

## **Effect of Climate Change on Acquisition of Quality Education: A Case Study of Maasai Pastoralists in Narok County, Kenya**

**Janet Korir**

Geography and Environmental studies department, Moi University.

**Emmanuel Meli**

Administrator, Ministry of Interior and Coordination, Kenya

**Beatrice Ndegwa**

Geography and Environmental studies department, Moi University

### **ABSTRACT**

Climate change is a global phenomenon with far reaching impacts. Arid and semi-arid communities in Kenya, among them the Maasai community from Narok County, are dependent on the natural resources for their livelihood thus are greatly hit by the adverse impacts of climate change. This paper sought to establish the indirect effects of climate change on the quality of education among the Maasai community. Desktop literature review approach and key informant phone interviews were adopted for data collection. The review of literature indicated that increased poverty levels arising from climate change has largely affected the affordability of quality education. Therefore, people in Maasai community resort to coping mechanisms on labour demands that accelerate school dropout as well as early marriages. The Maasai herders are forced to increase their migration trends to long distances, a practice that has increased child labour disrupting learning for most school going children. In addition, the girl child has become more vulnerable to sexual abuse and early marriages with a consequent denial of education opportunities. The effect of the climate change on wildlife habitat has led to human-wildlife conflict that poses a threat to the security of the community members and therefore interferes with the smooth running of schools. Consequently, interventions to mitigate climate change effects should not only concentrate on the direct but also the indirect impacts that have got multiplier effects on sectors like education. These interventions should include, provision of adequate water infrastructure, investment in education policy and boarding school Infrastructural development.

**Key Words:** Climate change, education, livelihoods, Pastoral community

### **INTRODUCTION**

According to the United Nations Framework Convention on Climate Change [1] climate change is an alteration of climate attributed directly or indirectly to human activity. Climate change alters the composition of the global atmosphere and observed over comparable time periods. The negative impacts of climate change are becoming increasingly evident in the present day. The effects include long term changes in average temperature and rainfall; changes in the

intensity, timing, and geographic distribution of rainfall; an increase in the frequency of extreme events such as drought, floods and rise in the sea level [2].

According to Varner [3] the South-eastern part of South America precipitation has been recorded to increase and is experienced in the form of sudden deluges that often leads to flooding, soil erosion hence endangers lives and livelihoods. South-western parts of South America and Western Central America have been reported to experience reduced precipitation and increased droughts. A significant increase in rainfall at a rate of 49mm/year has been reported in south Africa and in Volta basin which comprises of six countries in West Africa between 1901 and 1969 [4].

In the Horn of Africa, the experience of drought with high intensity and frequency of drought periods has been recorded on a yearly basis for the last 12 years [5]. In Kenya the effect of climate change has already been felt with its arid and semi-arid regions being among the worst affected areas. As per the IPCC [2] projections, Kenya's mean annual temperatures will increase by 1-2.8 ° C by the 2060 and 1.3-4.5° C by the 2090.

Narok County is a relatively dry area and just like other dry areas in Kenya has witnessed climate change events in form of frequent severe patterns of floods and droughts, increased annual temperatures since 1950 [6]. The trend is projected to worsen in coming years [7].

It is evident that climate change impacts continue to be experienced globally with the phenomenon generally altering weather patterns around the world including rising temperatures; changes in rainfall pattern; rise in sea levels; higher frequency of droughts and increase in floods among other weather patterns [8]. Climate changes have got both direct and indirect impacts which affect the general development of every society. As opined by Verner [3], climate change is a great development challenge of the present day terming it as not just a global environmental issue but rather a threat to economic growth; poverty reduction and may unravel the development milestones made in the past decades.

Many of the interventions by governments and development partners have put in place are often skewed towards addressing the direct impacts of the climate change which are mainly the altered weather pattern whereas not much has been done to address the indirect impacts [9]. The indirect impacts and the consequent effects of these impacts need to be integrated into policy intervention decisions that are geared towards mitigation of climate change.

This paper therefore highlights the effects of climate change on the quality of education which is an indirect impact of climate change. The findings will help in drawing the attention of policy makers to the indirect effects of climate change and particularly on the quality of education.

