

Review Article

Imperatives for Pastoral Livelihood Sustainability in the Mara Ecosystem, Kenya

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ABSTRACT

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The seventeen (17) Sustainable Development Goals (SDGs) form a firm foundation for livelihoods and ecological sustainability in biodiversity conservation. Of the 17 SDGs, five of them focus on promoting sustainable consumption and production patterns (SDG 12), promotion of actions at all levels to deal with climate change (SDG 13), protecting and restoring all terrestrial ecosystems to end biodiversity loss (SDG 15), achieving peaceful and inclusive societies, the rule of law, effective and capable institutions (SDG 16) and strengthening and enhancing the means of implementation and global partnership for sustainable development (SDG 17) form the bond within which other SDGs coalesce with the goal of attaining sustainability of planetary ecosystems. The Kenyan and Tanzanian constitutions also are aligned to the achievement of livelihood sustainability. The fragmentation of the Mau-Mara ecosystem and consequent loss of wildlife habitat, the occurrence of droughts due to fluctuating rainfall patterns, loss of woody vegetation, commercial agricultural land use, population growth, increase in human settlement, and associated poaching are some of the factors responsible for shrinking wildlife resources in the Mara. Climate change poses a serious challenge for the Mara due to its adverse effects on temperature and rainfall patterns. Several recommendations have been suggested in this paper regarding different ways of addressing these human-wildlife conflicts. They include growing wildlife as a cash crop with a bonus to the local community and collaboration with the private sector to enhance the free movement of livestock while also freeing space within wildlife corridors, among others. This paper attempts to examine how the Maasai pastoral livelihoods are changing and the strategies adopted to cope with climate change and competing land uses in the Mara ecosystem. Suggestions are also made on some practical solutions that could contribute to sustainable pastoral livelihood systems in the area if implemented. This paper relies on literature search and review of various research works carried out in the Mara-Serengeti to highlight key issues involving livelihoods' sustainability in the Mara ecosystem. The research revealed the threat posed by climate change and underlined the need for adaptation ensure livelihood sustainability.

1. Introduction

The objectives of this study were to: highlight the dangers faced by the Mau, the Mara River and its ecosystem, examine the causes of dwindling wildlife numbers in the Mara Serengeti ecosystem, find out ways of reducing human-wildlife conflicts, and suggest possible actions for ensuring sustainability. The two theoretical approaches adopted were the Sustainable Livelihoods Approach/Framework and the Property Rights theory. A livelihood is sustainable when it is resilient and can stand on its own without depending on others while not undermining the natural resource base. The approach is people-centred and is aimed at eliminating

poverty. The theory has been applied in the study to understand how the pastoralists using available resources, and in the context of climate variability and change, can maintain sustainable livelihood systems.

On the other hand, the Property Rights theory explains how the right to use, sell or transfer land can impact the general conservation and degradation of the land, depending on the benefits individuals and communities expect to receive from the investment. The Mara ecosystem is characterised by communal, private and public land tenure systems, each with its strengths and shortcomings and implications regarding resource conservation, thus the need to

examine the systems for more sustainable livelihoods. There is, however, conflict between theory and practice as the two theories appear to be people-centred, while the practice prioritises wildlife conservation.

Expansion of human settlement and commercial agriculture were seen as some of the human activities that contribute to declining wildlife numbers in the Mara-Serengeti ecosystem. Other causes of dwindling wildlife conditions include drought, poaching, and loss of woody vegetation associated with expanding human settlement.

In the wake of climate change, it would be challenging to escape conflicts arising from shrinking ecosystem resources such as water, energy, and crop yields. Studies have shown that prioritising wildlife at the expense of people continued to limit the Maasai community's tolerance for wildlife and could become a disincentive to wildlife conservation in the Mara. For instance, state pressures for economic productivity, rapid urbanisation, changing market opportunities, privatisation of land rights, population growth, and changes in land use (commercial farming), present symbols of marginalisation and anxiety among the Maasai Community, leading to reservations in wildlife conservation. Education, religion, and the availability of wildlife corridors were more pro-wildlife conservation (Homewood and Brockington, 1999; Dybas, 2011; Galvin et al., 2006; Baird, 2015; Goldman, 2009).

