and huge financial burden to families	Credit services to nomads, promotion of self-reliance and relief foods availability with provision of other livelihood options

Source: Researcher (2017)

Table 6.4: Constraints to the identified indigenous Coping Strategies in Ilemi Triangle, Turkana County Kenya

H. INDIGENOUS COPING STRATEGIES SOLUTIONS

The findings of the key informants from the two sites (Figure 6.6) showed that improving and development of adequate water resources(32%,68),strengthening livestock livelihood options(10%,21),improving early warning methods (14%,30) , livestock markets provision (12%,26) , credit facilities (5% ,11),peace building with neighbouring ethnic groups (6%,13)and infrastructure investment (3% ,6) and Supporting on management of grazing zones and emergency pastures (18% ,38) are major programs to go for in order to support the traditional coping strategies the pastoralists in Ilemi Triangle implement .This study has summarised these solutions and options for dealing with constraints in coping with drought in Table 6.4 . The findings are similar to study findings by Mureithi (2012) that has also advocated for having adequate water and pasture for nomads to enable the pastoralists cope with drought. The study proposes strengthening of water resources, working on development projects, early warning methods and supporting traditional coping strategies.

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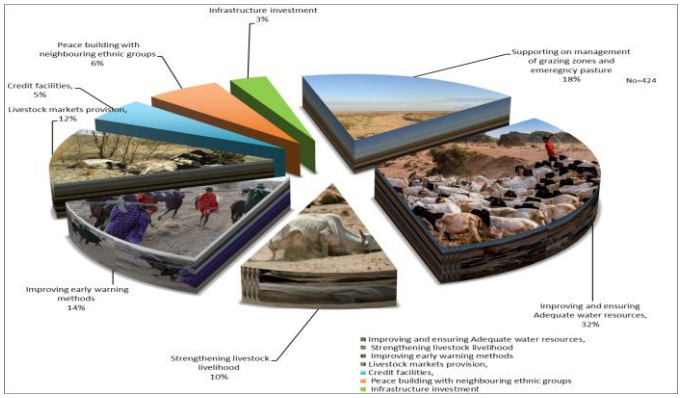

Source: Researcher, 2017

Figure 6.6: Suggested programs to improve coping strategies in Ilemi Triangle, Turkana County, Kenya

VII. DROUGHT MITIGATION STRATEGIES IN ILEMI TRIAGLE, TURKANA COUNTY, KENYA

A. INTRODUCTION

Drought survival among pastoralists in Kenya is increasingly becoming arduous and its recurrence complicates the rescue measures to the pastoralist's livelihoods. Kenya is particularly prone to drought because only 20 percent of the country receives adequate and regular rainfall (Tuimur, 2017). Mitigation, therefore, remain one of the major components of disaster risk management required to adequately lessen population vulnerability. If well implemented, they lead to sustained development and lessens post disaster loss of life, property, and financial solvency. Successful disaster risk management requires the implementation of all these four phases of disaster management cycles to include mitigation, preparedness, response and recovery.

Mitigation strategies lessens the likelihood and severity of disaster by implementing sustained actions, to reduce the possibility of disaster and reduces the need for assistance actions to include hazard assessment, vulnerability analysis, risk analysis, risk evaluation, vulnerability reduction and integrating disaster risk reduction activities in all development activities making it mandatory.

B. DROUGHT MITIGATION STRATEGIES IN ILEMI TRIANGLE, TURKANA COUNTY KENYA

Mitigation measures are taken either short or long term to guard affected communities against drought impacts and increase their coping capacity. Most of the pastoralist's livestock production systems rely on natural pastures supported by rainfall. In the arid and Semi-Arid Lands (ASALs), which constitute 80 percent of Kenya and where most of the livestock is found according to Lekapana (2013), pastoralism is the main livestock production system that is also fully dependent on rainfall patterns. Conflicts among neighbouring communities, human and wildlife are bound to escalate during drought as livestock are moved from one area to another in search of pasture and water. Every drought incident has come with its lessons and these have been documented.

ASAL areas are therefore, drought-prone areas of the country and seem to have a regular timetable of natural disasters. They are hit hardest whenever there is a national drought which occasion's shortfall in livestock economy and production. Even areas where massive famine relief handouts and drought mitigation programs have been implemented by governments and humanitarian organisations, each drought episode results in excessive disruption of the survival strategies among already vulnerable populations (Lekapana, 2013). The negative impacts of these recurrent droughts have undermined the resilience efforts to protect livelihoods in Africa according to Silale and Nyambegera, (2014) and have continued to threaten the inverse development gained in many parts of the world Logar, and van den Bergh (2013).

Therefore, the evidence-based practice to change the situation is to mitigate drought and get well prepared before the next cycle of drought happen. In such, as much as the Government remain the lead in guiding the mitigation measures, everyone's individual effort including the nomadic pastoral population and humanitarian partners are critical to lessen drought impacts and absence of mitigation measures makes the population remains vulnerable. Stronger efforts are needed to build resilience and limit climate-related hazards and natural disasters. The chapter reports on the drought mitigation strategies used in the Ilemi Triangle to counter the drought impacts. It provides answer the question of what drought mitigation strategies are used in Ilemi Triangle to lessen the impacts of drought.

With specific reference to the year 2011 drought, recurrent drought problems, intervention programs must be viable; they must be designed with the ability to cope with the drought stresses. While supporting this line of thought of Tuimur (2017),this study recommends that since drought impacts have continuously caused long-term pastoral economic disruption in arid and semi-arid lands, a proper formulation of sustainable livelihood intervention policy must be in place and should begin with an understanding, and analysis of current mitigation strategies in Ilemi Triangle instead of overlooking and relying on other areas information and practices when each area has specific drought impact and vulnerability causes.

