

The Impacts of Climate Change on the Ilchamus Community Based On Gender

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Abstract: Climate change is considered as one of the undesirable effects of man's unsustainable development practices according to Bruntland report. The study sought to determine the impacts of climate change on the Ilchamus community based on gender by providing empirical status of affairs on climate change effects on the livelihood based on feminist theory and grounded theory. The study used descriptive design from the observations and focus group discussion. Study findings revealed that Lake 94 has been invaded by water hyacinth, has increased gender roles on women and exposed the community to food insecurity thus recommending deconstruction of gender, re-establishment of irrigation scheme and address the issue of water hyacinth urgently.

Key words: climate change, livelihood, food insecurity, water hyacinth, feminism

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I. BACKGROUND TO THE RESEARCH PROBLEM

Climate change will exacerbate existing economic, political, and humanitarian stresses. It will compound existing water scarcity problems, increase the number of people suffering water stress, and reduce access to safe drinking water. It will have an impact on rain-fed agriculture, affecting both local cropping patterns and international production and trade (UNDP, 2009). Intergovernmental panels on climate change found out that 75-250 million people across Africa could face water shortages by 2020; crop yields could increase by 20 percent in East and Southeast Asia, but decrease by up to 30 percent in Central and South Asia; and agriculture fed by rainfall could drop by 50 percent in some African countries by 2020. The loss of biodiversity will have additional negative effects on people's livelihoods (UNDP, 2009). The international negotiation process over, how to address climate change recognizes that although industrialized countries are largely responsible for greenhouse gas emissions, it is people living in developing countries who will bear the brunt of the effects of increasing temperatures, severe weather events and changes in rainfall patterns (Mainlay and Tan, 2012). Climate plays an important role in contributing to socio-economic development of the country as it determines availability and distribution of resources like water, wildlife and forests. Climate change impacts on the one hand vary depending on the regions and sectors but will be more severe where vulnerability to change is higher, stress factors are multiple and adaptive capacity is low. Poor communities tend to be more vulnerable especially when located in high risk areas as they have lower adaptive capacity and depend more on the local ecosystem services such as water and food (Government of Kenya, 2009). The severity of the climate change is felt most in those areas by the vulnerable members of the society especially the gender groups of women, children and the old who usually take time to relocate during disasters like droughts which have increased in recent years due to climate change (Government of Kenya, 2009).

Gender is both social and economic variable that can be used to measure the adaptation, vulnerability and resilience of the population against climate change impacts in local groups of people in sub Saharan Africa (Assan, 2014). Gender inequalities exist in Africa due to cultural background of different communities especially those who live in pastoral areas of Africa, where knowledge on gender equality information is still limited (Government of Kenya, 2008). Gender analysis recognizes that men and women play different roles in their families, communities and societies; they also have different kinds of access to information, resources and networks. It assesses the impact that an activity and environmental factors may have on men and women, and on

gender relations. This analysis can help to ensure that men and women are not disadvantaged by an activity, resource management and environmental factors to enhance sustainability and effectiveness, and identify priority areas for action to promote equality between women and men (Hunt, 2004). Gender is also important in the development of climate change laws, policies and adaptation planning. Social and institutional change action on climate change at individual, community, local, regional and national level, in private and public sectors are all affected by gender (Mainlay and Tan, 2012).

Kenya as a country in the sub Saharan Africa is very vulnerable to climate change impacts which affect the realization of sustainable development goals (KCCWG,2014). On the other hand, the Constitution of Kenya, 2010-elevates environment and development as human right, laying a firm foundation for climate change framework (ibid). The population under absolute poverty was estimated at 56% in 2000 (Government of Kenya, 2009). Climate change causes reduction in crop yields and food production thus affecting women livelihood strategies and food security (ibid). Traditional food sources may become more unpredictable and scarce as the climate changes. Women are further affected by extreme events of climate such as flooding and droughts. This is because, women keep livestock as a source of income and food security (KCCWG,2014).

Baringo County in Kenya is among the worst hit in the country by climate change impacts (ibid). The noted impacts include drying up of Loboï swamp due to global warming. Other indicators are drying up of the grass in the swamp environs and saline levels heightened due to inadequate water supply, reduced habitat for bees has increased as charcoal burning in the region produced a lot of smoke that affects apiculture in addition to Exotic tree species that had been planted in the areas from 1997, some of which are unfriendly to the bees. Siltation of lakes and diversion of river courses in the county due to increased soil erosion and decreasing numbers of Pod trees in the southern region are noted as further effects of climate change (KCCWG, 2014). The impact of climate change has seen the creation of Lake 94, which came into existence in 1994 adjacent to Lake Baringo as shown in figure 1.1.

It has been flooded and the growth of strange aquatic vegetation has become a concern besides increased human-wildlife conflict. The issue is raising concern since the crocodiles are feeding on livestock and hippos feeding on crops. Increased cases of epidemic diseases like Rift valley fever and malaria have compounded the problems.

II. STATEMENT OF THE PROBLEM

Vulnerability indicators include floods, drought, food shortage, lack of grazing areas and presence of alien species introduced on land and the lake. In the terrestrials environment they are exposed to the negative effects of an introduced alien species known as *Prosopis juliflora* (known locally as Mathenge), which was introduced by the government in 1975 to stop desertification effect in the area, while on the aquatic environments they are facing the challenge of another introduced alien species called *Crassipegrassippe* (water hyacinth) which is alleged to have been introduced by a fishermen from lake Baringo into Lake 94 as shown in figure 1.1 to protect the breeding areas for Claris and lung fish to increase their populations.

The community has lost traditional food security bases, degradation of their ecosystem support systems (land and water) thus making them vulnerable to impacts of climate change. The disruption has also impacted on their indigenous knowledge adaptation and long-term resilience strategies. All these challenges have been worsened by the climate change impacts in recent years. The worst affected are women, children, and the aged who take time to relocate whenever disaster like drought, flooding or insecurity attacks occurs. Since there was limited gender information's of Lake 94 area before and after its formation, in relation to climate change impacts, gender disparity and resilience, there was a need to carry out this study.

General objective of the study

The general objective of this study was to determine the impacts of climate change on the Ilchamus community based on gender.

Scope of the study

The study covered the whole of Legumgum sub location that surrounds Lake 94 in Baringo County. The study was carried out for a period of six months beginning June –December 2016.

Significance of the study

This study was significant in a number of ways;

The findings of this study provided vital information on areas of climate change, vulnerability and adaptation strategies and the roles women play in fighting climate change which can be used to inform policy. The study also provided empirical status of affairs on climate change effects on the livelihood of the vulnerable members of Ilchamus community living adjacent to Lake 94 area of Baringo County which has not been studied in detail before and after the creation of the lake by the effects of climate change. There are reported cases of negative impacts closely linked to effects of weather variations in the area. Alien aquatic plants species

have invaded and colonized the lake reducing the population of fish for the women, children and men, while wild animals like crocodiles and hippos have occupied the lake and are now posing a threat to livestock, crops and the community around the lake.

Invasive plant called *Prosopis juliflora* have also colonized the land next to the lake and affected livestock's production, changed the local vegetation, affected crops that are the sources of food and income and reduced indigenous herbs used for medicine by the men, women and children's of this community. Increased charcoal burning has also led to deforestation and migration of bees, relied on for honey, due to smoke. Whereas, soil erosion has led to siltation of the lake and diversion of rivers Perkerra and Molo. The lake has become a breeding ground for vectors spreading diseases like malaria and bilharzia that affects the health of men and women lessening their production. Currently there isn't an in-depth knowledge on climate change mitigation measures and adaptation strategies information that are accurate and packaged in a simple way for use among the Ilchamus of Baringo. This has made them become vulnerable to the negative effects of climate change. This study therefore was aimed at assessing climate change impacts, gender disparities and response resilience knowledge among the Ilchamus in Baringo county of Kenya.

III. THEORETICAL REVIEW

Feminist Theory

Ecofeminism, established by French feminist Françoise d'Eaubonne in the 1970s, is a relatively new form of feminist theory. It caught the eye of feminists, environmentalists and peace activists as a result of its aim to break down the structures and institutions limiting feminism as a philosophy. The study chose to use ecofeminism since it addresses phenomena that affect contemporary society, patriarchy, gender equality and environmental preservation by trying to understand how oppression as a structural process is used to eliminate domination. The theory purports that the society has been constructed to prioritize the dominance of patriarchal values and acknowledges that the union of groups who are oppressed can deconstruct the current social hierarchy to create a more inclusive society. This the study uses when assessing the gender roles before and after the formation of Lake 94 on the Ilchamus community. The theory also utilizes intersectionality, that is, the interconnectedness of identity traits such as gender to recognize similarities between the oppression, the oppressed and the domination of women which in this case the study disputes because it is in the climate change not the gender imbalance which has formed the lake forcing change on the gender roles among the Ilchamus community.

The ecofeminism movement concludes that human need to control the environment is identical to men's need to control women which according to Ilchamus society might be contrary as far as gender vulnerability is concerned. However, ecofeminism utilizes grassroots initiatives such as collective action through rallies and bottom-up decision making as seen through prayers by Ilchamus women and sacrifices offered by men to mitigate weather. This is also in line with feminism or liberal feminism which is also known in international relations theory when it strives for gender equality and environmental preservation within the framework of pre-existing patriarchal system as witnessed among the Ilchamus, while ecofeminism on the other hand aims to dismantle and completely rebuild with the foundation that all living things have value, worth and different qualities that make them vulnerable by trying to make women equal in a man's world or to prioritize the environment in a society that values consistent and extreme development. Ecofeminism highlights what a new world order should look like with man and woman, human and plant, all respected and contributing on an even playing ground especially when responding to natural disasters such as floods, formation of Lake 94, which are all effects of climate change. Ecofeminist concern is about the environment and how to adjust one's habits to be more eco-friendly for this reason the researcher chose to use this theory, whether or not the Ilchamus are passionate about equality across the gender spectrum. This has also been supported by Chipko Movement as illustrated in Shiva's 1988 book titled *Staying Alive: Women, Ecology and Development* where she discussed how women in Northern India were at the forefront in saving the forests from commercial loggers.