This is a review paper using literature review or secondary data to address problems under study and the results provided in written text. Some of the challenges facing the Mara and Mara river and its ecosystem include population increase and rapid urbanisation, agricultural expansion and changing market opportunities, private land tenure system and technological advances (mobile phones, internet, among others), policies favouring mechanised farming, farming in wildlife calving areas, rapid in-migration to rangelands, dwindling livestock numbers as well as preference to wildlife compared to Maasai pastoralists.

Conflicts between humans and wildlife could be avoided through spatial planning of various land uses and demarcating wildlife dispersal areas and zones is long overdue, poverty eradication, exploration of a working formula for keeping livestock, wildlife and people, while also learning to grow wildlife as cash crop (where the local community earn cash from wildlife conservation, with bonus to boost their incomes) is important, including private sector collaboration.

2. Literature Review and Theoretical context

Many studies have been carried out in the Mara-Serengeti ecosystem, but few examine the livelihoods of the local communities and their sustainability. For instance, (Tarawali et al., 2011) explored the opportunities for innovations in the livestock sector to contribute to sustainable livelihoods and economic growth. The Author noted the need for sector transformation to meet the growing demand for milk, meat

and eggs. In this section, some of the relevant studies are reviewed. The theoretical framework guiding the study is also presented (Bedelian & Ogutu, 2017).

2.1 Sustainability and Livelihoods

All Sustainable Development Goals (SDGs) support the sustainability of livelihood and ecological systems. The post 2015 Development Agenda was a commitment to 17 Sustainable Development Goals with 169 targets. Several conventions also support livelihood sustainability, such as the Convention on International Trade in Endangered Species of Wild Flora and Fauna, Convention on Biological Diversity, Convention on Migratory Species, Convention on Wetlands of International Importance, Convention on Plant Genetic Resources for Food and Agriculture, Protection of Cultural and Natural Heritage Sites, International Plant Protection Convention, the United Nations Framework Convention on Climate Change (UNFCCC), as well as the United Nations Convention to Combat Desertification (UNCCD), among others (United Nations Open Working Group on SDGs, 2015; Pisupati et al., 2016).

By observing these five (5) important SDGs, it is possible to achieve all other SDGs either as a means of achieving the five (for instance, through education for all, gender equality, sustainable, affordable and modern energy, promoting strong, inclusive and sustainable economic growth and decent work, sustainable industrialisation and inclusive and sustainable cities and human settlement) or as an outcome of the five SDGs (poverty eradication, food security, secure water and sanitation, reduction in inequality, and conservation and sustainable use of marine resources, oceans and seas). The result of this process is sustainable livelihoods and ecosystems.

At the national level, the issues of livelihoods are covered in the Kenyan Constitution 2010 Chapters on: The Bill of Rights – Chapter 4- sections 19- 59), Land and Environment- sections 60 to 72, and in Tanzania, in the Tanzanian Constitution as well as the United Republic, Political parties, the People, and the Policy of Socialism and self – reliance (Chapter 1-sections 1 to 32) (Government of Kenya, 2010; United Republic of Tanzania, 1977). This is a review paper with the main goal of addressing the challenges facing the Mara River and its ecosystem to ensure sustainability. Specific objectives are to: highlight the dangers faced by the Mau, the Mara River and its ecosystem, examine the causes of dwindling wildlife numbers in the Mara Serengeti ecosystem, find out ways of reducing human-wildlife conflicts, and suggest possible actions for ensuring sustainability. The link between sustainability and pastoral livelihoods is discussed later in this paper.

2.2 The 'Weeping' of the Mara and Mara Ecosystem

Dybas (2011) emphasised that the Mara is an important waterway connecting Kenya's famed Maasai Mara with Tanzanian's Serengeti and fusing them into one ecosystem.

Kenya shares 65 per cent of the Basin and Tanzania 35 per cent of the basin (the Mara River Basin). This important basin is supported by 13 Acres Enapuiyapui swamp, through two small streams- the Nyangores and Amanda Rivers, resulting into the 395 km long Mara River. Enapuiyapui is supported by the Mara swamp on the Tanzanian side. As a result, the challenges of the Mara forest deforestation, climate change, and dwindling overall rainfall patterns remain challenges to Enapuiyapui- which is dependent upon the dense indigenous woodland of the Mau Forest. The death of Enapuiyapui will also result in the death of the Mara, while the Mara River drying off would lead to the die-offs of the Serengeti Mara's herbivore populations with effects on the carnivores (Dybas, 2011). Building fences also prevents the animals from reaching the water, thus requiring: afforestation, control of irrigation downstream, close monitoring of the catchment area and continuous research and monitoring (Løvschal et al., 2017).