Figure 7.1 shows the main mitigation measures deployed in Ilemi Triangle to lessen the drought vulnerability. These top mitigation measures included

- ✓ Provision of Relief foods (70%, 149 in Loruth and 62%,132 in Napak)
- ✓ Livestock management practices to include improving livestock health (5%, 11 in Loruth and 10%, 21 in Napak)
- ✓ Provision of Non-foods Items (2%, 5 in Loruth and 11%, 24 in Napak)
- ✓ Construction and management of water resources (8%, 17 in Loruth and 2%, 5 in Napak)
- ✓ Community involvement, peace practices (1%, 2 in Loruth and 7%, 15 in Napak)
- ✓ Modern early warning information sharing (3%, 7 in Loruth and 2%,4 in Napak)

- ✓ Development aid programs strengthening through livelihood strengthening (1%,2 in Loruth and 2% ,5 in Napak)
- ✓ Management of range and grazing zones (1%,2 in Loruth and 1% ,2 in Napak)
- ✓ Policy improvement (0%, 0 in Loruth and 1%, 2 in Napak) with little investment on research on drought mitigation practices.

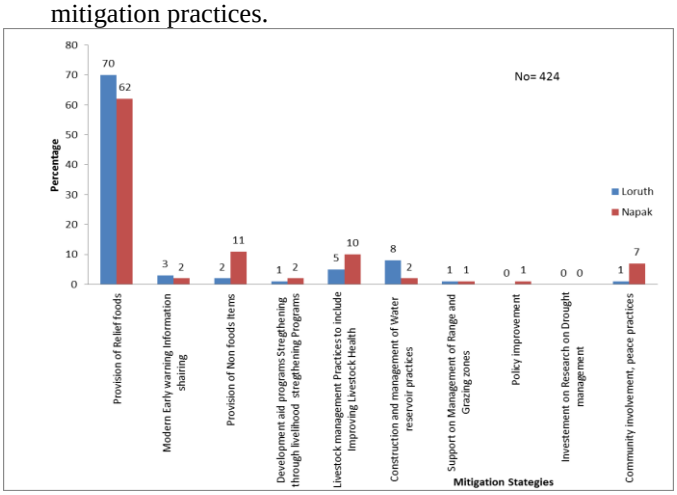

Figure 7.1: Mitigation strategy in Ilemi Triangle, Turkana County in the Northern Kenya

Source: Researcher (2016)

The key informants in the two sites identified relief foods, provision of water, non-food items, and livestock management practices to include improving livestock health, provision of early warning information and programs that strengthen livelihoods in the order of strength of strategies.

The information from the key informants were not different from what was identified by the heads of the households and the focal group discussion in Napak (Table 7.1) that identified relief foods as a main mitigation method.

S/No	Indigenous mitigation strategy by 10 FGD members in Napak	Napak		
		Total Score	Mean	Rank
1	Provision of Relief foods	198	19.8	1
2	Construction and management of Water reservoir practices	85	8.5	2
3	Provision of Non-foods Items	70	7.0	3
4	Livestock management Practices to include Improving Livestock Health	68	6.0	4
5	Modern Early warning Information sharing	30	3.0	5
6	Development aid programs Strengthening through livelihood Programs	24	2.4	6

Source: Researcher (2016)

Table 7.1: Focal group discussion on the mitigation strategies in Napak, Ilemi Triangle, Turkana County in the Northern Kenya

When probed further, the findings of key informants and focus group discussion stressed the need for a continuous mitigated drought coping strategies, which should be implemented for the affected community to overcome the effect of drought in a resilient manner. The key informants generally cited the need for sustainable safety-nets programme that encourage resilience, pastoralists capacity, livestock management practices like vaccination, preposition of food reserves and water for household and livestock use and its availability enhancement programs among other

The FGD in Loruth (Table 7.2) identified that the main common strategies utilized in Loruth Ilemi Triangle, Turkana County, Kenya include relief foods, provision of water, livestock management practices to include improving livestock health, provision of non-food items, provision of early warning information, and programs that strengthen livelihoods in the order of strength of strategies.

S/No	Indigenous mitigation strategy by 10 FGD members in Loruth	Loruth		
		Total Score	Mean	Rank
1	Provision of Relief foods	192	19.8	1
2	Construction and management of Water reservoir practices	110	11.0	2
3	Provision of Non-foods Items	90	9.0	3
4	Livestock management Practices to include Improving Livestock Health	85	8.5	4
5	Modern Early warning Information sharing	80	8.0	5
6	Development aid programs Strengthening through livelihood Programs	76	7.6	4

Source: Researcher (2016)

Table 7.2: Focal group discussion on the mitigation strategies in Loruth, Ilemi Triangle, Turkana County, Kenya

In summary, the FGD rankings in Napak and Loruth were having correlation coefficient 0.99±0. 0054. Thus it was statistically significant ($\rho < 0.05$). This implied that the FGD rankings in Napak and Loruth had significant positive correlation. Thus, they were mainly the same. Thus, the communities of the two localities were experiencing the same events hence same perceptions.