### **LITERATURE REVIEW**

Climate change phenomenon has been characterized by extreme weather conditions of alternating floods and drought; rising temperatures and rise in the sea level. The recurrence of floods and drought in the last few decades have increased spatially and intensified with its effects being felt with a lot of intensity than ever before across the globe [2]. The trends in rainfall have also changed in that; whereas some regions have experienced a decrease in rainfall, others have recorded an increase. These changes have been evident across the world

for instance in Latin America as mentioned in the preceding section. The rainfall trend in some parts of Africa has also recorded a decline and has been drier in the last few decades with an estimated decrease of 6 mm/year between 1970 and 2002 whereas in some parts like in South Africa and the Volta basin has recorded a significant increase in rainfall [4].

In Kenya the temperature is estimated to have been increasing at the rate of 0.2% annually over the past five decades [9]. The climate projection for the ASAL of Kenya includes longer and more frequent dry periods interspersed with intense but shorter and unpredictable periods of rainfall [10]. In Narok County climate change has been manifested in the form of frequent severe patterns of floods and droughts as well as increased annual temperatures since 1950 [6]. The trend is projected to worsen in coming years [7]. The figures below show the annual average temperature between 1960 and 2016 and rainfall trends between 1950 and 2016 for Narok County.

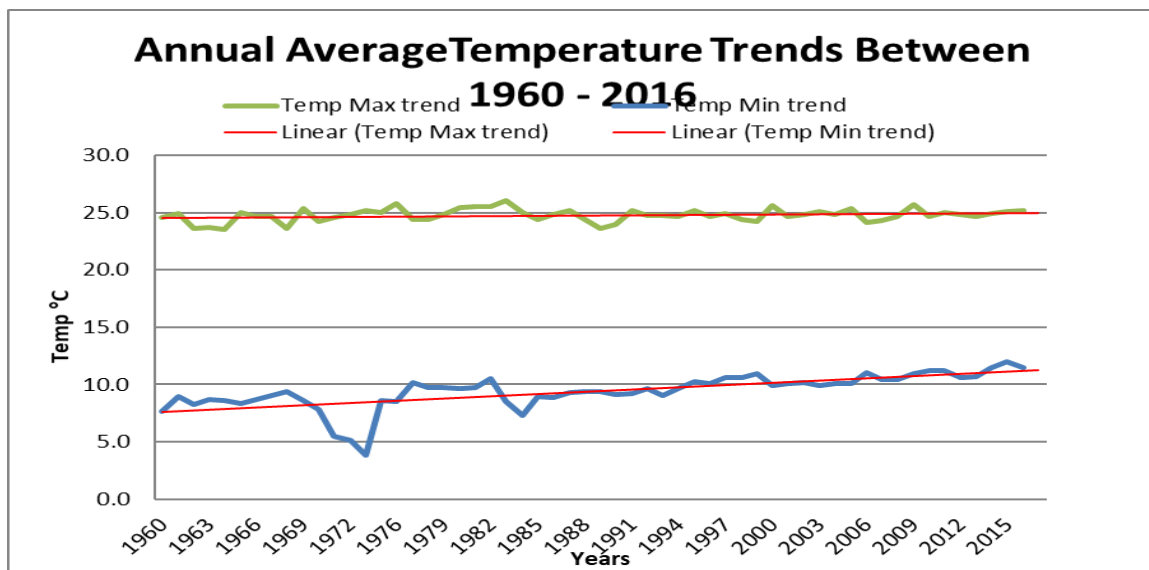


Figure 1. Annual average temperature trends -1960-2016 Source Korir2019

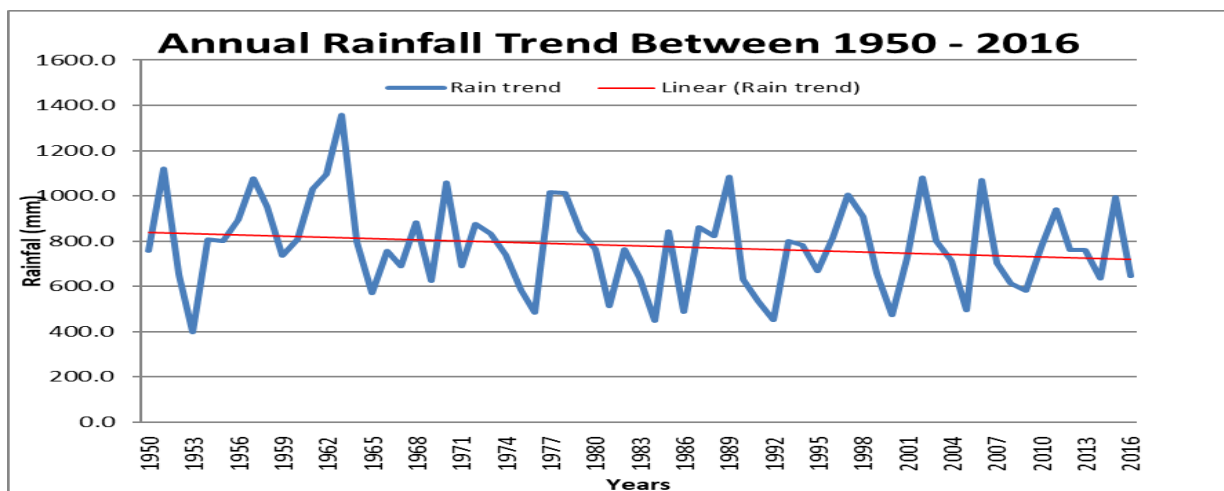


Figure 2. Annual Rainfall trends -1950-2016 Source Korir2019

The alterations of weather patterns caused by climate change are the direct impacts that affect the economies of the world. Indirect impacts are the consequent effects of the direct impacts. The indirect impacts are exemplified by increased prevalence of pests and diseases; degradation of natural resources; food prices; displacement; potential conflicts and employment risks among others. In many developing countries climate change could increase household vulnerability to poverty, hunger, disease, mortality, displacement, and violent conflict [9].

Climate change affects countries differently depending on their natural conditions and economic structure. Some examples for specific countries include: many countries in Sub Saharan Africa depended on rain fed agriculture thus more vulnerable to an increase in climatic variability, with national output projected to record high losses [11]. Countries in North Africa and in the Middle East that are experiencing water stress