Fig. 1 illustrates the relationship between the Mau forest and the Mara River Basin. The Mau Ecosystem is the main source of the Mara River, and interference with the Mau forest could spell doom for the entire Mara River Basin.

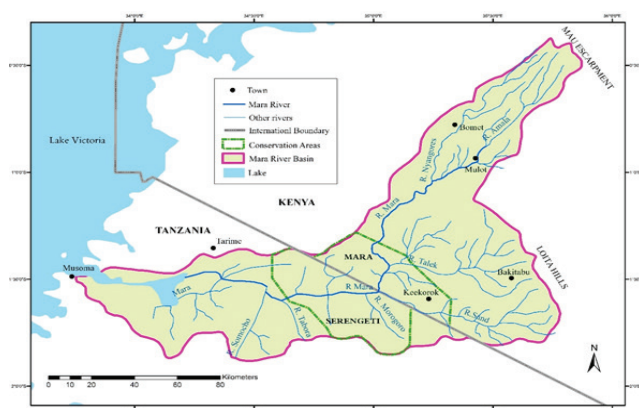


Fig. 1: The Relationship between the Mau Forest and the Mara River Basin. Source: Adapted from Survey of Kenya, 2011

Demand for livestock products due to population growth is an incentive to keep larger volumes of livestock. Other developments that interfere with the sustainability of livelihoods and wildlife conservation include technological advancements- telephone, mobile banking, among others, enhance the easy flow of information regarding grazing lands and in movement, Increasing variable and unpredictable arid and semi-arid rangeland environments, privatisation of communal grazing lands, rapid in-migration and population growth, increasing cash needs to cover education as well as Health-related and other socio-economic pressures. Other challenges mentioned include loss of pastureland to private farms, ranches, game parks and urban areas. Increased commoditisation and rising inequality within livestock economy, outmigration of poor pastoralists, periodic dislocation brought about by drought, famine and civil war, urban mi-

gration and political turmoil and civil war (Adano et al., 2012; Dybas, 2011; Galvin et al., 2006; Baird, 2015; Home-wood et al., 2001; Ottichilo, 2000; Goldman, 2009). How does demand increase?

A study of African elephants (*Loxodonta africana*), an endangered species due to habitat loss, habitat fragmentation and poaching, revealed that among the existing elephants, nearly 70 per cent inhabit non-protected areas (Browne-Nuñez et al., 2013). Expansion of human settlement contributes to habitat loss and fragmentation, hence threatening wildlife (Odingo et al., 2015).

Observations indicate that non-migratory wildlife changes were due to droughts, poaching, loss of woody vegetation and enhanced human settlement. According to (Home-wood et al., 2001), the main drivers of land-use cover were agro-pastoralist population growth and land use. The decisions on land use are dependent on trade-offs between different economic opportunities and not by population pressure. Similarly, wheat farming in the study area, although occupying relatively small portions of the land, its location at the core of wildebeest breeding and calving grounds and wet season grazing range led to 75 per cent decrease in the Kenyan wildebeest population in the period over the years (Ottichilo, 2000).

Among the pastoralists, it is not the drought but the length of the rains that is associated with greater conflict casualties as pastoralists fight during periods of plenty disrupting livelihoods. Additional studies have established the relevance in collectively managing common-pool natural resources – forests, grazing lands and fisheries-for collective benefits (Galvin et al., 2006; Baird, 2015; Bedelian & Ogutu, 2017).

Baird (2015) established that habitat loss effects are more sensitive to changes in the numbers of households than changes in population. Further, it was found that education is associated with measures of well-being such as greater expenditures, better health, higher savings and greater capacity to adapt to climate change-related shocks. The author further explains that wildlife decline in Africa has been attributed to private ownership of land and market-based opportunities for commercial agriculture rather than livestock-related activities. Land sparing (through agricultural intensification) is more promising in terms of protecting biodiversity. Fig. 2 shows the Mara-related conservation areas in Kenya and Tanzania. Wildlife corridors are essential for climate change adaptation as wildlife would need to move to access new grazing areas (Vetter, 2005; Goldman, 2009). Fig. 2 also indicates the wildlife dispersal areas.