Grounded theory on climate change

The study used grounded theory because of being encouraged by its originators Barney, G. Glaser and Anselm S. Strauss (1967), who proposed that researchers should engage in simultaneous data collection and analysis which has become a routine in qualitative research. The main assumption was that, from the beginning of the research process, the researcher codes the data, compares data and codes, and identifies analytic leads and tentative categories to develop through further data collection. Grounded theory is new interaction and organization using methodology that is attentive to issues interpretation and a process not binding itself too closely to longstanding assumptions such as presentation of raw data, perfect or routine application of formulaic techniques of data. It is not for theory testing or absence of methodology.

This process is often described as theoretical sensitivity when reviewing literature in order to develop critical and analytical skills for the ensuing data according to Glaser (1978). The theory also helped in

conceptualizing data in order to make abstract interpretation of them. Climate change in relation to human societies require analysis of relations among human beings and between human beings and nature. This can be possible using grounded theory as an intersectional approach developed within critical feminist theory because of gender relations and power structures based on context-specific and dynamic social categorizations of gender roles. The theory provides an avenue to illustrate how the Ilchamus community reinforce or challenge and renegotiate in realities of climate change. This is because climate change has gained prominence on the political agenda where responsibilities and strategies to handle the challenges are debated. Climate change are mediated through social cultural and economic structures and process thus creating the need for social analysis since in the past climate change studies were originally shaped by natural science leaving out social scientific and humanistic approach which is part of grounded theory. The theory gives voice to the most exposed and vulnerable to adverse impacts of climate change such as women, children, the sick, the old and people living with disabilities. These groups are underrepresented at all levels of decision making in the community. It is through the intersectionality approach embedded in the grounded theory where climate change and gender vulnerability is best analysed. Intersectionality is also manifested in institutional practices, norms and symbolic representation of climate issues as witnessed among the Ilchamus community since it has evolved within feminist theory and grounded in a feminist understanding of power and knowledge production. It is an analytical tool used in the study to shed light on how structures of power emerge and interact between gender and politics of climate, society and nature.

The intersectionality approach comes in when the responsibility, vulnerability and decision-making power of individuals and groups in relation to climate change can be attributed to social structures based on gender, age, place and socio-economic status when coupled with the impacts of climate change as well as strategies for mitigation and adaptation in order to reinforce or challenge such structures and categorizations thus responding to study objectives two, three and four.

Consequences of climate change

The consequences of global warming have already manifested in the form of frequent occurrences of warm and drought years, decline in glaciers and snow cover, heavy precipitation and flash floods, sea level rise etc. it is very likely that such extreme events will continue to become more frequent, posing potential threat to ecosystems throughout the world (Varadanet *al.*, 2014). It is anticipated that climate variability and change in the Sahel will have overwhelming impacts on agriculture and land use, ecosystem and biodiversity, human settlements, diseases and health, and hydrology and water resources. With respect to agriculture and land use, climate change will likely elicit a significant change in agricultural production both in terms of the quantum of products as well as the location or area of production (*ibid*). For example, the change is expected to lead, among other things, to a shift in rainfall belts. Since agriculture is largely rain-fed in the Sahel, this will be accompanied by a shift in the traditional areas of production of certain crops with all the possible negative consequences that this may bring to the local people. The southward movement of the isohyets has also resulted in the southward migration of pastoralists into lands formerly occupied by sedentary farmers. This has been a major source of conflicts in the region leading to widespread destruction of farmlands and cattle, with adverse implications for food security in the region (Nyong, 2007).

Changes to biodiversity brought a lot by climate variability influence poor people's ability to exploit natural resource and cope with climate changes impacts (Republic of Kenya, 2009). In developing countries rural poor rely on wild food sources as food and fodder, medicinal plants to maintain health and forest products as fuel and construction material. Health's effects of climate change are manifested in the spread of infectious diseases are of concern to poor rural communities where access to proper health care and nutrition are severely limited. There is increase in vector borne disease such as malaria, dengue, and fever with increase to climate change related temperature rise (Government of Kenya, 2009). The world's dry lands are likely to be affected by more extreme weather with prolonged droughts and flash floods, which will not only exacerbate food insecurity, but might also cause forced migration, political instability, fragility and conflict. Some regions are more at risk than others. The Sahel, for example, faces a high desertification rate with an estimated 350,000 hectares of land lost per year. In addition, it is confronted with political instability – a worrisome combination of two critical developments (UNCCD, 2014).

Impacts of Climate Change

Some of the observable and projected impacts of climate change, in Kenya include flood and flash floods resulting from torrential rains (Handmer, et al., 2012). This has destroyed infrastructure and property, claimed lives and displaced many more. The obvious case scenario being the 1997/98 El Niño that resulted in massive economic losses as was described above. Moreover, during floods, diseases such as cholera, typhoid and bilharzia reach epidemic levels. This has been a burden on the already stretched public health infrastructure. Due to the increasing incidence of desertification, more land mass is continually becoming arid and semi-arid land (ASAL). As of 2013, approximately 85% of the total Kenyan land mass was ASAL, with a paltry 15%

being arable, occasioned by higher temperatures and varied precipitation. In other words, ASAL areas are slowly encroaching into arable land and the tragedy of this being that 60% of Kenyan pastoral communities are found in these ASAL areas. This may have an adverse effect in their livelihood.

Climate change has resulted in biodiversity losses, Chapin *et al.* (2000). Kenya's rich flora and fauna is one of its most valuable assets, however species losses have been observed while in other places indigenous species numbers of trees and animals have dwindled. Drought has resulted from the failure of rain in some seasons (Degefu, 1987). Famine resulting from massive crop failure has caused food insecurity. To put this in context, the 2009 drought and subsequent crop failure placed an estimated 10 million people (quarter of the population) at risk of malnutrition, hunger and starvation.

According to White & Ward, (2010), climate change has resulted in resource use conflicts, such as human-wildlife conflicts. For instance, pastoralists in search of pasture and water have encroached into game parks chasing away wild animals from their natural habitat while on the same breath; drought has pushed the wild animals closer to waterholes and vegetation near human settlements.

Furthermore, climate change has considerably affected Kenya's energy supply. Hydropower that supplies the country 70% of its electricity has suffered over the past two decades from catchment destruction. Indiscriminate cutting of trees in river catchments in Kenya's water towers has seen receding river discharge and reduced water volumes in generating dams. Climate change has exacerbated this by prolonging events of drought that see further reduction in water levels.

Global warming and climate change have been observed to disrupt or destroy tourist attractions. For instance, the snow-caps of Mount Kenya are melting while the great wildebeest migration has been under threat from reduced river flow (Rotich, 2015). These have and will continue to impact negatively on the tourism sector.

Climate Change Impacts among Small Holder Farmers

Although there has been much recent public discussion of the effects of climate change on rural areas of developing countries (Morton, 2007), there has been little discussion that both engages with the science of climate change impact on agriculture, and with the specificities of smallholder and subsistence systems. There are quantitative projections of future impacts from modeling studies, at a variety of geographical scales, focusing on key smallholder crops or ecosystems used by smallholder farmers, or reviewing data from such studies at a regional level.

Jones and Thornton in their work indicated that climate change translate to the reduction in the aggregate yields of maize in smallholder rain-fed systems in Africa. The reduction could be by a decrease of $\approx 10\%$ by 2055 (Jones & Thornton, 2003), but that these results hide enormous variability and give cause for concern, especially in some areas of subsistence agriculture.

A contested link between land degradation, climate change and conflict

Is there a link between land degradation and conflict in the world's dry lands? If so, what's the connection? Researchers have started to take a closer look at this question, also in the broader context of climate change impacts (KCCWG, 2014). Based on the findings of their research, scientists draw a broad range of conclusions. For some of them, the correlation is obvious, whereas others are more cautious and refer to environmental stressors, threat multipliers or threat amplifiers impacting armed conflicts.

At present, there is no scientific evidence proving that desertification, climate change and conflict interact (*ibid*). Researchers agree that land and other environmental degradation could be contributory factors to conflict but would never be the sole cause. As with all conflicts, there is always a mixture of causes and drivers such as political repression, economic crises and hostility between social groups. The question is how dominant one factor is in relation to others.

Many scholars therefore see a need for more extensive research. Only then will it be possible to gain a more accurate picture as the basis for sound policy recommendations (*ibid*). Conflict in improvised rural regions is a serious issue related to climate change. The confluence of food insecurity, loss of livelihood and increase in vulnerability to infectious diseases may result in various forms of adaptation that will generate new and exacerbate existing conflict.

Declining access to land and natural resources leads to loss of livelihoods and food insecurity, forcing affected population to migrate and encroach on already occupied productive lands. This leads to land related disputes and conflicts. Violent forms of conflicts erupt when poor people resort to aggressive means to obtain access to land and resources and provide for their immediate needs. Climate change can increase income inequality and class-based conflict (KCCWG, 2014).

Effects of alien /invasive species

Some of the respondents attributed the increase in soil degradation to the increase in *Prosopis juliflora*. They argue that since this invasive species does not allow any undergrowth, it makes the soils more vulnerable

to erosion. According to Mwangi & Swallow, (2005), *Prosopis juliflora* stands interfere with drainage, blocking watercourses and exacerbating the periodic effects of flooding. Therefore, the responses provided by the pastoralists are a confirmation of what was reported by the two researchers who conducted their research in this area (Lelenguyah, 2013).

2.4.2.9 Changes in the population of crocodiles and hippopotamus

Lelenguyah, (2013) attribute changes in aquatic animal population to the frequent floods and the increase in the water level of Lake Baringo. The changes in the abundance of the hippopotamus and crocodiles in the area over the study period is a clear indicator of the effects of climate variability and change in the area. This is because the increase in flood water leads to expansion of habitat for these two species. With most of the respondents reporting an increase in the abundance of these two species, the area seems to have been experiencing heavy rainfall amounts leading to expansion of habitat for the two.

The crocodiles particularly were said to have increased in population to the extent that they frequently visit the homesteads at night to prey on livestock. Over the recent past, children were also attacked by crocodiles while fetching water in Molo River near Logumgum according to the respondents (ibid).