S/No	Factor identified in Loruth by 10 FGD members in Loruth	Napak Rank	Loruth Rank	D	D^2
1	Provision of Relief foods	1	1	0	0
2	Construction and management of Water reservoir practices	2	2	0	0
3	Provision of Non-foods Items	3	3	0	0

4	Livestock management Practices to include Improving Livestock Health	4	4	0	0
5	Modern Early warning Information sharing	5	5	0	0
6	Development aid programs Strengthening through livelihood Programs	6	6	0	0

Source: Researcher (2016) $\sum D^2 = 0$

Table 7.3: Ranking Correlation between Napak and Loruth on the mitigation strategy of drought in Ilemi Triangle, Turkana County, Kenya

In Vision 2030, drought is among the emergencies foreseen by the Kenyan Government and deals with it through different strategies. This will inform all relevant authorities to put in place elaborate measures to lessen the drought effects thereof. The study shows that the government through NDMA have addressed some impacts of drought on pastoralists in the study area through different support programs.

According to UNESCO (2017), mitigating climate change and its impacts will require building a strong momentum on programs that lessen vulnerability causes in the local setting. This according to UNICEF (2018) requires stronger efforts that are needed to build resilience and limit climate-related hazards and natural disasters. This calls for support of drought multi-partnership program initiation in Ilemi Triangle. Therefore, helping pastoralists cope with and recover from both environmental and man-made hazards through proper mitigation has been major focal by the Kenyan government, humanitarian organisations (NGOs) and United Nations (UN) agencies working in the country according to Lekapana (2013).

a. PROVISION OF RELIEF FOODS

Provision of relief food has been provided as the top mitigation measure used in Ilemi Triangle (70%, 147 in Loruth and 62%, 132 in Napak). The FGD in both sites described that the government intervention is mainly through the provision of relief food supplies comprising maize, beans and cooking oil. The provision of only relief foods option to the Turkana pastoralist's population by the government and many humanitarian organisations available in Ilemi Triangle according to Solh and Ginkel (2014) demonstrates inability by many humanitarian organisations, the government, and the populations to initiate other strong mitigation plans to encounter drought impacts.

The study argues that the relief food that should normally be taken or utilized as a coping strategy has been applied in the setting as a major drought mitigation strategy. The relief food according to Mureithi (2012) promotes dependency without opting for long-term mitigation measures and other practical measures of reducing vulnerability and enhancing resilience. This result corresponds with study findings by Lott, Christidis and Stott (2013) study that revealed that during drought, the government and the County and humanitarian organisations only provide relief food aid. The study contemplates that this short-term support of relief foods should only be vital during emergencies and not for sustainability because this will only create high a dependency and denies the nomadic pastoral population chances of adapting and promoting other livelihood options that will ameliorate their lives.

Relief food unlike other strategies like cash for work, food for work, and cash transfers do not promote a sustainable development approach but it remains one of the forms of a 'Hunger Safety Net Programme '(HSNP) that was started in the year 2012 by the Kenyan Government in partnership with civil societies meant to protect the drought affected populations with an of addressing the risk, vulnerability and social exclusion (Aliow *et al*, 2017). This impression is shared by Mureithi (2012) study that suggests that humanitarian organisations in ASAL regions of Kenya have a poor understanding of drought management strategies and keep on an uncoordinated implementation of similar non-viable activities before and after the drought.

These humanitarian organisations, National and County Government continue to champion for relief food as top of their agenda without looking for long term drought mitigation strategies. This practice is strongly objected by this study and suggests that it has continued to promote dependency without thinking other practical measures of reducing vulnerability. Relief food this study suggests should only be used in specific period of time and act an emergency bridging gap option while looking and starting other sustainable options.

The government through NDMA must deal with the indigenous coping strategies not presently supported and efforts for sustainable development absolutely need to be prioritized. Mitigation efforts attempt to prevent hazards from progressing into disasters or efforts to reduce the effects of disasters. They focus on long-term measures of reducing or eliminating risks which is contrary to relief food provision that has become like a long term and in essence, it is not.

Accordingly, relief handouts do not open opportunity for other livelihood options, mitigation measures and continue to facilitate a beggary attitude among the population. The study argues that legislation is required to govern relief food modalities in nomadic population and during drought. The study argues that the provision of relief food needs to be more adaptive to lead to sustainable programs and lessen beggary situation. There must be drought management policies in Ilemi Triangle that are adaptive to sustainable mitigation choices. These policies can be re-energized and financed to scale up the mitigation practices.

Regarding the government interventions in mitigating drought, the key informants argued that apart from relief food that does not last a long time, little has been done to enhance and improve pastoral livelihood and their resilience to drought menace in their areas. The key informants asserted the need for more robust mitigation strategies that last to support livelihoods instead of creating excessive depended with relief foods. They also argued the need for the development of water and pasture, support in livestock diseases and livestock trade and marketing as strategies that government can support to reduce impacts of drought. This critique indicates the

willingness of the indigenous population to provide knowledge to change their living standards but lack government support.

On relief food as a mitigation measure, one Key informant from Loruth mentioned that

> The government and NGO will come to help when many livestock are dead, supply relief food and go back. I do not know why the Kenyan government do not emulate the Uganda drought mitigation strategies and copy the type of support to Karamojong pastoralists receive because they have no problem with water, pasture, and livestock. We are the only ones moving towards them every year. Key informant interview, 26th July 2016 Loruth Village).

The statement informs of the kind of desperation the nomadic pastoralists have from the type of support they receive from the government and the type of mitigation strategy implemented in Ilemi Triangle. What is clear is that the type of strategy applied to reduce drought impacts have not worked at all in Ilemi Triangle and a lot of support is required for this population to lessen the recurrent drought impacts.

Relief food aid according to Solh and Ginkel (2014) damages livelihoods of poor farmers and spoils their future in Turkana. Relief foods need to be stopped if it is preferred as a longer solution to drought vulnerability because it perpetuates the culture of dependency, which would only create an endless cycle of poverty. Relief food should only be essential during emergencies, it has been turned to be an exercise by agricultural exporting countries to dump surplus production from their farmers and as such, such exporting countries remain reluctant to help recipient build own capacity to grow food according to Opiyo (2014).