According to (Börjeson et al., 2008), the last three decades have witnessed tremendous change in land use in the Maasai Plains of Northern Tanzania, from Savanna vegetation to agricultural land use. The changes in land use are a result of political and economic factors. These factors typify the major characteristics of the 20th century, such as the modernist development regimes, state pressures for

increased productivity, rapid urbanisation, changing market opportunities, the privatisation of land rights and population growth. The main issue here is that the Maasai have become marginalised and vulnerable due to expanding commercial agriculture on former rangelands. Besides, the Maasai are regarded as pure pastoralists with neither significant interest in nor experience in farming.

Tarawali et al., (2011) emphasised that in order to enhance sustainable livelihood and economic growth opportunities in the livestock sector, it would be important to carefully appreciate the strategic objectives of all its varied sectors at the production level, upstream and downstream, and; re-examination of public policy and institutional environments that connect the different actors across systems, regions, and countries. In other words, there is need to understand the production, distribution, and marketing environment in which the sector operates to secure sustainable livelihoods for various stakeholders.

Fig. 2 shows the migratory routes within the dispersal area. The Mara ecosystem and the dispersal areas require joint efforts in conservation to enjoy the services offered by this specialised ecosystem.

2.3 Socio-economic and Ecological Viability of Pastoralism in the study area

Human and wildlife mobility has been curtailed by blocked migration corridors and dispersal areas, thus interfering with the ecosystem balance in terms of people, land and livestock (Moritz, 2006; Ole Seno and Tome, 2013). Further, a combination of sedentarisation and climatic changes has increased pastoralists' vulnerability to drought. For instance, the movement of young labour from pastoralism to education and other jobs mean that the hitherto labour-intensive pastoralism as a livelihood strategy has been affected, thus contributing to poverty and deaths of livestock. In addition, Group ranches idea does not work as outsiders continue to invade the market leading to degradation. As a result, there is need to deal with poverty among the pastoralists, and find a working formula for livestock keeping, wildlife and the human population.

However, pastoralism remains the link between wildlife, people, agriculture, and settlement in the face of changing climate. It is important to appreciate that the Maasai, whether educated or not, still prefer pastoralism as a way of life. Some of the challenges experienced in the process include the reluctance of the government to incentivise the pastoralists, failure to recognise the importance of pastoralism in the national economy, meeting the demand for livestock products due to growing population and appreciating the role of technological advancements in enhancing the easy flow of information regarding grazing lands and in movement (Idris, 2011; Kaye-Zwiebel and King, 2014; Fan and International Food Policy Research Institute (Eds.), 2014).



Fig. 2: Wildlife Dispersal areas in the Serengeti-Maasai Mara Ecosystem (Source: Adapted from Survey of Kenya 2011).

A study on livelihood choices and returns among pastoralists in southern Kenya (Radeny et al., 2007) identified some of the pastoralist pressures such as increasing variable and unpredictable arid and semi-arid rangeland environments, privatisation of communal grazing lands, rapid in-migration and population growth, increasing needs for cash to cover education and Health-related needs and other socio-economic pressures.

According to (Fratkin and Mearns, 2003), to sustain their pastoralist livelihoods, the Maasai of East Africa need to avoid challenges that may threaten their livelihoods and sustainability of the ecosystems. Some of these challenges are: population growth, loss of pasture to other land uses, outmigration of pastoralists and periodic dislocations caused by drought or famine. The livestock numbers are declining, thus jeopardising the sustainability of both rangeland resources and pastoral livelihoods. In this article, rangelands were seen as a source of food production which were in competition with game parks.

In a study carried out in Tarangire-Simanjiro Ecosystem (Terrat village) by (Nelson et al., 2010), payment for ecosystem services (PES) has been promoted as a way of enhancing incentives for biodiversity conservation. A community-based PES has been introduced whereby private investors pay the community annually for the land used as wildlife corridor, which is important for their business. Such an arrangement gives local landowners rights to wildlife and its economic values. Even though this is commendable, the practice creates conflict with policymakers who want patronage over such resources, leading to additional conflict by local landowners and concern for other land uses. The agreement also prevents other activities like charcoal burning and unlicensed hunting in the concession area. The

activities are monitored by Village scouts, while resources are used for Community development. The practice assisted in controlling farming in conservation areas among the community members in the area.