2.4.2.10 Indigenous peoples experience of severe effects of climate change

The indigenous people experience of climate change includes droughts, floods, extreme rainfalls, strong winds, disruption of seasons, drying up of rivers, rising temperatures and frost. These hazards threaten their economic, social and cultural survival when, for example, livestock die, wild plants that form core elements of their diets rot or dry, or medicinal plants are no longer found in the forest. Their cultural values and institutions are challenged, when decreasing predictability of weather conditions is undermining their traditional knowledge and cultural notions of causal relationships.

Some of the community perceptions of climate change and related impacts are close to scientifically predicted changes, while others differ. Further, scientific and indigenous notions of climate change and related impact are not necessarily immediately comparable (Osunade 1994; Warren 1992).

IV. METHODOLOGY

The study adopted descriptive research using case study and key informants to gather information. The study was carried out in the semi-arid rangeland of Logumgum sub-location of Baringo County, Kenya. This area is located between latitude 00°26'- 00°32'N and longitude 36°00'- 36°09' E and an average altitude of 900m above the sea level. It is located within agro-climatic zone IV and V (Wasonga, Nyariki, & Ngugi, 2011). Logumgum is one of the sub location in Marigat sub-county in the larger Baringo County. It is made up of 10 (ten) villages which include; Logumgum, Sororwa, Silango, Losamburmburu, Loitip, Sirata, Eldebes, Retoti, Lorok and Tasekwam. The sub location covers an area of 1,677.45sq.km (District Development Office, 2011). Administratively, the sub location is being administered from Sirat market centre as shown in Figure 3.1

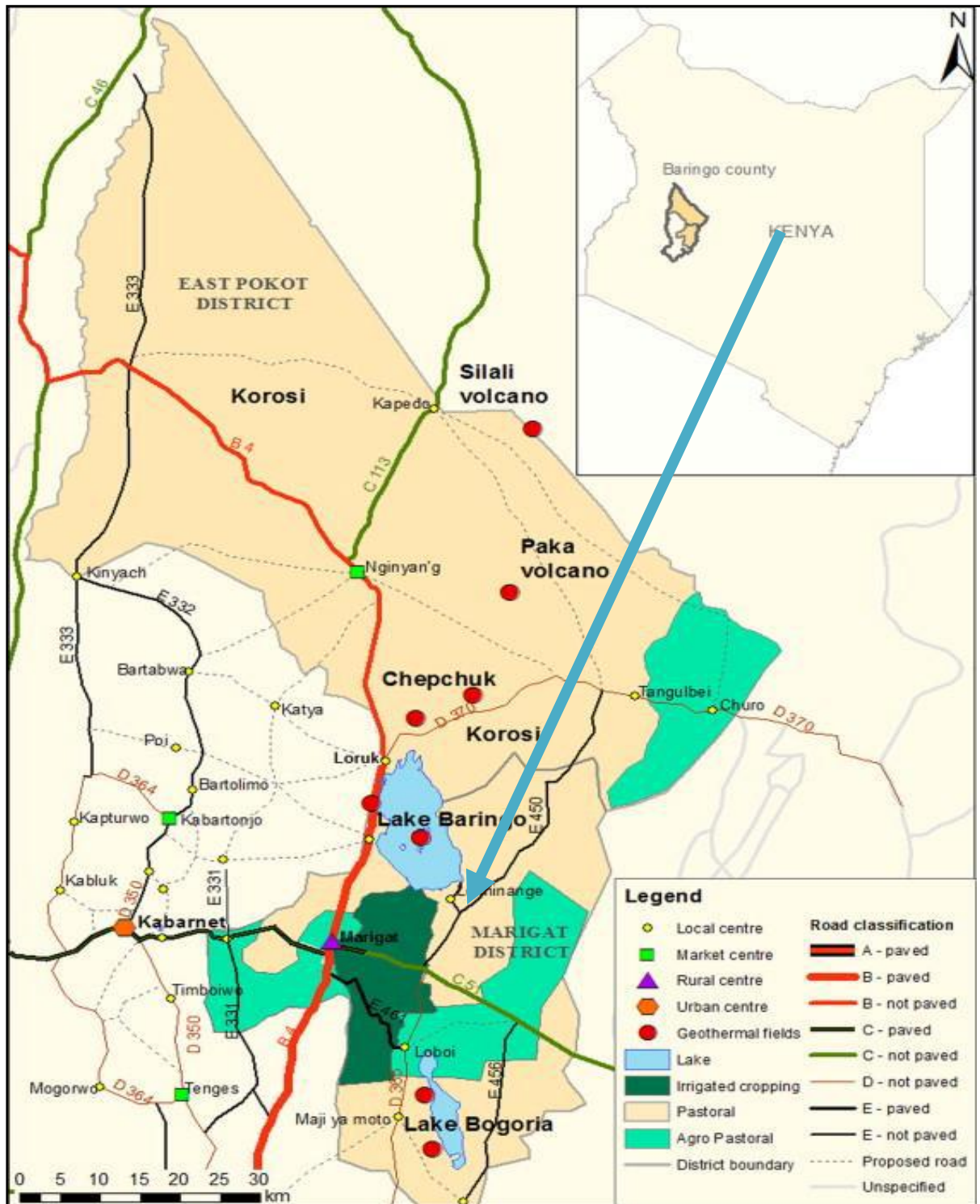


Figure 3.1: Map of Baringo County showing the study area (Highlighted in dark blue) (Lelenguyah, 2013)

V. STUDY FINDINGS

5.2 Impacts of Lake 94 on the health of the Ichalmus community

Water in Lake 94 is considered fresh water as the level of fluoride and other dissolved elements are very low according to key informant. This has not affected the teeth of children in the area using the water, unlike other areas in Rift Valley where cases of fluorosis effect are pronounced and evident, but the quality and safety of the water drawn from the lake is not known.

The impact caused by the extreme weather on the livelihood of the community was increase of human and livestock diseases like malaria, typhoid, yellow fever, abortion and zoonotic disease like rift valley fever which killed a number of livestock. The lake collects a lot of run-off water during rainy season which

contaminates water since most homes have not constructed latrines thus depending on open fields to relieve themselves as observed during the study.

5.3 Literacy level before and after formation of Lake 94

The creation of the Lake 94 has brought positive impact on the education of Ilchamus children living in Legumgum sub location, according to respondents; it has reduced cases of absenteeism and lateness of children to school in the area. Primary school enrollment in the area has gone up by over 300% from 1995 to date according to the head teacher of Logumgum primary school and data provided in table 4.5. Since animals are left free to graze around the shore of the lake without attendance by the young boys and girls. The search for water which made parents to pull their boys and girls out of school to go graze their livestock or search for cooking water is no longer practiced as explained by the key informants.

According to the Parents Teacher Association (PTA) chairman of Logumgum primary, the Ilchamus community is investing in education. The school has boarding programme for children from far flung parts of the location. The water has enabled the school to carry out its feeding programme, which has attracted a large number of pupils as shown in Table 4.6 except in 1998 when enrolment dropped as a result of floods experienced that year displacing many families and also due to outbreak of water borne diseases.

Table 5.1: School Enrollment in Logumgum Primary School between 1984- 2017

Year	Boys	Girls	Total
1984	69	49	118
1985	50	52	102
1986	61	56	127
1987	67	60	127
1988	54	50	104
1989	56	61	117
1990	58	45	103
1991	64	47	111
1992	70	56	126
1993	56	62	118
1994	61	57	118
1995	73	64	137
1996	70	69	139
1997	71	56	127
1998	61	38	99
1999	70	52	122
2000	70	60	130
2001	72	64	136
2002	81	69	150
2003	103	92	195
2004	136	125	161
2005	149	97	246
2006	130	113	243
2007	123	146	269
2008	143	118	266
2009	137	116	253
2010	141	113	253
2011	150	162	312
2012	169	165	334
2013	172	181	353
2014	194	176	370
2015	178	190	368
2016	198	199	397
2017	217	218	435

Table 5.2: Schoolenrollment in Logumgum primary school for the year 2017

Class	Boys	Girls	Total
1	28	32	60
2	25	32	55
3	27	28	55
4	24	37	61
5	32	28	60
6	31	25	56
7	28	23	51
8	22	13	35
	217	218	435

Table 5.2 shows enrolment of pupils and significance of drop-out rate of girls from standard five to eight when most girls have reached puberty. This drop-out was attributed to early marriage as practiced in the area according to the key informant.

5.4 Impacts of climate change on the Ilchamus community

The impacts caused by these extreme weather on the livelihood of the community were displacement of people, hunger, destruction of property, sweeping away of grass seeds, death of livestock, shortage of food, reduced pasture areas, migration of people to other areas, effect on economic activities like farming, trade among others as explained by general respondents and key informants.

Climate change has contributed to increase in cattle rustling. During rainy season's cattle rustlers become more active because they want to restock their livestock lost during drought which are attributed to climate change. Cattle's rustling is the habit of stealing cattle from neighbouring communities either to restock their livestock after drought or due to cultural practices such as using the animals to pay bride wealth since men must first take neighbour's cattle to pay before his father can chip in.

A common practice the young man comes out with the help of his age mates normally after passing through the rite of passage which is marked by circumcision and seclusion from the community for some period. The Ilchamus community was always attacked by their Pokot and Tugen neighbours. They also led similar raids to their neighbours. Moranism and early marriage was found out to be still active in the area. *Adongokedong* dance was performed by women to men to celebrate their successful cattle rustling raids or Girls sing to the morans challenging them why they have not made successful raids, this provokes the young men and make them go into this raids and get animals. These raids were normally carried out during rainy seasons when the animals were healthy and could move faster. This creates insecurity in these areas that it was difficult to conduct the study among these tribes at the same time as explained by 70% of key informants.

7.4 Impacts of climate change on the socio- economic activities of Ilchamus community

Climate change impacts have seen an increase in cattle rustling in the region. This is the habit of stealing cattle from neighbouring communities either to restock the livestock lost after drought or due to cultural practices as reported by the respondents.