are likely to record additional decrease in agricultural production which in turn affects rural incomes and food security in general [8]. It has been observed that African countries that are dependent on natural resources and rain fed agriculture are more vulnerable to climate change [2]. It is predicted that 480 million people in Africa could be living in water stressed areas by 2025, and that up to 40% of the wildlife species habitat in Africa could be lost by 2085 [9].

Arid and semi- arid communities in Kenya who are dependent on the natural resources for their livelihood just like in other regions of the world experiences high rainfall variability and cycles of drought and thus more vulnerable to climate change [12]. The predominant pastoral and rain fed agriculture livelihoods activities in Narok County have been greatly affected by the climate variability. Climate change will have differential impacts on different groups of people, because of differences in their exposure, sensitivity, and adaptive capacity. Climate change as it affects countries differently will affect people differently depending on their economic, environmental, cultural and social situations and contexts [13].

A growing number of studies point to the need to recognize the importance of these differences as crucial to understanding vulnerability. In education sector, Climate change will make existing inequities even worse as climate change will not affect all equally. Because of the risk associated with them, flood and drought zones often overlap with areas of high poverty and low access to essential services such as water and sanitation. This means that children and families who are already disadvantaged by poverty and those with the fewest resources for coping are likely to face some of the most immediate dangers of climate change [14].

Climate variability resulting from climate change in Narok County has greatly increased the Maasai community's vulnerability to poverty. Traditionally, cattle which formed the backbone of the Maasai pastoralists' means of livelihood were sold for food, clothing, and school fees for children, but when the cattle were weakened by climate change stress, Maasai income went down thus imposing social and economic stress to every pastoral household. According to Rembold and others [15], the aftermath of 2014 prolonged drought in Narok County was low cattle prices which went lower than the long-term average by 8.57% and had a huge impact on food security for pastoralists. The same sentiments were opined by Iona [16] and Lelenguya [17] who noted a strong correlation between poverty and vulnerability to climate change shocks, meaning that any attempt to reduce poverty should consider the inter-linkages between climate change and livelihood systems.