The Key factors enabling PES to succeed were the enabling institutional framework with respect to wildlife governance institutions and land tenure, low opportunity costs, as a result of the compatibility of local pastoralists' livestock management practices with the maintenance of wildlife habitats, and low transaction costs as a result of prior experience with establishing private-community tourism ventures in the area.

According to (Tarawali et al., 2011), by identifying a special niche market, pastoralists can also opt to produce special products such as milk and meat that combine ecological and economic empowerment, market engagements and benefits for environmental activities as part of the payment for ecosystem services. This is supported by training and establishing networks of stakeholders.

Some of the causes of change in the rangelands that call for economic policy to maintain pastoral viability (Galvin et al., 2006) include fragmentation due to agriculture, private land ownership and well-construction, as well as climate change. These changes have contributed to the establishment of livelihood sources outside conservation areas through diversification into agriculture and intensification of livestock production through sedentarization, leading to human-wildlife conflicts (Pavanello, 2009; Homewood, 1992).

Currently, over one-half of the Maasai live below the poverty line, though living on the land that attracts huge profits from wildlife tourism. In-migrants and pastoral elites dominate the benefits. Secondly, pastoralists are often marginalised by government policy that favours dominant settled cultivation lifestyles (Reid et al., 2016). The study by (Reid et al., 2016) supported research modelled on integrating knowledge from policymakers, communities and researchers in Maasai land in East Africa.

Some of the challenges faced by pastoralist include political disempowerment and economic marginalisation through national policies, which give preference to farming. Other challenges include population growth, droughts and famine, loss of common property resources, commoditisation, sedentarisation and urban migration war (Fratkin, 2001; Mwangi, 2007).

2.4 Theoretical Framework Model

In order to understand the livelihoods and their sustainability in the Mara ecosystem, this paper incorporates two theoretical frameworks. These are the sustainable livelihoods approach and the property rights theory.

2.4.1 Sustainable Livelihoods Approach

According to the Sustainable Livelihoods Approach (SLA), a livelihood comprises the capabilities, assets and

activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future while not undermining the natural resource base (DFID, 2000). The primary purpose of livelihood sustainability is to alleviate poverty.

Sustainability is achieved when the livelihood is resilient in the face of external shocks and distress, independent from external support, and able to maintain the long-term productivity of natural resources while not undermining the livelihood options of others (GLOPP, 2008). Sustainable livelihoods approach (SLA) tends to conceptualise human operations within vulnerability, characterised by shifting seasonal constraints, economic shocks and long-term trends, and the use of livelihood assets and capital, subject to vulnerability context and existing institutions and processes, and; using the available asset base to develop livelihood strategies, leading to expected outcomes. Fig. 3 shows the Sustainable Livelihoods Approach or model.

Vulnerability arises from shocks, trends and seasonality, while structures include levels of government and the private sector. The processes entail laws, policy, culture and institutional processes. The livelihood outcomes are visible in increased incomes, well-being, reduced vulnerability and improved food security as well as more sustainable use of natural resource base.

The approach helps in conceptualising how the pastoralists and agro-pastoralists in their settings facing climate change can attain sustainability of their livelihood systems using the resources at their disposal by employing appropriate strategies. The approach can be applied in many contexts with specific attention to gender and ecological issues as those in the Mara-Serengeti ecosystem.

2.4.2 Property Rights Theory

According to (Feder and Feeny, 1991), land use may include hunting, gathering, grazing, cultivation, mining of minerals, the use of trees, and even the right to destroy resources. In such circumstances, land rights may specify the conditions under which various transfer rights may be affected and the parties to whom such transfer may be made. For instance, in open access there could be lack of incentive to conserve, leading to resource degradation. The distinction between communal rights and open access may be grey if the community holding the right is too large.