The Ilchamus community is always attacked by their Pokot and Tugenneighbours. They also lead similar raids to their neighbours. Baringo county and many drier areas in the northern parts of Kenya, cattle rustling is very rampant due to moranism and early marriage, which was found to be still active in the area.

Indicator of early marriage was proved by the presence of a rescue centre built and run by Baptist church. It was reported to be rescuing girls from early marriage. Moranism was associated with *Adongokedong* dance which was performed by women to men to celebrate their successful cattle rustling raids or in some occasions girls could sing to the morans to provoke and challenge them why they have not made successful raids and brought herds of cattle to prove that they are tough men who are ready to become family heads. This is claimed to provoke the young men and made them go to raid and get herds of animals. These raids were normally carried out during rainy seasons when the animals were healthy and could move fast. This has created insecurity in these areas that it was difficult to conduct the study among the Ilchamus in the company of a Tugen.

The problem was real that a Tugen officer could not accompany the researcher to Sirat trading centre. Mwangi and Swallow, (2005) report that sharing land, pastures and water, which are common resources, has become a major challenge for the Pokot, Tugen, Ilchamus, Turkana and other communities in Baringo County. These ethnic groups have developed a deep mistrust of one another. The fear of cattle rustling haunts the land.

A conflict assessment of northern Kenya by Pragya, an NGO working for the appropriate development of vulnerable communities and sensitive ecosystems, reports clashes occurring between the Tugen and Pokot in

May 2012. At least five people died, and violence displaced more than 7, 000 people and led to the closure of more than 10 schools.

The Ilchamus have stopped keeping large herd of cattle and rain fed agriculture due to climate change and expansion of *Proposisjuliflora* which has reduced grass biomass as shown in figure 7.3 below.



Figure 7.3:A small herd of cattle's grazing on land infested with *Proposisjuliflora* around Lake 94 (Akinyi &Oruko,2016)

They have instead adopted irrigation farming, shop keeping, fishing and selling of grocery, transport using motorbikes, charcoal burning, and beekeeping as sources of economic livelihood. According to Orindi *et al.* (2007), Drought affects pastoralists and agriculturalists, its impacts on pastoralists are higher as people loss animals. Local communities have been forced to develop different coping strategies for drought (Meza-Morales, 2010).

For agriculturalists the strategies include reduction of sown surface and crops prioritization, irrigation management (accumulate, recycle and water right shifts), drill and deepening wells, use of public resources. While for pastoralists coping strategies are nomadic summer pastures, selling cattle, storage of fodder, seek an alternative source of income (e.g. mining activity and agricultural temporary work). The Ilchamus have tried to expand their irrigation but the participation of women is not clearly spelt out when it comes to allocation of land and user right of water to grow crops as explained by respondents.

The Ilchamus were eating meat, milk and blood from cattle before climate change impacts increased in the area. After the increase of impacts, the Ilchamus now eat fish, githeri, rice, wheat, maize flour, kales, tomatoes and vegetables, watermelon, papyrus some grown in their farms while others they buy from shops. They even store food in traditional granaries after harvesting for some period.

The implications of the changed eating habit among the Ilchamus due to climate change are found to be increased body immunity through improved nutrition. This has led to increase in population by speeding up birth rate and growth rate.

High population growth later leads to deterioration of the natural environment and threatens the provision of food if there is no proper planning. For instance, in Kenya the land resource base has been affected by overstocking, water and soil pollution (Ndunguet *al.*, 2010).

Large number of livestock overburdens the land carrying capacity and causes soil erosion which ends up polluting water bodies and reducing the quality and quantity of water for human consumption. This affects the health of women and children. As a rule, poor social groups bear the brunt of climate change not only because they are more dependent on natural resources, but also because they lack the requisite capacity to adapt to climate change. About two thirds of the world's populations living in poverty are women, which underlines their greater vulnerability to the changing climate. The differential impact of climate change on women and men is due to social norms, traditional roles and different power structures states Schalatek,(2009).

Loss of traditional foods like milk and blood affects the household nutrition and has impacted negatively on Ilchamus community survival and cultural identity; although their loss is being supplemented by fish as source of protein, but the management of fisheries sector as a natural resource has not been gendered

therefore women still face limited opportunity in this area as explained by Ndunguet *al.* (2010). This is due to minimal documentation on women's role in the sector as explained by these factors; the debate on fish catch and production goals and solving the overexploitation problem is dominated by men and continues to dominate national policy agendas.

As a result, research attention continues to be focused on the catching sector (male dominated) rather than processing and marketing sector (female dominated). Research which purports to be gender –neutral is often “gender blind” and fails to see the bigger livelihoods picture. Gender roles in the fisheries sector are dynamic and have to change in relation to each other and their activities in order that livelihoods are protected and the ultimate goals of food provision, family security and socio- economic advancement can be attained (ibid). Therefore, women are more on marketing of fish but not its production as shown in figure 7.4 below.

Other social changes the Ilchamus have experienced due to climate change are change on land ownership because people are now registering their land into group ranches. This is excluding women because it is only men who are allowed to register their names on land according to 61% of the respondents. Formerly land was owned by the whole community and it was possible for women to make a claim through their husbands.

The same applies to animals kept in those ranches, they are owned by men. Unfortunately, women in Kenya and other Africa countries do not own land according to Ndungu et al. (2010), both modern land distribution system and customary land ownership exclusively bestows land ownership to the male counterpart. It means that women cannot use such land as collateral to obtain credit facilities from banks. This also means that women cannot invest on sustainable land management practices which limit their creativity and actions (Boserup *et al.*, 1970).

Women are usually responsible for providing the family with its basic nutrition, yet they rarely have access to and control over the resources required to fulfill this task when cultivation conditions deteriorate. Hence climate-induced crop failure also puts the food security of the entire population at risk (Denton, 2002). More than anything else, however, women lack land rights, ownership rights for the means of production, technology, finances, information and training, for example, in climate adaptation and disaster prevention according to Rodenberg (2009).

Studies have shown that women and children are 14 times more likely to lose their lives in a natural disaster as reported by Araujo *et al.* (2007). This is also explained by socio-cultural stereotypes: warnings of disasters announced in public places that are often in accessible to women. In the aftermath of natural disasters, the lack of ownership titles poses an enormous problem to women, as they are denied the right to buy a plot of land should they have to resettle (ibid). Moreover, after a disaster, women face a heavier workload involving clean-up work, subsistence activities and nursing the sick (ibid).

Consequently, not only are they left with virtually no time for income-generating activities, but they also run the risk of being exhausted and overworked (Bridge, 2008). Within the lake Baringo area, increase in human population and livestock numbers over the years has caused pressure on the available natural land resources, including vegetation, soils and water. This has resulted in past as well as current land degradation processes of different types and magnitude (Onywere *et al.*, 2014).

The dynamics of population and livestock pressure when considered in the light of the changing land tenure as a result of the changing lifestyle of the inhabitants from pastoralism to sedentary or accommodation of agro-pastoralism practices has increased the vulnerability of the communities to the current flood and drought risk (ibid). There is need for legal and policy instruments to consider women as part and parcel of new processes of natural resources management.

To accelerate promotion of sustainable livelihood at community level, women must be given the right to inherit land and have access to resources and credit (Overbolte *et al.*, 1985). In Kenya, the new constitution has recognized land ownership and inheritance by women but the implementation at local levels is still facing challenges thus the need to mainstream the gender issues at village levels to support disadvantaged women.

The study also found out that the effects of invasive species has been experienced in the area especially *Prosopis juliflora* which has colonized the terrestrial environment by over 80% since it was introduced in 1975 by the government through FAO project. The project was started to increase food production in semi-arid areas. The larger part of Lake Baringo watershed is characteristic of semi-arid environment and faces many challenges among which soil erosion and water pollution ranks highest and directly affects human health (Onywere *et al.*, 2014).

More recently there have been environmental impacts of far reaching dimension on both human and livestock health, brought about by this invasive plant species. *Prosopis juliflora* introduced to the area to control soil erosion and provide fodder for livestock, the basis of livelihood in the area has raised concerns that; there are lowered water table and lack of alternative plant species for pastures in the areas that have been invaded by the plant (ibid). In addition, the area is a highly fragile ecosystem with impacts on water quality from geothermal manifestation (ibid). Some of the respondents attributed the increase in soil degradation to the increase in *Prosopis juliflora*. They argue that since this invasive species does not allow any undergrowth, it

makes the soils more vulnerable to water erosion. *Prosopis juliflora* is also not a social plant and has allelopathic effects.

Herbs and scrubs that normally grow underneath large trees are known ecologically to act as natural filters and buffer zone for soil erosion and nutrient trappers. When their growth is inhibited then those ecological functions are reduced leading to soil degradation observed by the respondents. According to Mwangi and Swallow, (2005) *Prosopis juliflora* stands interfere with drainage, blocking water courses and exacerbating the periodic effects of flooding. Therefore, the responses provided by the pastoralists are a confirmation of what was reported by the two researchers earlier who conducted their research in this area according to Lelenguyahet *al.* (2014). *Prosopis juliflora* (Mathenge) has prolifically increased in its growth, limiting accessibility to many areas as shown in figures 7.5.

The plants thorns also pose a risk to injury from those buried by floods (Onywere *et al.*, 2014). The flood waters from Lake Baringo were reported by respondents to have spilled over into Lake 94 and surrounding areas. This caused the movement of fish and other animals out of Lake Baringo. Onywere *et al.*, (2014), observed that, the fish in the lake Baringo spread far and wide within the flooded areas including Lake 94 and villagers are fishing from within the flood plains. Therefore, the expansion of Lake 94 influenced the Ilchamus community living nearby to get involved in fishing activity.

The crocodiles and hippopotamus in the lake are now not confined to the lake but are now coming out to the flood areas (*ibid*). The snakes that infest the Lake Baringo area have migrated to drier areas increasing the risk of snake bites (*ibid*). Increased amount of floating mats of water weeds (Nile Cabbage) that are seen as islands in Lake Baringo are now the main undergrowth in the flooded areas (*ibid*). The raised water level dislodged any loosely anchored papyrus along with water hyacinth and salvinamolesta that is now scattered all over Lake 94 as shown in figure 5.6.