Turkana County like in many other ASAL Counties in Kenya has been receiving food aid constantly according to Mureithi (2012) and as a result relief agencies have created and promoted a culture of dependency as opposed to partnership and nobody seems to care about helping local populace on planting crops and become self-sufficient in food, better farming and livelihoods promotion practices, provision of industrial tools for farming, tapping water from rivers or rains for agriculture and protection of nomadic population from cheap imports. Moreover, most of the Turkana men in Ilemi Triangle continue to practice pastoralism with political neglect without utilizing Permanent River like Nakuwa that flows between Ethiopia and Kenya boarder. This water remains underutilized and only few obscure and unsupported irrigation projects are being carried out again only on Ethiopia side.

Relief food aid drives down local prices and continue undermine the investment in agriculture and food security in Turkana County. The government and County should support this farming and provide skills and training to the famers on drought resistant crop with extension officers providing technical support to the farms. This will ensure continuous production of stable foods to the County.

According to Mureithi (2012), relief foods remain a permanent damage that deprives rural people of their livelihoods and to create conditions for food dependency that is the hallmark of food aid. This study takes the leniency on relief foods provision without looking at development programs as scandal in such vast territory with abundant water that no shift to grow food is considered. Vulnerability to drought will continue as drought will eventually happen in the near future and this calls for the need of addressing the issue of relief food aid and its repercussion in Turkana County. The study considers the continuity of relief food aid as a recipe of non-development when no other of sustainability is considered for this nomadic pastoralist.

We have to educate the local population on the insult that the food aid comes with. It is vital to mention that the end of tied food aid doesn't mean the end of food aid- it only means that food aid should not be an end as solutions to vulnerability reduction measures in Ilemi Triangle and that other solutions must be provided. People must have a way out and this study calls for proactivity in developing long-term options for food security and guarding populations against drought risks.

The continuous provision of relief food without other sustainable option the study notes can culminate to an increased donor fatigue on funding continuous relief food operations in ASAL areas because these nomadic pastoral areas do receive frequent drought and have a cyclic drought which needs to be dealt with tangible programs and not only food supplies that do not last. A newer approach to solve this problem is required according to Taylor (2013).

Instead of continued relief food provision as a mitigation strategy, the study contemplates that other alternative development activities or sustainable safety nets programs to include encouraging desert tourism, sand harvesting business, food for work activities, cash for work or food for assets programs that ensure population perform certain developments activities like gabions, planting trees and water harvesting pans in their own communities and paid by food or cash on the work done can be done. This lessens dependency. However, because these alternatives are yet to be tested in Turkana County, this study contends that testing they can be an opportunity for Turkana County government to check on their development strategies, check their viabilities, and adapt them accordingly. Therefore, working on vulnerability reduction.

b. EARLY WARNING INFORMATION SHARING AND COMMUNICATION

A smaller number of respondents mentioned of receiving drought information from National and Turkana County government sources. The study shows less than 5% in both areas (3%, 7 in Loruth and 2%, 4 in Napak). Absence of drought early warning information sharing has excessively caused vulnerability among the population of Ilemi Triangle and remains the top causes of vulnerability. The key informants and FGDs conclusively mentioned that absence of drought information sharing is mainly because there no present drought extension officers, absence of modern meteorological stations in Ilemi Triangle belt, lack of coordination of drought information sharing, unclear roles of who does what when drought strikes and absent backbone information on drought management framework within Ilemi Triangle.

This finding corresponds to Mureithi (2012) study findings that mentions that despite the government plays a key role in relief food, less information on drought is always delivered to the vulnerable population. An accurate early-warning system (EWS) is an essential part of effective drought mitigation and preparedness. If the pastoralists have adequate information about drought in advance, they could be able to adjust and cope with drought. However, another critical failure in Kenya's system of drought management is that donors are slow to respond to early indicators and only waiting to intervene with relief foods that are not sustainable. It is widely agreed that a lack of rapidly deployable resources is the primary factor preventing effective drought mitigation and preparedness. A national drought-contingency fund should then be established in drought prone areas in Kenya to ensure timely, appropriate, and adequate intervention aimed at mitigating the impact of drought related crises. This system should be replicated right across the region according to Oxfam (2017).

There is a huge gap on information provided on the early warning systems and on impending drought and the ability of government to act to reduce these drought threats need to be seen urgently in Ilemi Triangle. To lessen drought impacts, a good framework must be in place to monitor Ilemi Triangle situation that is experiencing cycles of drought. This will support to work on the persistent impacts of drought and distribution of information of important facts. This call for a drought monitoring global system that should be maintained in mobile populations that experience frequent drought to reduce the future effect of drought damages (Lekapana, 2013). Moreover, the pastoralists' experiences that can offer lessons for national governments wishing to support Ilemi Triable early warning activities and there is a need to integrate the local knowledge with modern technology to achieve this.

c. PROVISION OF NON-FOODS ITEMS

The study shows that provision of non-food items (2%, 4 in Loruth and 11%, 24 in Napak) remains an important element in mitigating drought in Ilemi Triangle. This corresponds to UNOCHA (2011) findings that suggest that foods are not the only items used and provided during crisis and emergencies and humanitarian organisations do provide non-food items like cooking utensils, water containers, and buckets and sleeping materials.