The negative impacts of climate change on the Maasai livelihoods are supported by the works of Makuna [9] who opined that the risks associated with climate change could increase household vulnerability to poverty, hunger, diseases, mortality, displacement, and violent conflict in many developing countries. The climate change threats to households and communities emanates from both direct risks like changes in climatic variability and indirect risks like increased prevalence of pests and diseases; degradation of natural resource; food prices and employment risks; displacement and potential conflicts associated with climate change. Many interventions as observed by Mukuna [9], tend to focus on direct risks and direct impacts of climate change with insufficient attention on the indirect risks and impacts on the communities and households.

Education sector is one of the sectors that has been indirectly affected by the risks and impacts of climate change among the Maasai community of Narok County. There is increased vulnerability to poverty due to the indirect impact of climate change affecting the prices of the cattle, which are otherwise considered by the community as a source of finance to educate their children thus affects the quality of the education. According to Vandenberg [14], high financial costs of schooling make education less affordable to the poor, who are very cost sensitive and consider opportunity costs of education as often high (for example, children may work in agriculture or do domestic chores such as fetching water).

As a result of the climate change impacts, the Maasai community of Narok has come up with coping mechanisms. According to Esho and others [18], one of the Maasai community's adaptive strategies to rising poverty levels caused by dwindling livelihoods is marrying off their girls, a practice that is viewed to be culturally acceptable by the community owing to the prevailing environmental conditions. The loss of livelihoods due to climate change by the Maasai community forces school-going children to drop from school and take up hazardous jobs to support their families in search of water and pasture. Families often must split up in search of food, leaving children alone, unprotected and exposed to violence, abuse, and exploitation [6]. The sale or lease of land to private developers has been witnessed in Narok County as one way of responding to the adverse climatic conditions that has affected the cattle rearing activity over the years [19]. This has rendered the pastoralist activity that has been in practice for decades unsustainable.

From studies on climate change impacts manifestations in water and pasture scarcity has greatly affected the Maasai community of Narok County. The community members are forced to migrate in search of pasture and water for the livestock and for domestic use. According to the United Nations Development Programme working draft paper and as per Mirza [20], the climate change phenomenon disproportionately affects women and girls negatively as they are the worst hit by extreme weather conditions coupled by their low capacity to respond to climatic risks owing to their social cultural status. The longer distances in search of water by women from pastoral communities due to climate change has increased the labour demands for women in their quest to accomplish household chores. The women's diverse reproductive and productive roles at household and community level are therefore adversely impacted by climatic changes [21]. The migration by the community and the increased labour demands affects the provision of quality education since the emphasis of the present mode of education does not respond to the pastoralists' way of life since the education programme assume stability

in the ecosystem of the inhabitants. This is contrary to the nomadic and unpredictable environments typical of the pastoral areas [22].

The climate change impacts on the environment, natural resource degradation and loss of wildlife habitats has been experienced in many parts of the world with 480 million people in Africa expected to be living in water stressed areas by 2025, and that up to 40% of the wildlife species habitat in Africa could be lost by 2085 [9]. The Long-term changes in climate exacerbate environmental degradation which according to Masago [23] leads to loss of wildlife habitat in many vulnerable places. The discussions on the impacts of climate change on quality of education among the Maasai community in Narok County will concentrate on the three aspects of the Maasai community's interaction with the effects of climate change. These are: impacts on livelihood, water and pasture, coping strategies and impact on wildlife habitats.

### **Theoretical Underpinning**

The paper adopted the theory of Constraints which is a methodology for identifying the most important limiting factor (i.e., constraint) that inhibits achievement of a goal. The theory was proposed by Dr. Eliyahu Goldratt, and it gained popularity in 1984. It was conceptualized as a philosophy of continuous improvement that entails a systematic approach to organizational problem-solving technique [24]. The theory is applied in various fields of study because of its comprehensive Five Focusing Steps including: (1) Identifying the system's constraint; (2) Deciding how to exploit the system's constraint; (3) Subordinating everything else to the above decision; (4) Alleviating the system's constraint; and (5) Preventing inertia from becoming the constraints.