This was enlarged when water hyacinths also invaded the Lake 94 ecosystem where it was claimed by respondents that Luo fishermen introduced it from Lake Baringo claiming that it helps in the reproduction and faster breeding of fish species especially *claris* and lung fish.

The effects of the invasive water hyacinth presence in a Lake due to high nutrient loading on the physico-chemical characteristic and phytoplankton productivity has been documented by Mironga *et al.* (2012); Mironga *et al.* (2011). They include loss of biodiversity inside the lake and along the riparian zones. According to Lelenguyahet *al.*, (2014), the frequent floods and the increase in the water level of Lake Baringo and by extension Lake 94 has brought changes in the abundance of the hippopotamus and crocodiles in the area of the study, a clear indication of the effects of climate variability and change in the area which affect both men and women. This is due to the increase in flood water that led to expansion of habitat for hippopotamus and crocodiles.

With most of the respondents reporting an increase in the abundance of these two species signifies that the lake is wide and deep enough to accommodate large animals. The impacts of these animals' presence is the human-wildlife conflicts frequent reports. The crocodiles particularly were said to have increased in population to the extent that they frequently visit the homesteads at night to prey on livestock.

Over the recent past, children were also attacked by crocodiles while fetching water in the lake near Logumgum according to the respondents. Snake bites have increased because many snakes moved away from their riparian habitats to dry terrestrial land where people live. Hippopotamus destruction of food crops like maize, vegetables, tomatoes and water melon within the irrigation plains of river Perkerra and the surrounding of Lake 94 was reported by most of the respondents. This affected the family food security and source of income and impacted negatively on most women who work in those farms to feed the family.

Water hyacinth menace in Lake 94 was reported to have reduced fish population and blocked access into the lake for fishermen. This resulted to inaccessibility of fishing grounds by fishermen with their artisanal boats and their fishing gear ending up with less fish production. Some fish species like tilapia which cannot live in oxygen deficient water were affected and their population reduced in such ecosystem as explained by Mironga *et al.* (2011). The lung and mud fish species, which could survive in such ecosystem, were over harvested and this led to their depletion which has made former fishermen to turn to farming, where they are faced with wildlife menace, increasing gender vulnerability in the face of climate change among the Ilchamus community.

Behavioural changes like prostitution, alcoholism, charcoal burning, reliance on relief food and buying of food from shops are all attributed to climate change impacts according to the respondents. Some of the responses of the local pastoralists to these changes have far reaching implications both on the environment and the area's economy. For instance, the change in normal livelihood source of income which was livestock economy to charcoal burning led to destruction of forests and loss of important water catchment areas as shown in figure 7.4.



Figure 7.4: Deforestation due to charcoal burning around Lake 94 (Akinyi, 2016)

In addition, the dependence on relief food will strain the economy of the county through diversion of funds from prioritized economic areas to buying food reserves for feeding the displaced populations (Lelenguyahet *et al.*, 2013). Prostitution and alcoholism has led to the spread of HIV, AIDS and other pandemic diseases which affect both gender. Tuberculosis, HIV/AIDS and malaria are the leading causes of morbidity and mortality in Kenya. They impact most on women due to underlying socio-cultural factors such as the burden of household responsibilities including care for the sick (Report of Kenya Government, 2009). Evidence indicates that men and women may have fundamentally differential risk taking behaviours even in climate change related scenarios.

Women risk adverse behaviour may afford them certain benefits when it comes to climate change adaptation (Pattet *et al.*, 2009). Development-policy issues, particularly gender equality aspects, have long been ignored by the climate discourse. Gender equality has been paid increasing attention only since the publication of the United Nations Development Program (UNDP) report and that of the Intergovernmental Panel on Climate Change IPCC of (2007) according to Rodenberg, (2009).

This is surprising as the consequences of climate change are by no means gender-neutral. The gender dimension in climate change comprises primarily two aspects: women, particularly in developing countries, are more vulnerable than men to the consequences of climate change (higher vulnerability); second, men and women play different roles in dealing with climate change, whereby women are major actors in several areas of mitigation and adaptation (agents of change) (Rodenberg, 2009).

7.5 The formation of Lake 94 and its effects

According to the respondents, on 26/4/1994, a torrent rain was experienced in the area. This resulted into the flooding of river Molo which originates from the eastern part of Mau forest in Nakuru County. The flood carried along with it big logs that were left on its channel to Lake Baringo which led to the formation of Lake 94, a fluvial lake, as described in 4.4.

Blenckner, (2005), explain that fluvial lakes are very shallow, although they constitute almost 10% of all lake surface area, they hold only about 0.3% of the volume. The authors explain that Sediments transported by rivers may accumulate, for example, in river bends, and create a form of dam, or running water may excavate depressions. Meandering rivers may also take a new course through a river bend and then a lake ending up with the formation of the oxbow lake. A river system with an oxbow lake often includes many such small lakes like Lake 94.

The fluvial lakes can also be created due to processes acting over a long time, or as a consequence of very extreme weather events (ibid). This fits the respondent's explanation of how Lake 94 got formed. Using the narrative given by the respondents, the lake can be described as a fluvial lake formed due to sediments transported, deposited or accumulated by river Molo and Perkerra, as a consequence of very extreme climatic events, which occurred in 1994, where torrential rainfall pounded the area causing a massive flood that resulted into the formation of the lake. This is supported by the fact attributed to Onywere *et al.* (2014), who reported that,

the increased recharge of Lake Baringo was mainly from Molo and Perkerra Rivers, now both reaching the lake directly through surface recharge and bringing in a large amount of sediment loads.

The Ilchamus like the Maasai, Ogiek and Turkana live within the Rift Valley Province of Kenya now Baringo county since 2010. They all have long historical connections and have retained their socio-cultural links with the lands and environments that they depend on for their livelihoods.

Traditionally, the Maasai and Turkana were pastoralists, the same way the Ilchamus were in the olden days according to Boko *et al.* (2007). This defined much of their culture and economy. The Maasai community depends directly on Lake Naivasha, which also feeds off the Mau Forest Complex, which eventually releases some of its water into river Molo that drains into Lake Baringo by Extension feeds also Lake 94 (*ibid*).

Lake Naivasha in recent years has suffered substantial degradation as a result of competing land uses, especially arising from the establishment of large horticultural farms. Thus, traditional livestock keeping practices have come under immense pressure, particularly due to the curtailment of livestock mobility. The same scenario has not spared the Ilchamus and the Lake 94. The site falls close to Perkerra irrigation scheme in Baringo. The irrigation scheme and the areas covered by Lake 94 have taken up most of the land that was previously used as dry season grazing fields for livestock's according to the respondents. This has curtailed livestock numbers and mobility among the community. The impact has a bearing on the gender equality in the area. The other notable ecological changes that have been experienced in the area include the diversion of river Perkerra along its original course. This has resulted into the drying of river bed thereby causing the drying up and eventual death of *Ficus sycomorus* trees as shown in figure 7.5.



Figure 7.5: *Ficus sycomorus* trees drying up along the riparian zone of former course of river Perkerra (Akinyi & Oruko, 2016).

The drying of these trees can be explained by the following scientific facts. The tree falls into the categories of C₃ plants that require a lot of water for growth. When the river course changed the ground water supply was interfered with. The trees could not survive the dry environment therefore they got dried up as observed. Since they were key species in the ecosystems, their death has affected the riparian zone of the river and by extension this has affected the gender in the area.

According to respondents, beneath these big trees used to grow some herbs which the Ilchamus used as traditional medicinal herbs and vegetables during dry periods. These dried up. The tree was also used to host the beehives for the community; therefore its extinction within the zone is a disaster to the Ilchamus community. The introduced species of *Prosopis juliflora* which is not a social plant very few herbs are also not able to grow underneath it. It does not help the bees as well. The end result is the negative impacts both socially and economically on the livelihood of the Ilchamus community.

Climatic variations factors and ecological succession around Lake 94

Since its formation, the lake has dried up twice due to severe drought in 2000 and 2009. The average annual temperature of the area is about 27°C. The period between January and March is the hottest with temperature rising to over 40°C according to Kimani *et al.* (2014). This climatic variability significantly affects

the water levels in Lake 94 as it hastens evaporation and evapo-transpiration of moistures from water surface and floating aquatic plants in water during photosynthetic process.

This problem is exacerbated further by water abstraction for irrigation by horticultural local farmers in the sub location. This affected both gender in the area that relies on farming as their source of food and income. The Rift Valley lakes have had a history of fluctuations which have been recorded since 1860 (Richardson, 1966).

The current lake level rise and formation of new ones represents an opportunity for scientist to study *in-situ* ecological changes taking place as a result of the increased water volumes and the flooding of the riparian areas of the lakes from the raised water levels and how they relate to gender issues as proposed by Onywereet *al.*(2014).Secondary Ecological succession was observed on the areas where the lake was receding as shown in figures 7.6.



Figure 7.6:Secondary ecological succession observed around Lake 94(Akinyi &Oruko,2016)

Terrestrial (dry land) is composed of the indigenous species of plants like *Balanitis aegypticus*, and *Acasia* species among others. The immediate zone is composed of invasive species like herbs, *Prosopisjuliflora*and many others. Plants and trees that arenot adapted to aquatic environment dried off when they were submerged by water. Water zone was observed to have aquatic plants like tyhpa, papyrus, sage grass, water lilies and water hyacinth.Some of these aquatic plants are being consumed by the area residents as vegetables and food as reported by the respondents and sampled by the author.

The colour of water in the lake was observed to be brown in colour an indication of soil pollution from surface run off probably from the catchments areas.Thegrowth of emergent/floating plants in the lake were indications of eutrophication effect which is due to the enrichment of the water body with nutrient like Nitrate and Phosphorous from non-point sources of pollution from within and without the surroundings of Lake 94.