The key informants in the two sites have mentioned though this practice of provision of non-food items is done, leaders do not always put it on forefront. These non-food items are required because the populations are poor to purchase even livestock water collection materials so they are needed but they do not receive them often like relief food. The research asks for a legislation of what need to be provided in every kind of hazard. There is a need to establish minimum essential package for drought management and what is must to be provided to the vulnerable population.

The study suggests that this can only be strengthened by application of a legislation that will target drought management and livestock based interventions. Tuimur (2017) that if these packages are provided, the population will not be vulnerable to the next drought cycle further suggests this suggestion of minimum package for drought management. Moreover, drought does not have to lead to emergencies and disasters in Kenya if early interventions through coordinated programs like provision of non-food items and better preparedness are provided and can save lives and livelihoods.

d. DEVELOPMENT AID PROGRAMS STRENGTHENING

Development aid programs strengthening through livelihood reinforcement (1%, 2 in Loruth and 2%, 4 in Napak) have been used in Ilemi Triangle to mitigate drought. The key informants in both sites have challenged the National and County government to invest on nomadic pastoral programs and economies especially in the development of water and pasture and or range land management systems as seen in neighbouring Karamojong of Uganda where the National government has invested more on pastoral programs unlike in Ilemi Triangle.

The findings correspond to a study finding by Lekapana (2013) in Loiyangalani that mentioned that the government have supported the pastoral population from drought impacts by rolling out other livelihood diversification program like fishing equipment's, switching to a more drought-resistant livestock species like camels, educating the population on harvesting and selling gum and aloe and doing small business and encouraging sedentarization. This can be adapted to Ilemi Triangle and improve the lives of the population though fishing cannot be visible in Ilemi Triangle when lake and other water bodies are far from Ilemi Triangle.

Opiyo (2014) have proposed other alternative sources of livelihoods in ASALs population for drought mitigation to include the use of herbs such as Aloe vera farming and tapping into gum tree to create wealth. Harvesting gum from drought-resistant Commifora and Acacia species to include Commifora holtziana, Commifora pseudopaolii, Acacia Senegal and Acaciaseyal according to Oxfam (2011) helps to support families to gain access foods when they sell it and especially when Turkana County had not received rain for almost 5 years before the drought of the year 2011.

In Turkana, the government development support is through drought management livelihood strengthening programs through Hunger Safety Net Programme (HSNP); the Government's State Department for Special Programmes, National Drought Management Authority (NDMA) programs. These programs according to NDMA (2018) include a supply of animal feeds to keep nomad's herds alive during drought and purchase of livestock from pastoralists and slaughter them to feed hunger stricken families. However, many of these good practices according to Mureithi (2012) are not practiced in the whole part of Turkana County.

The study contemplates this strategy need to be taken as an adaptation strategy and not a mitigation strategy as such though it has been used in the setting as a drought mitigation option. However, the study during data collection observed a huge gap in the existence of these excellent programs that reduces vulnerability. The study observed that what is indicated to have been done on the ground is not the reality. The situation in Ilemi Triangle, the study contends, requires a quick check-up, monitoring, and supervision of development

program. It is, therefore, essential to recognise the realities of the nomadic population's daily life in Ilemi Triangle region in order to recognise and appreciate the way they span both traditional livelihood practices, new linkages and how they ensure survival in this difficult environment.

e. CONSTRUCTION AND MANAGEMENT OF WATER RESOURCES

Boreholes construction the household's heads suggested formed part of the mitigation strategies (8%, 17 in Loruth and 2%, 4 in Napak). The key informants and focus group discussions have all concluded that if there will be no proper or functioning water reservation practices present in Ilemi Triangle, then pastoralists will always suffer with their livelihoods. The key informants from Napak further counted situations where they had to migrate close to their enemies to fight for water for their livestock and the National and County government water services were not forthcoming because the government have not done enough on water situation in Ilemi Triangle and the present boreholes are either insufficient, never been maintained and or not well managed as seen in Plate 19.

Drought has depleted water resources in areas occupied by pastoralists in Ilemi Triangle (Lekapana, 2013). Pastoralists rely on seasonal wells for domestic and livestock use and they require to be developed. This study contemplates that water should be a premier solution for pastoralist's livelihoods and this can be done through provision of boreholes and water pans. Accordingly, if water sources dry up, population will migrate. This migration eventually leads to conflicts with either wild animal who come close to human habitat and or with other warrying neighbouring communities whom they fight for this important resource.

Source: Researcher, (2017)

Plate 19: Destroyed water borehole in Napak that has remained unrepaired, Ilemi Triangle, Turkana County, Kenya

These findings correspond to the findings by Mureithi (2012) that reported that not all areas in Turkana County have enough water and drilled boreholes and or have water pans. One old key informant in Loruth compared their water problem in Ilemi Triangle with big towns like Kakuma and posed that if big towns like Kakuma in Turkana County that is close to the County government headquarter Lodwar have a huge problem with water and the County have been defeated to supply water and how about them that are far away so it is a catastrophe.

The contribution and the contingency plans for the government and the Turkana County government during drought emergency to including water supply, keeping strategic watering points functional along the migratory routes and monitoring water availability for nomads has not been observed in Ilemi Triangle. This remains a critical gap while the same commodity is essential for livelihood production for this nomadic population. A long-term option to improve water resources for nomads by a construction of water pans, developing new ones in the migratory routes of nomads, construct dams, and ensure underground tanks to harvest rainwater in Ilemi Triangle will be required. This activity will contribute to resilience by reducing the distance of travel by the pastoralists in search of water and increasing the availability of water between rains by increasing storage capacity.

According to Mureithi (2012), despite the existence of water resource management systems in northern Kenya based in Lodwar, the effective management of water sources in pastoralist areas remains a challenge. This is evident in Ilemi Triangle where the struggle for water resources among the pastoralists has been a problem ever since before and after independence.