The theory of Constraints emphasizes the importance of identifying the "system constraint" or bottleneck to achieve the set goals in an organization or in a social system. It considers that at any given time, an organization is limited from achieving its highest goal by a single constraint. It therefore provides tools to help identify and break through the constraint and it is based on pure logic and on humanist principles which states that:

- Any system (in the scientific meaning of the word) has its output limited by one and only one constraint at a given time.
- Any situation even if it seems complex has inherent simplicity.
- People (most of them at least) try to do as well as they can.
- A win-win solution always exists.

Using a theory of constraint, Marton and Paulova [25] averred that there is only one constraint in a system at any given time limiting the output of the entire system. They further note that the remaining links are known as non-constraints and when that constraint is strengthened, however, the system does not become infinitely stronger because the constraint simply migrates to a different component of the system. The theory has been used by many researchers to guide policy and organizations to successfully "break" the constraints that limit the achievement of the organization's goal.

This theory is extremely practical in this study in that it helps find simple, effective solutions to real-world problems such as impacts of climate change shocks in education system. Climate change is a major crisis faced by humankind especially the pastoralists who inhabit the already fragile arid and semi-arid lands. The Pastoral communities of Narok County who are already

affected by the arid conditions are greatly constrained by the climate change phenomenon from achieving quality education, and unless its impacts are dealt with the achievement of quality education will be greatly curtailed.

### **METHODOLOGY**

The study used a desktop literature review method which involved an in-depth review of peer-reviewed journals based on wide range of key terms including: Climate change, pastoral community, livelihoods and education. Multiple databases which included google scholar, Academia and library were used, to sample for available and relevant articles and books for this study. The initial literature searches yielded 120 relevant articles, but these got reduced to 20 articles when the year of publication and the research objectives were considered as a criterion for inclusion. This approach was chosen so as to improve on quality of the reviewed literature, which is dependent on, among other aspects, what literature is included and how it was selected. Data abstracted from the literature was interpreted, classified in accordance to the purpose of the study and summarized to form research findings of this study.

The authors also conducted In- depth phone interviews with 8 key informants to get more information on the impacts of climate change on education in the study area. In-depth interview which is a qualitative research technique involving conducting intensive individual interviews with a small number of respondents became appropriate in exploring the views of the informants on climate change impacts on the pastoral livelihoods. The method was also used to probe deeper into the real issues about climate change in the study area and it yielded much more detailed information than what was available through literature review. The key informants who had earlier been met by the authors, included specific respondents who occupy some leadership position in the community as well as the representatives from government agencies and non-governmental organizations and county officials like agricultural experts, environmental experts, and experts from livestock department in the study area.

### **RESULTS AND DISCUSSIONS**

The indirect impact of climate change on the Maasai community has affected education quality through its impact on livelihoods which exposes the community to poverty. The quest by the Masaai community to cope with the adverse impacts of climate change also affects the provision of quality education. The effect of climate change on the wildlife habitats results in wildlife human conflicts further jeopardizes the attainment of quality education by the community of Maasai in Narok County. This section discusses the effect of climate change on the quality of education while focusing on climate change impacts on livelihoods, wildlife habitats and the effects of the coping strategies on the quality of education.

#### **Climate Change and Livelihoods Constraints**

Climate change is a global phenomenon with far reaching impacts to various spheres of life that are crucial to humans across the world. The Maasai community from Narok County is heavily dependent on natural resources for their livelihoods. The natural resources rely entirely on the availability of water, failure to which such livelihoods are faced with sustainability challenges [6].

Extreme weather conditions associated with climate change particularly drought, directly affects food security, water, and pasture availability. Water and pasture scarcity is a critical

resource for any pastoral community since their livelihood of cattle rearing is dependent on them for survival and sustainability. The Maasai community of Narok whose livelihood is mainly cattle rearing has over the years been faced with adverse climate change shocks (extreme events) that has gradually diminished their livelihood owing to the loss of cattle due to inadequate pasture and water; livestock diseases and famine [6]. The loss of livelihoods forces school-going children to drop from school to take hazardous jobs in order to support their families in search of water and pasture. Most often, families are forced to split up in search of food, leaving children alone, unprotected and exposed to violence, abuse, and exploitation. While these conditions present with them insecurities in the community, they also increase the incidence of communicable diseases since due to scarcity of the water, poor drought-affected families and children resort to using unsafe water. Consequently, School attendance drops sharply.