It is speculated that farmers are applying excess amount of fertilizers in their farms along the rivers basin and upstream, which are not taken up by plants. These excess nutrients end up being washed by rain water into the Lake 94where they cause eutrophication effects. This promotes algal growth resulting into a mat of bloom which lowers the water quality and in some cases lead to death of aquatic species ending up with reduced biodiversity.

Loss of biodiversity in an ecosystem has a negative effect on gender, when they rely on environment for existence as is the case in Logumgum sub location. The growth of water hyacinth in the lake has reduced drastically the population of fish as the respondents reported that the catch has gone low in recent past. This has affected the family income and nutrition base which was supplementing the loss of milk in the diet. The long term effect is likely to be felt by the community in years to come, mostly by women and children.

7.7 Influence of Lake 94 on health of the community

Water in Lake 94 is fresh as the level of fluoride and other dissolved elements are very low according to key informant.Onywereet *al.*(2014), states thatLakes Naivasha and Baringo are fresh-water bodies. This is due to the fact that the two lakes have underground outlets of waterwhich reduces the concentration of mineral salts which causes salinity in most lakes in the rift valley.While observing the pupils of Legumgum primary

school it was seen that their teeth has not been affected by the lake water in spite of consuming it, unlike other areas in rift valley where cases of flourosis effect are more pronounced. This is justified by figure 5.11.

The impacts caused by the extreme weather on the health of the community was reported by respondents as increase of human and livestock diseases like malaria, typhoid, yellow fever, livestock abortion and zoonotic disease like rift valley fever which killed a number of people. The rift valley fever is normally associated with flood water in arid and semi-arid areas after prolonged drought as explained by the officer in charge of tsetse fly control in the area. It is a zoonotic disease that affects both animals and human beings. It is controlled by vaccination and immediate treatment when the symptoms are detected in time and medication is administered immediately.

During El-nino rains of 1997-98, humans and livestock died in large numbers which forced the government and nongovernmental organizations to intervene. The lake has also become a breeding ground for mosquitoes causing malaria, thus many respondents reported increased cases of malaria.

Typhoid disease was reported in the area because residents consume raw water from the lake without boiling. The occurrence of yellow fever and rift valley fever shows that the area could be incubation ground for these diseases or the residents might be having dangerous disseminators among the populations, who could be carrying the disease without being affected while spreading it to others who come into contact with them.

The disease outbreak prompted government to build a dispensary in the area; it will be good to post-qualified health personnel to monitor the spread and pattern of the diseases in the area in future. Health's effects of climate change are manifested in the spread of infectious diseases that are of concern to poor rural communities where access to proper health care and nutrition are severely limited.

There is increase in vector borne disease such as malaria, dengue, and rift valley fever with increase to climate change related temperature rise according to Kenya government report, (2009). Increased temperatures can lead to changes related to the development, transmission, and lifespan of mosquitoes. Adult mosquitoes actively feed during the spring, summer, and fall months. Higher temperatures speed development of larvae and pupae, thereby producing more generations. Higher temperatures shorten the extrinsic incubation temperature of both viruses; thereby enhancing transmission. Higher temperatures would likely lengthen the mosquito season, thereby extending the transmission season according to Adaptation Subcommittee workgroup members, (2010). Health is also a major factor in people becoming poor.

In Cambodia, people's resilience to health-related shocks is limited. If the intensity and frequency of these shocks were to increase, it would bring additional pressures that could become unmanageable, according to Cambodia human development report. (2011), even though Cambodia has made significant progress in reducing the prevalence of major diseases and has been internationally recognized for its efforts in response to HIV/AIDS, over the last decade important improvements have also occurred in Cambodia's health with indicators starting from a low baseline but the quality of health services still requires further strengthening.

Food and water-borne diseases remain critical factors in the prevalence of illness. There are many reasons for this (ibid). Despite improvements, the percentage of rural people who have access to safe water and sanitation is still very limited. Villagers often have only a single water source for drinking (including ponds, streams or rivers), which can be easily contaminated. Even if access to toilets exists, education regarding their appropriate use is often lacking. Water and sanitation programmes may not reach very remote parts of the country, and infrastructure may not be accessed or maintained (ibid). The listed factors were found to exist among the Ilchamus community.

Sheltering issues do also arise due to extreme weather events. Hurricanes and floods may lead to evacuations, which will stress Connecticut's sheltering assets. Around Lake 94 floods and thunderstorms in company with strong winds normally occur and lead to destruction of property and lives. The American Red Cross has been working with the Department of Emergency Management and Homeland Security (DEMHS) and with Emergency Management Directors (EMDs) from towns and cities within the state, to compare sheltering data according to Adaptation Subcommittee workgroup members (2010).

In Lake 94 area, Kenya Red Cross and Kenya governments have been coordinating the evacuation and temporary settlement of the victims according to respondents. The most impacted populations by climate change will likely be communities of color and low-income communities that are socially disadvantaged, disproportionately burdened by poor environmental quality, and the least able to adapt, otherwise known as Environmental Justice (EJ) communities.

These EJ communities may disproportionately experience effects like extreme heat events, and see increases in cardio-respiratory illness (including asthma), vector associated infectious diseases, food insecurity, and natural disasters. The same situation replicated in Lake 94 among the Ilchamus community especially among women and children as narrated by the focus group discussion.

Vector-associated diseases will likely be impacted by climate change. These diseases can be transmitted from ticks (e.g., Lyme disease) and mosquitoes (e.g., West Nile Virus). According to the public health workgroup, ticks and mosquitoes are very likely to increase due to climate change, and their associated diseases may pose a greater risk in Connecticut. Temperature, precipitation, soil moisture, and water runoff are all drivers

of vector-associated diseases. Climate change alters ecosystems that will increase vector survival, replication, biting frequency, and geographic range (Adaptation Subcommittee workgroup members, 2010). The same scenario was experienced in Lake 94 area when flood occurred in the sub location as reported by the key informants.

7.8 The impact of Lake 94 on the Education

The creation of the Lake 94 has brought positive impact on the education of Ilchamus children living in Logumgum sub location. According to respondents; it has reduced cases of absenteeism and lateness of children going to school in the area. Primary school enrollment in the area has gone up by over 360% from 1995 to date according to the head teacher of Logumgum primary school as supported by data provided in table 4.1.

The data shows that the overall enrollment of pupil in the school rose by 360% from the year 1994-2017. As per gender parity boy's numbers went up by 356% while girls went up by 382%. The mean increments of boys for the last 23 years since the Lake was formed in 1994 are 129 and the girls are 119. This means that the boys were not held back to look after the animals, while girls were not detained by their mothers to help in house chores, as explained by the respondents that animals are nowadays left free to graze around the shore of the lake without the need of attendance by the young boys and girls restrained to search for water. Before the formation of the lake parents use to pull their boys and girls out of school to go graze their livestock or search for cooking water and firewood. They no longer do that as explained by the key informants.

Water is easily collected from the lake while fire wood is gathered from the forest nearby that is dominated by *prosopis species*. This concur with report by Angie Daze, (2012), that state that some government policies also favour sedentarization, including policies around basic education, which has an impact on mobility and reduces the labour available for herding livestock. In many developing countries, women's educational opportunities are often limited due to social/cultural expectations and their extensive domestic responsibilities, such as caring for the sick and gathering water.

Women's relative lack of formal education and high illiteracy rates has two key consequences in the context of climate change. First, women often have limited access to and understanding of climate science and the impending effects of climate change. Second, women are often unable to acquire certain skills that would help increase their resilience to these impacts.

According to the PTA chairman of Logumgum primary, the Ilchamus community is investing heavily on education. The school has a boarding programme for children's from far flung parts of the sub location. The water has enabled the school to carry out its feeding programme, which has attracted a large number of pupils as indicated in chapter four.

Availability of water near the school has made it possible for the school to have feeding sessions after classes and this has attracted young pupils as the enrollment in lower classes is very high compared to the number of pupils that eventually complete standard eight. Water rationing is no longer practiced in the area, unlike parts of East Pokot where water is scarce and during drought, there is water rationing both for human and animal consumptions as serialized by Okari of Nation television, (2017), the documentary known as the Pokot warriors territory.

In the documentary, a Pokot residents laments of how lack of education is taking their people backwards yet the Ilchamus community have embraced education and have got lawyers and learned people. The interviewee from Pokot went on to narrate how "their people still relies on old tradition of cattle rustling which has killed many of them yet their lives has not improved at all. Their people consider the Tugen and Marakwet as cowards yet their people are learned and understand the law, while their people operate as if law and order does not exist". In East Pokot when drought strike, parents move away with their children's thus disrupting the education of the pupils, this is no longer the case among the Ilchamus community. They are now leading a semi sedentary life. East Pokot rivers and small Dams or water pans known as *silanga* dries up during drought due to raving drought, while the Ilchamus community around Lake 94 have a reliable water supply in the name of Lake 94. The water quality, quantity and availability is so acute in East Pokot to the point that even feeding programme in schools during drought periods are normally suspended or done intermittently when water is available narrates Okari, (2017). The trend of pupil's enrollment, before and after the Lake came into being up to date is shown in figure 7.7.