Building on what is known on pastoralist movement and culture; this study argues that the partners should already explore water management systems among the pastoralists and how best they can be supported to reduce vulnerability. Local disaster risk reduction strategies need to be developed within Ilemi Triangle because these analyses are missing in Ilemi and drought strikes when populations have no options to adapt to relieve themselves from drought impacts.

Huge aquafer has recently been discovered in Turkana County in Ilemi Triangle in a place called Lotikipi according to Pflanz, (2013), this water is unsafe for drinking, as it is very salty and full of minerals according to Mureithi (2012). However, for drinking, Migiro (2015) suggests that this water can be treated and cleaned up to be safe for both human and livestock consumption. The study argues that the National government can tap and borrow experience from other Sahara African Countries with pastoralists having similar problem and or do research on how best this water can be cleaned and salt reduced so that it can further be utilized for irrigation.

Accordingly, water training institutes the study argues need to be started in these arid areas so that many water problems can be dealt with. Water management and technology will further be transferred to the local population that will join such institutions.

Moreover, as water remain a problem for nomadic pastoral populations and the National government decentralizing services in the Counties, the study suggests that the Turkana nomadic pastoralists in Ilemi Triangle can benefit from ensuring that water ministry is further decentralised into sub County level so that the nomadic pastoralist's population can manage water problems within their own locality.

f. MANAGEMENT OF RANGE AND GRAZING ZONES

The study showed a minimal support from the National government and County government on the coordination of grazing zones among the population of Ilemi Triangle. The management of range and their grazing zones was at 1%, (2) in Loruth and 1%, (2) in Napak.

The finding of the Ilemi Triangle mitigation measures corresponds to the study findings by Lekapana (2013) that mentioned that the government plays a key role in arid and semi-arid areas on supporting the population with the management of range and grazing areas through community information and organising on grazing pattern. However, the lesser observable presence of government support on this has been realized in Ilemi Triangle and the nomadic population only rely on traditional social networks and traditional religious leaders to predict areas within Ilemi with pasture and advice on management of grazing areas.

In Ilemi Triangle, land on other hand is communal, since colonization Ilemi Triangle areas have been claimed by Kenya, Ethiopia, and South Sudan to be belonging to them, and this problem has remained up to date unresolved. The nomadic pastoralists in Ilemi Triangle have continued to roam around and within the all ill-defined boarder in search of pasture while attacking each other on their way for better pasture areas. This excessive mobility according to Opiyo (2014) ensures the population grazes freely.

This lack of clear definition of the boarder is believed to accommodate the successful functioning of the pastoralist system within Ilemi Triangle because it crucially allows access to critical resources during times of scarcity according to Melle (2016). The traditional institution including the religious leaders and community leaders according to Lekapana (2013) play a key role in defining the areas of grazing and organising the grazing pattern and in Ilemi triangle, there exists organised migratory routes and specific areas for grazing depending on the kind of drought.

According to the key informants of Napak, grazing on the mountainous areas is reserved for severe drought, and during the rainy season when pasture is available, the low land is preferred while a movement to further northern areas deep in Ilemi Triangle is only done when pasture and water are finished in the mountainous areas. This movement in the far deep areas in Ilemi Triangle results to Turkana nomadic pastoralists having a conflict with other neighbouring ethnic groups living in Ilemi Triangle for pasture and water.

The study observed absence of hay and any other livestock supplementary feeding activities and argues that the NDMA if they respect their mandate in these areas, vulnerability can be reduced. Moreover, livestock insurance according to Lekapana (2013) cover for the pastoralists livelihoods during crisis and should be present to shield them from loses induced by climate change would be a welcome move as well as access to credit facilities and microfinance.

g. POLICY IMPROVEMENT ON LIVESTOCK MANAGEMENT

The respondents indicated the importance of policy improvement as a significant element in safeguarding their livelihoods. Though Policy improvement (0%, 0 in Loruth and 1%, 2 in Napak) was minimally mentioned by the respondents, it is worth to say that the though the Kenyan government has made a step further in improving policy on pastoralist's livelihood to reduce drought impacts, these policies require regular review and get adapted to the change of climate and the need of pastoral population. Water and pasture problems remain a concerns the pastoralists and policies surrounding the management and support for these resources in Ilemi Triangle has not yet been adapted and strengthened according to Lekapana (2013).

The key informants and focus group discussions demonstrated a need for improvement of pastoral key resources and the problem continues if these water and pasture resources are not improved. Grazing policies need to be enacted and water management system in pastoral sites areas especially around the boarder with other Countries need to be strengthened. The impact of weather on these resources is usually huge and if the government support in enacting policies that strengthen these important resources in the pastoral communities, then, vulnerability is reduced. There is a severe gap of such support in Ilemi Triangle according to key informants.

According to Opiyo (2014) and Mureithi (2012), the Turkana County with highest poor population that practice pastoralism and living in rural areas lags behind on policies that touch on the disaster mitigation and to lessen these drought impacts, there must be a fast track of drought solutions in the establishment of effective policies and legislative frameworks that will support in guiding and coordinating disasters response and management in Turkana County.

Moreover, the Turkana County disasters management and contingency plans should be elaborated and synergized towards providing a proactive framework that will guide drought responses in the County. This response requires to be triggered once drought happens. Therefore, clearly set out policies need to be in place to promote disaster risk reduction through early warning, planning, and early response.