### **Education and Severe Scarcity of water and pasture**

The culturally gendered roles by the Maasai Community assign men and male children the role of herding and therefore the male child is forced to accompany their fathers in the quest for water and pasture. Climate change has occasionally increased trends of migration by Maasai pastoralists to relatively far areas in search of water and pasture. This means that the male child who helps the parent to take livestock to look for water and pasture often drops out of school, hence affecting their equal access to education. As established by Dyer [22] the present and modern way of education which assumes stability in the ecosystem of the inhabitants, limits pastoralists' access due to their unpredictable environments. Education disparities are therefore bound to happen as the climate continue to change.

The longer distances in search of water by women from pastoral communities due to climate change has increased the labour demands for women in their quest to accomplish their household chores. The women's diverse reproductive and productive roles at both household and community levels are adversely impacted as posited by Dankelman [21]. The change in climate has increased water scarcity and the Maasai community is forced to walk for long distances in search of water for livestock and domestic use. As a response to such labour demands, families with elderly parents often pay dowry for young girls to be married to help ease the labour demand caused by the climate change [18]. The girl child in such instances is denied the opportunity to pursue basic education and therefore lead to education inequality among the community members.

The consequent impact of school dropout by learners to accompany parents is the low enrollment of learners in schools due to the shrinking catchment for the schools. This will in turn affect the infrastructural development of schools as they will fail to attract resources which are more often pegged on enrollment numbers of learners by the government. According to Okumu [26] the mobility of nomadic communities and the few teachers from nomadic pastoralist background makes it hard to motivate and retain teachers hence the teacher student ratios are always low adversely affecting the learning process. The schools in these areas therefore fail to establish well yet schools without resources hamper learning. More so, many teachers may not find their job interesting and satisfactory because of lack of facilities to carry out their job. This therefore leads to disparities in learning between the schools in the region and those in other regions. This is supported by studies by Ezeomah [27] which revealed that pastoralist learners are always left behind in primary and secondary school attainment due to

constant migration, poor staffing, and inadequate resources. This was also confirmed by sentiments from one key informant over the phone who indicated that majority of the Maasai pastoralists did not have any form of formal education.

Education inequality among the Maasai community due to the impacts of climate change is also informed by the way climate change impacts affect men and women differently. According to the United Nations Development Programme working draft paper [28], the climate change phenomenon disproportionately affects women and girls negatively as they are the worst hit by extreme weather conditions coupled by their low capacity to respond to climatic risks owing to their social cultural status [28]. Owing to the disproportionate impacts of climate change women and girls are rendered susceptible to sexual abuse which leads to unwanted pregnancies and early marriages hence dropping out of school. This widens the education inequality gap among the community. The movement of men to seek alternative source of income due to the diminishing returns from pastoralist has added more burden to women who have taken up the roles of herding livestock in addition to domestic chores [29]. The increasing labour demand thus forces school going children to drop out of school to help with work at home.

### **Education and climate change-induced human-wildlife conflict**

Long-term changes in climate exacerbate environmental degradation which according to Masago [23] leads to loss of wildlife habitat in many vulnerable places. Human-wildlife conflict occurs when the needs and behavior of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife [30].

Furthermore, climate change alters the location and nature of the geographical environment forcing wildlife to migrate to new areas as a way of adapting or face extinction. As there are limited natural places left for wildlife to move to, this will likely bring wildlife into more densely populated human areas and create situations of human-wildlife conflict. Masago [23] opines that human wildlife conflict in Narok West Sub-County poses a threat to the acquisition of quality education since wildlife have caused insecurity within the locality. This has in turn increased absenteeism of the students in the affected areas. Wherever absenteeism occurs it always lowers acquisition of quality education.