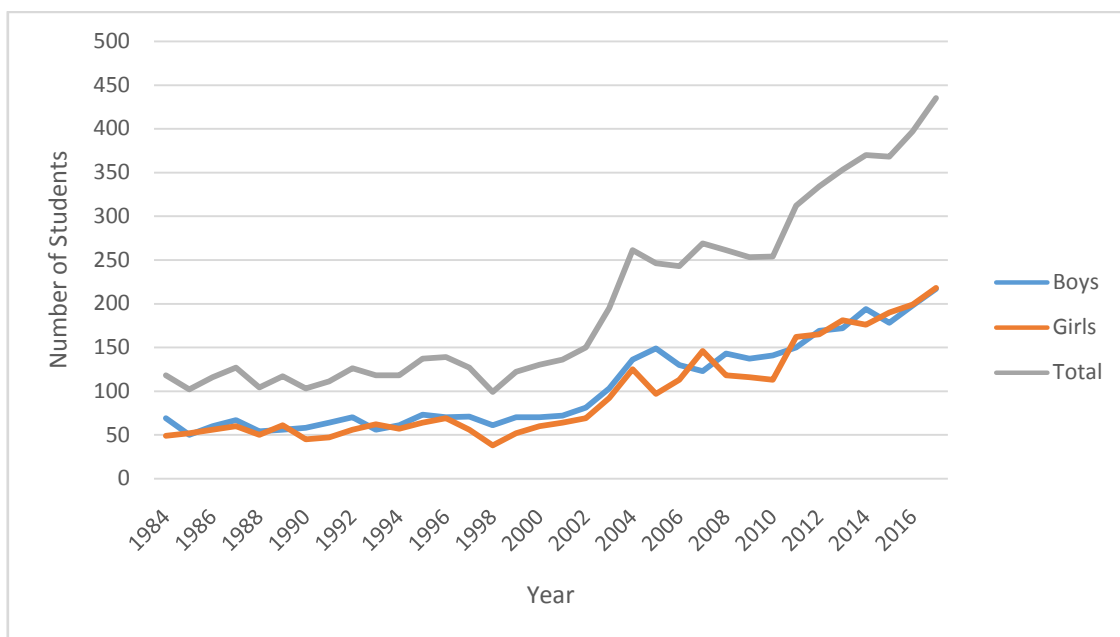


Figure 7.7: Enrollment trends in Legumgum primary school from 1984 -2017

There is a steady increment for both genders, but a disturbing trend was noticed on the data provided in table 4.2 and figure 5.13. The numbers of girls who start school in standard one and those who sit their Kenya Certificate of Primary Examination [KCPE], tend to show a wide variation compared to boys which draws concerns. The number of girls who joined standard one in 2009, dropped by 40% in numbers to those going to sit their KCPE this year (2017), in comparison to 79% of boys who registered in the same period and are going to sit for their exam this year 2017.

This is a pointer to either early pregnancies or early marriage among girls, which needs to be addressed to reduce the inequality being observed in the education of girls and boys. Low registration of pupils was observed in the year 1998, when El nino rains swept the area killing people livestock and displacing many homes. This made the people to migrate to higher grounds far away from the school as explained by the focus group discussion. This affected the number of pupils who enrolled that year as explained by the key informants and FGD. The graph depicts girls number as high from standard one to four but start declining from standard five to below 15 in standard eight. This should be a point of concerns, when addressing gender equality in education among the Ichalmus community. The enrollment per class for the year 2017 is shown in figure 7.8.

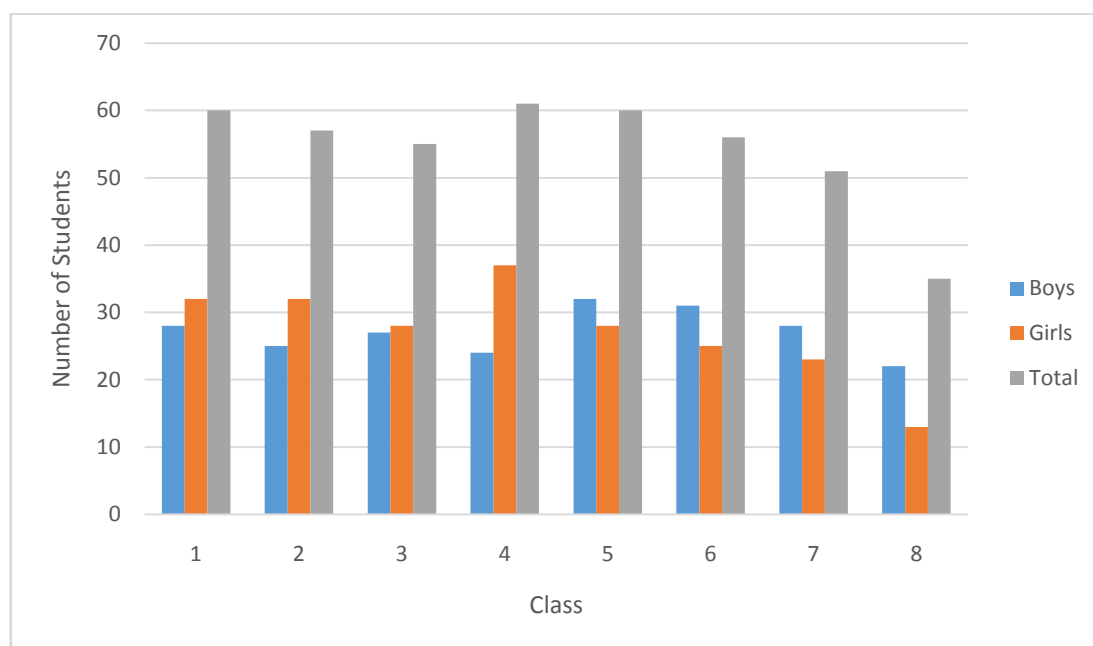


Figure 7.8: Gender enrollments per class for the year 2017 in Legumgum primary school.

Women's lack of access to information and reduced opportunities for formal education can limit their ability to cope or adapt to the effects of climate change (UNDP, 2011). Climate change can impact on agriculture, food security, water quality and health. Therefore, access to education, training and upgrading in the context of climate change measures among the marginalized group should be designed for training and continuing education for children and women in the following areas, like awareness of the causes and consequences of climate change in order to sensitize women and children to the dangers of climate change and to the possible requirements/mechanisms of adaptation. Awareness of existing mitigation and adaptation programmes in which women and children's can be involved and from which they can benefit at the local levels.

Training programmes on adaptation measures with a special focus on the needs of women (e.g., alternative cultivation methods and more resistant crops in agriculture, more efficient domestic and agricultural use of available water resources, alternative sources of domestic energy).

Training programmes on the use of (new) technologies (e.g., means of agricultural production, energy-efficient cooking stoves and ovens, renewable energy systems, information and communication technologies) and lastly awareness of existing rights and laying claim to these rights in different spheres of life (e.g., land ownership or land use rights, ownership rights for means of production) as explained by Cambodia human development report (2011).

There is further support to above fact by Adaptation Subcommittee workgroup members, (2010) of the need to educate not only the public on the impacts of climate change on Connecticut agriculture, infrastructure, natural resources and public health, but also their own stakeholders. For example, Connecticut agriculture will need to educate both consumers on the changing food supply and prices, and farmers on how to productively adapt. Increasing the number of people who are educated among the Ichalmus community especially women and children's will empower them more to face the climate change from an informed platform.

7.9 Impacts of climate change on infrastructure

The area is accessible by earth road which branches off the main tarmac road heading to Lake Bogoria. Some parts of the road have been graded with murrum while others are not. This road is inaccessible during rainy seasons and when the rain is heavy it is normally swept away. This affects the movement of peoples and their goods from the outside market into their sub location and from their farms around the lake to those markets outside. The damage is normally caused by surface run off, considering the land terrain in this area is flat. The water sometimes carries away individual homes as well as displacing people. This is being addressed by digging of water pans and dams in the area by government and nongovernmental organizations to hold back the excess water as explained by the Governor of Baringo County while being interviewed by Okari of NTV, (2017).

The floods caused by climate change also damaged the water channels directing water from river Perkerra to people's farms. These damaged roads had negative impacts on pregnant women if they require treatment at referral hospitals far away in Kabarnet or Nakuru. It was reported by Onywere et al, (2014), that at least 6 Schools in the villages around Lake Baringo and Lake 94 along with Health Centres were submerged by floods during the El-nino rains of 1998.

The above explanation concurs with the Adaptation subcommittee workgroup members, (2010), reports which states that water supply, quality and quantity are normally compromised during drought and flood periods. The committee explains further that potential variability in water quality and quantity due to climate change was determined to have a high impact on the core functions of agriculture, infrastructure, natural resources and public health.

The Infrastructure Workgroup determined that more frequent and intense droughts will decrease the quantity of available water, while increased precipitation and extreme precipitation events will increase storm water and wastewater volumes, and thus decrease water quality from related pollutant loads. All of the workgroups were also concerned, to some extent, with the future structural integrity and location of buildings in Connecticut in light of climate change impacts. Specifically, the Agriculture, Infrastructure and Public Health workgroups were concerned with the structural integrity of buildings, particularly historic structures, strained from increased precipitation and sea level rise, while the Natural Resources workgroup expressed concern with the impact of increased building run-off on natural habitats. Furthermore, the Natural Resources workgroup has already expressed concern about the impact of the relocation of buildings as an adaptation strategy, which could further cause habitat fragmentation, thus reducing the resiliency of habitats to adapt to climate change. Transportation, as explained by the infrastructure workgroup planning, was determined to be critical for the core functions of agriculture and public health in Connecticut, as well as other infrastructure planning areas.

Delayed agriculture inputs, such as seeds, animal feed and labour will hinder or even halt the production of agricultural goods, while goods that are delayed from processing or direct sale may spoil. Obstructed transportation would impede the treatment of patients during extreme weather events, and could complicate evacuation and sheltering, especially in Environmental Justice communities. As with buildings, the Natural Resources workgroup has already expressed concern about the impact of the relocation of transportation

avenues as an adaptation strategy, which could cause further habitat fragmentation, thus reducing the resiliency of habitats to adapt to climate change.

VI. CONCLUSION

In conclusion, it was observed from the assessment that the rainfall is less frequent in the areas surrounding Lake 94. The study found out that the areas experienced extreme droughts which were succeeded by extreme floods that eventually led to the formation of Lake 94 in the year 1994, adjacent to Lake Baringo. The lake was established to have been formed due to fluvial deposition.

The name 94 was given to the lake because it is the year the lake was formed as well as it is a neutral name that neither belongs to the Tugen, Ilchamus or Pokot though it is in Logumgum area. The Ilchamus community living in Logumgum sub location, Kiserian location within Marigat Sub county Baringo County where Lake 94 is located were found to be aware of climate change, which they attribute to change in rainfall pattern, frequent droughts and floods.

VII. RECOMMENDATIONS

The Ilchamus community indigenous knowledge on climate change prediction and mitigation should be documented for future references. Training on disaster management among the vulnerable members of community should be carried out especially to women and children. The climate change information should also be packaged in a format that is easily accessible by the members of the Ilchamus community. Alternative source of income other than burning and sale of charcoal should be introduced since this further worsened the situation even though it is a mitigation strategy to tame the spread of 'mathenge' plant in the area.