The key informants and focus group opinion that the Turkana nomadic population have been overlooked in decisions concerning them and viewed not to provide any tangible solution for drought corresponds to study findings by Lekapana (2013) that suggested that policies should not be built upon the view that Turkana nomadic pastoralist's people are submissive and helpless in the face of hardship but be built in a considerable manner to demonstrate the ability the population have that supports them to cope with drought in order to ensure survival in the harsh environment.

According to Ali and Hobson (2009), drought management policies should not be built upon the view that Turkana nomadic pastoralist's people are submissive and helpless in the face of hardship but be built in a considerable manner to demonstrate the ability the population have that supports them to cope in order to ensure survival in the harsh environment. Moreover, climate change adaptation projects and programmes, and integrated planning have played a major role in reducing underlying risk factors among many pastoral populations according to UNDP (2014), and this needs to be ensured in Ilemi Triangle.

The Kenyan drought management policy change led to the formation of NDMA in the year 2011(GOK, 2013) to help in the coordinating preparation of contingency action plans and risk reduction plans, layout risk awareness and education, coordinate the implementation of risk reduction programs, drought mitigation and relief activities while generating, consolidating and disseminating drought management

information has not taken in the importance of the incorporating the traditional institutions knowledge and ideas on mitigating risks.

However, the vulnerability has continued to increase because of poor adaptation of policies towards the nomadic pastoralist population around Ilemi Triangle that live along the borders with other countries. The traditional livestock economy and reviving the linkages that address long-standing customary social networks like the conflict with the neighbouring ethnic group in Ilemi Triangle or through allowing a greater degree of movement of people and stock across borders has not been further included in any policy implemented by NDMA.

Other policies on the early warning system that focus on food production do not either help the majority of the population in Ilemi Triangle who are purely pastoralists. In essence, the government approach to impacts of drought in the pastoral areas in many cases has been to only to relief foods and less of policy changes to minimise impacts of drought. According to the study, autonomous traditional coping support would be the option for policy initiatives. Evidence suggests it would be more effective, including cost-effective, to enable and strengthen the inherent adaptive capacity of pastoralists and find ways to encourage their autonomous adaptation, rather than providing foreign coping strategies that will not be taken up (Lekapana, 2013).

Furthermore, the physical access to the markets by the pastoralists is often an obstacle for livestock market participation in dry land areas. Policies that govern this are missing and needs elaboration. Kioko (2013) suggests that the effectiveness of marketing interventions to enable emergency restocking and boost pastoralist purchasing power in the early stages of a drought will ultimately be limited by the end-demand for low-quality meat. The market availability remains a paramount element to be considered for pastoral population, however, no livestock market is available in Ilemi Triangle.

A policy is required that will enable the establishment of the market in every sub County level of Turkana County. In the year 2012, Tullow Oil Company discovered oil in Turkana County, though a study by Johannes *et al,* (2014) demonstrates the plights of the marginalised Turkana pastoralists, amid pre-existing and increasingly militarized inter-ethnic and cross-border conflicts primarily driven by poor policy on improvement on livestock management, competition over scarce pasture and water resources, and likelihood of a face readied 'oil curse' that has brought untold devastation on the livelihoods of communities as elsewhere in Africa, the study contemplates that the recent 25% share of oil revenue recently informed by Kenyan government (Lutta, 2018) will benefit the whole Turkana County .

The study suggests that the funds can be used for long-term sustainable programs to include pastoral economy development programs and or livestock development packages, instead of assigning money into personal individual accounts and or individual own ATM cards. This provision will not only encourage laziness but also over dependency while there is a need to encourage sustainability and reduced vulnerability. Moreover, supporting and improving pastoral population programs and livestock management education in Turkana County and converting any support to a kind of a Higher education loans (HELB) for Turkana populations especially in Ilemi Triangle who lag behind in education, can be attractive to increase population knowledge and accessibility of loans that can support long-term reduced vulnerability.

h. CONFLICT RESOLUTION AMONG THE ILEMI TRIANGLE COMMUNITIES

One of the mitigation strategies that the County government and humanitarian partners have ensured in Ilemi Triangle is by empowering the nomadic pastoral communities through involving them in taking peace initiative. Conflicts resolution strategy in Loruth was 1%, (2) and 7%, 14 in Napak. The findings are related to study findings by Melle (2016) that reported that most neighbouring pastoralist 'communities' conflict for water, pasture, and mitigate this conflict by ensuring peace co-existence among them. Moreover, government functions in Ilemi Triangle have remained minimal for many years (Mwangi, 2010). This is conjoined with the poor security situation in Ilemi Triangle that is attributed to the failure of the different governments to provide security to its citizens, closeness to porous international borders and the existence of cattle rustling according to Melle (2016).

Additionally, the community involvement and peace building practices can further support and introduce synergies between the Turkana County government and different investors. These will attract and tap into investors for different resources like precious stones, Ilemi Triangle mountainous sceneries and mercury, and can support livelihood diversification, improvement of people's lives and further reduction of vulnerability.

VIII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter gives a summary of the study findings, conclusions that emanated from the study findings and draws recommendations based on research findings of each specific objective of the research done in Ilemi Triangle. The summary, conclusions and recommendations are organized as per the study specific objectives.

B. SUMMARY OF THE FINDINGS

In this study on the coping and drought, mitigation strategies among the Turkana nomadic pastoralists of Ilemi Triangle region of northern Kenyan were explored using multiple research designs. The study aimed to determine the major factors causing drought vulnerability to drought, indigenous drought early warning system, community drought copings strategies and drought mitigation strategies used in the Ilemi Triangle, Turkana County in Kenya. The research was able to identify the following.