### **Education and Climate Change Coping Strategies**

The change in climate has seen the Maasai community of Narok County come up with coping strategies to counter its adverse impacts. The sale or lease of land to private developers for instance, has been witnessed in Narok County as one way of responding to the adverse weather conditions that has affected the cattle rearing activity over the years [19]. Land ownership that was originally communal has now been made individual to enable individuals to use their lands appropriately and economically while avoiding free range cattle rearing. The practice may help to cushion the pastoral livelihoods against adverse impacts

### ***Climate change and increased exposure to Early/ Child Marriages***

In attempt to respond to the dwindling livelihoods caused by climate change, the Maasai pastoral community of Narok has resorted to marrying off their daughters at a young age hence education inequality among the community members. This measure is undertaken by the parents to restock cattle lost due to drought. According to Esho et al. [18], one of the Maasai

community's adaptive strategies to rising poverty levels caused by dwindling livelihoods is the marrying off their girls, a practice that is viewed to be culturally acceptable by the community owing to the prevailing environmental condition. The consequence of such adaptive strategy is the increase in school dropout by the girl child. The cumulative effect over time widens the education inequality among the Maasai boys and girls and between the pastoral community and other communities in the entire country.

Similarly, prolonged stay at home in respond to climate change shocks further exposes girls' cultural aspects of female genital mutilation, which is considered a prerequisite before marriage among the Maasai community. The practice is unlawful in Kenya and is being monitored closely, hence the community resorts to sneaking girls out of school and hiding them in the neighboring counties for a longer period to avoid being tracked by the anti- Female Genital Mutilation agents and the Government Officers. These girls are eventually married off and therefore widening the gap of education inequality with their male child counterpart in the community.

### **CONCLUSION**

In conclusion, climate change has indirectly influenced the quality of education among the Maasai community of Narok County. The direct impact of climate change on cattle rearing which is the main livelihood of the Maasai people has rendered them economically unstable. The consequent increased poverty levels lead to response by the community to adopting ways of coping with climate change which further affects the quality of education. One of the coping mechanisms of restocking exposes the girl child to early marriages which is preceded by the female genital mutilation hence perpetuating education inequality in the community. The other strategy is the selling of land to private developers which renders pastoral activity less stable.

The scarcity of pasture and water has led to migration by the Maasai community for long distances. There is a great constraint in the performance of the gendered roles by the different segments of the Maasai community that is attributed to directly and indirectly to climate change. The Maasai are often forced to travel further and further in search of water and pasture and therefore migrates with their school going children far away from their usual residence, hence disturbing their learning.

The scarcity of water in the community has increased labour demand for women and girls hence in their quest to fulfill their societal roles; they walk for long distances in search of water. This overwhelming demand often leads to child labour; disrupts girls' education and encourages early marriages as a support strategy to the elderly parents. Furthermore, the disproportionate impact of climate variability on men and women/girls with the women and girls more vulnerable renders them more susceptible to sexual abuse and early marriages with a consequent denial of education opportunities to the girl child. The effect of the climate change on wildlife habitat has led to human- wildlife conflict that poses a threat to the security of the community members and therefore interferes with the smooth running of schooling by learners in the affected areas.

### **Recommendations**

The discussions on mitigation of the adverse impacts of climate change should be viewed from a broader perspective as it is evident that the impacts of climate change have got far reaching

spiral effects directly and indirectly cutting across every sphere of life. There is therefore need to ensure provision of quality education among children now to promote future resilience to climate change. The interventions to mitigate the effects of climate change should not only concentrate on the direct impacts but also the indirect impacts that have got multiplier effects on sectors like education quality.

Provision of adequate water infrastructure will reduce the movement of the community members in search of water and therefore reduces the disruption of learning for their children due to labour demands. This will eventually promote equality in the education sector.

In addition, investment in education policy is recommended since the present mode of education does not correspond to the pastoralist way of life as the education programme assumes stability in the ecosystem of the inhabitants which is contrary to the nomadic life and unpredictable environments in which the pastoralists live. School Infrastructural development and especially boarding schools will help keep the children in schools and maintain them in school deterring them from child labour and other harmful activities that disrupt their education endeavors.

### **Way forward and implications for further research**

The indirect impacts of climate change should be integrated into the interventions designed by the government and development partners. Research on the best education programmes that are responsive to the unpredictable pastoral way of life will help policy makers in addressing the provision of quality education in pastoral communities. The analysis of climate change impacts ought to be dealt with case by case as its effects vary from country to country depending on their nature and economic structure which also vary from individual community to the other depending on the economic, environmental, cultural, and social contexts.

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