REFERENCES

- [1]. Adaptation Subcommittee to the Governor's Steering Committee on Climate Change . (2010). The Impacts of Climate Change on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health.
- [2]. Angie, D. (2014). Climate Vulnerability and Capacity Analysis in Northern Kenya Adaptation Learning Programme for Africa. CARE International.
- [3]. Araujo, A., Quesada-Aguilar, A., Aguilar, L., & Pearl, R. (2007). Gender Equality and Adaptation. Fact sheet. Women's Environment and Development Organization.
- [4]. Assan, N. (2014). Gender, Agriculture and climate change impact and vulnerability of resource poor farmers in Africa. *Agricultural Advances*, 3(11), 272-279.
- [5]. Blenckner, T. (2005). A conceptual model of climate-related effects on lake ecosystems. *Hydrobiologia*, 533(1-3), 1-14. doi:10.1007/s10750-004-1463-4
- [6]. Boko, M., Niang, I., Nyong, A., Vogel, C., Githeko, A., Medany, M., . . . Yanda, P. (2007). Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. In M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden , & C. E. Hanson, IPCC Fourth Assessment Report: Climate Change 2007 (pp. 433-467). Cambridge UK: Cambridge University Press.
- [7]. Boserup, E. (1970). *Woman's Role in Economic Development*. Earthscan Publications.
- [8]. Cambodia Human Development Report. (2011). *Building Resilience: The Future of Rural Livelihoods in the Face of Climate Change*. Ministry of Environment.
- [9]. Chapin III, F. S., Zavaleta, E. S., Eviner, V. T., Naylor, R. L., Vitousek, P. M., Reynolds, H. L., . . . Díaz, S. (2000, May). Consequences of changing biodiversity. *Nature: International Journal of Science*, 405(6783), 234-242.
- [10]. Degefu, W. (1987). Some aspects of meteorological drought in Ethiopia. In M. Glantz (Ed.), *Drought and Hunger in Africa: Denying Famine a Future* (pp. 23-26). Cambridge: Cambridge University Press.
- [11]. Denton, F. (2002). Climate Change Vulnerability, Impacts, and Adaptation: Why does Gender Matter? *Gender and Development*, 10(2), 10-20. doi:10.1080/13552070215903
- [12]. District Development Office. (2011). *District Annual Monitoring and Evaluation Report*. Marigat District.
- [13]. Glaser, B. G. (1978). *Theoretical Sensitivity: Advances in the Methodology of Grounded Theory*. Mill Valley, CA: Sociology Press.
- [14]. Government of Kenya. (2009). *National Environment Action Plan Framework*. National Environmental Management Authority.
- [15]. Government of Kenya. (2010). *State of the Environment and Outlook*. National Environmental Management Authority.
- [16]. Handmer, J., Honda, Y., Kundzewicz, Z. W., Arnell, N., Benito, G., Hatfield, J., . . . Yan, Z. (2012). Changes in impacts of climate extremes: human systems and ecosystems. In: *Managing the Risks of*

- Extreme Events and Disasters to Advance Climate Change Adaptation. (C. B. Field, V. Barros, T. F. Stocker, D. Qin, D. J. Dokken, K. L. Ebi, . . . P. M. Midgley, Eds.) A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC), pp. 231-290.
- [17]. IPCC. (2007). *Climate Change 2007: Mitigation of Climate Change*. Contribution of Working Group III to the Fourth Assessment Report of the Inter-. (B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, & L. A. Meyer , Eds.) Cambridge, United Kingdom: Cambridge University Press.
- [18]. Jones, P. G., & Thornton, P. K. (2003, April). The potential impacts of climate change on maize production in Africa and Latin America in 2055. *Global Environmental Change*, 13(1), 51-59. doi:10.1016/S0959-3780(02)00090-0
- [19]. KCCWG. (2014). *Sustainable development through land restoration, a case for Baringo County, Kenya*. Kenya Climate Change Working Group.
- [20]. Kimani, E. W., Ogendi, G. M., & Makenzi, P. M. (2014). An Evaluation of Climate Change Indigenous Coping and Adaptation Strategies for Sustainable Agro-Pastoral Based Livelihoods in Baringo County, Kenya. *IOSR Journal of Environmental Science, Toxicology and Food Technology*, 8(8), 38-58.
- [21]. Kotikot, S. M., & Onywere , S. M. (2014). Application of GIS and remote sensing techniques in frost risk mapping for mitigating agricultural losses in the Aberdare ecosystem, Kenya. *Geocarto International* , 30(1), 104-121. doi:10.1080/10106049.2014.965758
- Lelenguyah, G. L. (2013). *Effects of climate variability on pastoral livelihoods in Marigat District, Baringo County, Kenya*. Masters Thesis, Kenyatta University, Department of Environmental Education.
- [22]. Lelenguyah, G. L., Kabochi, S. K., & Biwot, J. C. (2016). Pastoralists' Perception on the Trend of Various Climatic, Social and Environmental Variables in Baringo County, Kenya. *Journal of Ecological Anthropology*, 18(1).
- [23]. Mainlay, J., & Tan, S. F. (2012). *Mainstreaming Gender and Climate Change in Nepal*. IIED Climate Change Working Paper No. 2. London: IIED.
- [24]. Meza, M., & Laura, E. (2010). Drought risk management: Pilot study on vulnerability and local coping strategies. *Options Méditerranéennes*, 95, 175-185.
- [25]. Mironga, J. M., Mathooko, J. M., & Onywere, S. M. (2011). The Effect of Water Hyacinth (*Eichhornia Crassipes*) Infestation on Phytoplankton Productivity in Lake Naivasha and the Status of Control. *Journal of Environmental Science and Engineering*, 5, 1252-1260.
- [26]. Mironga, J. M., Mathooko, J. M., & Onywere, S. M. (2012). Effect of Water Hyacinth Infestation on the Physicochemical Characteristics of Lake Naivasha. *International Journal of Humanities and Social Science*, 2(7), 103-113.
- [27]. Morton, J. F. (2007, December). The impact of climate change on smallholder and subsistence agriculture. *Proceedings of the National Academy for Sciences of the United States of America*, 104(50), 19680-19685.
- [28]. Mwangi, E. W., & Swallow, B. M. (2005). *Invasion of Prosopis juliflora and local livelihoods: Case study from the lake Baringo area of Kenya*. ICRAF Working Paper No. 3, World Agroforestry Centre.
- [29]. Ndungo, C., Masiga, C., Bekalo, I., Ochola, W. O., & Mwonya, R. A. (2010). Gender and Natural Resource Management. In W. O. Ochola, P. C. Sanginga, & I. Bekalo (Eds.), *Managing Natural Resources for Development in Africa: A Resource Book* (pp. 211-262). University of Nairobi Press.
- [30]. Nyong, A., Adesima, F., & Elasha, B. O. (2007). The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. Springer Science & Business Media.
- [31]. Okari, D. (Director). (2017). *Pokot Territory* [Motion Picture].
- [32]. Orindi, V. A., Nyong, A., & Herrero, M. (2007). *Pastoral Livelihood Adaptation to Drought and Institutional Interventions in Kenya*. UNDP Human Development Report Office Occasional Paper 2007/54. Nairobi (Kenya). UNDP.
- [33]. Osunade, M. A. (1994). Indigenous climate knowledge and agricultural practices in Southwestern Nigeria. *Malaysian Journal of Tropical Geography*, 25, 21-28.
- [34]. Overholt, C., Anderson, M. B., Cloud, K., & Austin, J. E. (Eds.). (1985). *Gender Roles in Development Projects: A Case Book*. West Hartford, CT: Kumarian Press.
- [35]. Patt, A., & Gwata, C. (2002). Effective seasonal climate forecast application. Examining constraints for subsistence farmers in Zimbabwe. *Global Environmental Change*, 12(3), 185-195. doi:10.1016/S0959-3780(02)00013-4
- [36]. Republic of Kenya. (2009). *National Climate Change Response Strategy*. Ministry of Environment and Mineral Resources. Nairobi: Government Press.
- [37]. Richardson, J. L. (1966, January). Changes in level of Lake Naivasha, Kenya, during postglacial times. *Nature*, 209(5020), 290-291.
- [38]. Rodenberg, B. (2009). *Climate Change Adaptation from a Gender Perspective*. German Development Institute.

- [39]. Rotich, L. K. (2015). Perceived effects of climate change on tourism development around Lake Nakuru National Park, Kenya. Masters Thesis, Moi University.
- [40]. Schalatek, L. (2009). Es sind die Machtverhältnisse, die Frauen für den Klimawandel verwundbarer machen. In Heinrich-Böll-Stiftung (pp. 14-15).
- [41]. UNCCD. (2014). The Land in Numbers: Livelihoods at a Tipping Point. United Nations Convention to Combat Desertification.
- [42]. UNDP. (2009). Resource Guide on Gender and Climate Change. New York: United Nations Development Programme.
- [43]. UNDP. (2011). Overview of linkages between gender and climate change. United Nations Development Programme.
- [44]. Varadan, R. J., & Kumar, P. (2014, April). Indigenous knowledge about climate change: Validating the perceptions of dryland farmers in Tamil Nadu. *Indian Journal of Traditional Knowledge*, 13(2), 390-397.
- [45]. Warren, M. D. (1992). Indigenous knowledge, Biodiversity Conservation and Development. Keynote Address at International Conference on Conservation of Biodiversity in Africa. Nairobi.
- [46]. Wasonga, V. O., Nyariki, D. M., & Ngugi, R. K. (2011). Assessing socio-ecological change dynamics using local knowledge in the semi-arid lowlands of Baringo District, Kenya. *Environmental Research Journal*, 5(1), 11-16. doi:10.3923/erj.2011.11.17
- [47]. White, P. C., & Ward, A. I. (2010). Interdisciplinary approaches for the management of existing and emerging human-wildlife conflicts. *Wildlife research*, 37(8), 623-629. doi: 10.1071/WR10191

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