The study has demonstrated that pastoralists" vulnerability has been significantly affected by drought in

Turkana. That's various social-cultural-economic dynamics of the pastoral population in Ilemi Triangle, and its biophysical determinants have caused their vulnerability to drought and this included absence of water of services, unmitigated drought impacts, conflicts with the neighbouring ethnic group, absence of rainfall and aridity, poor early warning system practices, poor and inappropriate support from the government and poor infrastructure and absence of livestock market and absence of other livelihood options.

The main early warning methods used in Ilemi Triangle are all Indigenous Intelligent Knowledge without any present Modern Technology Information like satellite and radars in Ilemi Triangle. The traditional early warning methods identified by the study included drying of water sources, depletion of pasture, information from traditional community leaders, Traditional means like observations of bird's movement, sky stars and intestines observations, animal and human behaviour change and wind and temperatures rise. However, the traditional knowledge, prediction and intelligence are getting low because of repeated droughts.

The research revealed that household-level strategies for coping to drought are constrained by frequent droughts, are becoming unpractical with climate change and are all compounded by widespread poverty, violent conflicts, and diseases outbreaks and poor range conditions in Turkana. The most identified coping strategies included migration, herd splitting, sending part of family to relatives, keeping herds dominated by females, livelihood diversification, use of relief foods, and livestock loaning.

The results showed that though the government and humanitarian organisations have put in place some mitigation measures to lessen drought impacts, these strategies are not sufficient to lessen any form of vulnerability in Ilemi Triangle. Provision of relief food has remained a top mitigation measure to a lesser extend of other long terms livelihood strengthening programs that are required to combat drought impacts. Absence of such sustained mitigation measures has continued to makes the population remain vulnerable.

C. CONCLUSIONS

This study concludes that there are many unwarranted factors causing vulnerability in Ilemi Triangle that have not been dealt with and this lack of efforts have limited resilience and continued to ensure the population remain to suffer even with milder drought impacts. The imperative components of reducing vulnerability, managing drought and protecting nomadic pastoral communities from the impacts of hazards to include protecting the community's livelihoods from climatic change have not fully dealt with.

Turkana pastoralists have for decades been accustomed to droughts. Recurrent droughts have adversely affected the indigenous early warning system to include precise weather predictions. Weather information sharing is absent in Ilemi Triangle and thus, the population are not adequately prepared when drought occur.

Furthermore, majority of the Turkana Nomadic pastoralists will continue to be vulnerable to drought unless appropriate coping strategies are strengthened. Frequent droughts have weakened these traditional coping strategies with National and County government interventions being largely through emergency response during crisis level without sustainable drought solutions that work towards achieving resilience. This has continued to increase vulnerability.

The current drought mitigation and management activities in Ilemi Triangle, Turkana County in Kenya cannot reduce household's vulnerability and are not sufficient to be effective in protecting the pastoral livelihoods since they do not aim at vulnerability reduction. The National and County government have therefore, failed to prevent the impacts of drought due to poor translation of existing local ability and non-tapping of local knowledge into mitigation capacity. Therefore, the present applied mitigation strategies in Ilemi Triangle are short-lived and others dependent on limited humanitarian responses, which do not tackle current and future droughts and ensure resilience.

D. RECOMMENDATIONS

The study suggested four recommendations as per the four specific objectives of the study.

- ✓ To improve the National and county government engagement on drought management, there is need to systematic and urgently review current Turkana County drought management frameworks to include; County integrated development plans, emergency preparedness and contingencies plans, peace building, prioritizing water management among the nomadic pastoralist population and decentralising water management to the sub County level .Furthermore, drought management strategies should be locally owned, synergies assessed and gaps on drought management be identified at a more local level.
- ✓ The integration of indigenous drought household is perceptions on early warning and traditional weather intelligence and knowledge in to modern weather monitoring data is urgently required in Ilemi Triangle. The scientific meteorological stations provide precise weather information the study recommends for an Integration for better planning and targeting interventions. The study further recommends the Turkana County to test this Ilimi Model to have proactive and coordinated weather information flow.
- ✓ The National and County government must support pastoralists coping strategies to overcome future effects of drought. These strategies have been threatened and weekend by climate variability and change. More efforts must focus on reducing drought disaster risks and expanding opportunities for diversification of livelihoods and food production, safe livestock mobility and herd diversification. Applied interventions must target promoting women empowerment, supporting drought management education, community involvement and enhance access to livestock markets for climate resilient households. This must be prioritized in Ilemi Triangle.
- ✓ There is a need to support pastoralist's mitigation strategies that are sustainable and not short lived. The National and Turkana County government should immediately find a permanent water solution for pastoralists; improve security, work on food security,

improve livestock health services, strengthen pastoralist advocacy and invest in human capital in Ilemi Triangle to include introduction of immediate Turkana nomadic pastoralists livestock insurance framework and credit facilities, infrastructure improvement and livestock market. The study further recommends for an establishment of a drought research institute in Ilemi Triangle. This institute can produce weather extension officers and work on evidenced based weather management practices.

E. SUGGESTIONS FOR FURTHER RESEARCH

To strengthen the fountain of decision-making and generate more evidence based guidance and information that guide the pastoral programming in understanding on the coping and mitigation strategies, more research is required. The study has the following suggestions that may need further research

- ✓ The study scope was only on the Turkana part of Ilemi Triangle; there is a need to do a comparative research on the drought coping and mitigation strategies applied by other ethnic groups living within Ilemi Triangle to have a complete knowledge and policy adaptability.
- ✓ Further research is required to understand whether the safety net programs provided during drought in Turkana have reduced vulnerability or not.
- ✓ A study is required to analyse the implication of proposed ILIMI model on the early warning system in Ilemi Triangle.

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