Similarly, where individuals are assigned use rights and rights to sell and transfer private property, there is an incentive to put effort into tilling and preserving soil fertility. However, social unrest may emerge when individuals lose their land rights to non-members of the community, thus creating a landless class. Technological advances can change the dynamics of labour and productive assets among households in case of limited pieces of land, while lack of transferability may adversely affect productivity. The theory appears to be people-centred, and resource becomes second-

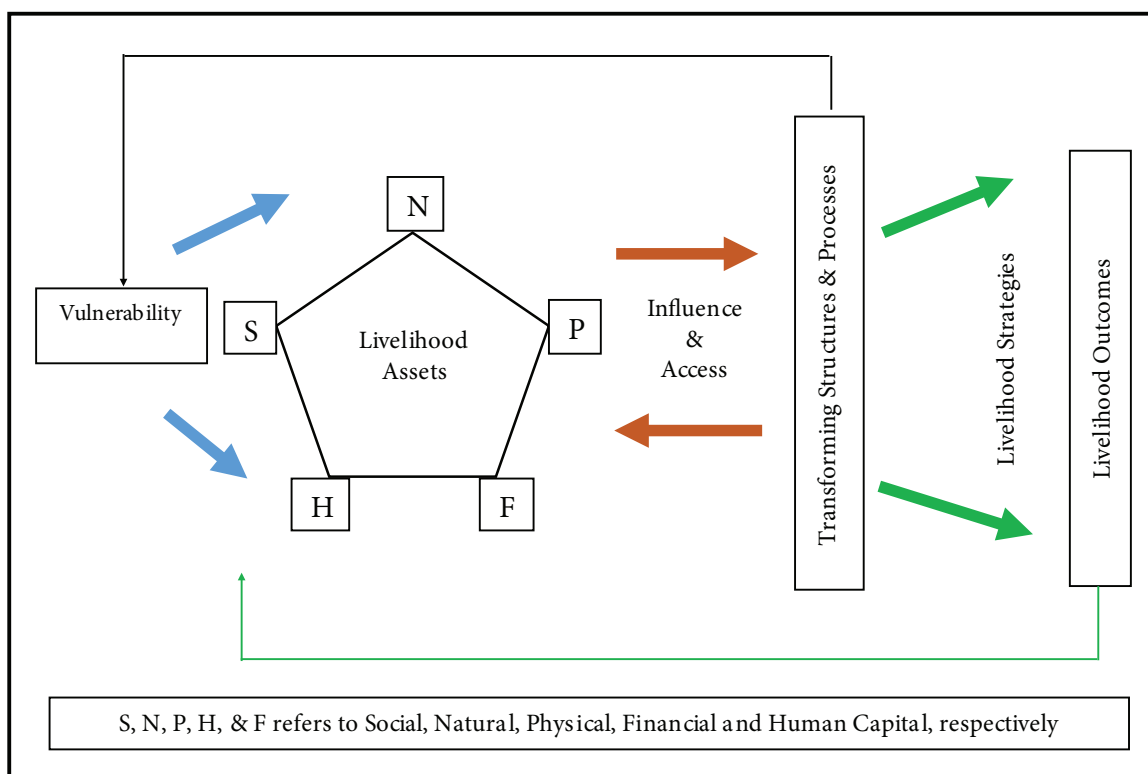


Fig. 3: DFID Sustainable Livelihoods Approach (Source: Adapted from GLOPP, 2008)

ary.

Among the pastoralists, communal rights to land are most common, and the members have their structured way of managing their use of land (normative behavioural codes). The code of conduct is subject to the constitutional order and institutional arrangements of the entire country, which may sometimes suffer from inadequate registration and enforcement. Initially, the Maasai community lived by themselves in the Mara, but with the increasing need to conserve wildlife and their habitat, a number of non-community members have moved into the Mara, either as holders of private land rights or in the form of conservancies where land is leased out from the community members for a given period and used for wildlife conservation. The unequivocal climate change (Adano et al., 2012; Stocker, 2014; Bedelian and Ogutu, 2017), added to increasing human and livestock populations pose conditions for resource degradation, conflict and escalating poverty. The situation is complicated by the spread of large scale commercial wheat farming in wildlife breeding areas which is seen as a threat to wildlife conservation, yet a more sustainable income earner for private landowners, as a form of diversification to dwindling climatic conditions in the area. All these calls for the need to find more lasting sustainable ways of survival for human and livestock populations and wildlife conservation to ensure sustainable livelihoods in the Maasai Mara.

2.4.3 Conflict of theories

While the Sustainable Livelihoods Approach and the Property Rights Theory bestow the power to humanity to

own, use, transact and manage, resources in wildlife conservation areas, wildlife appears to have priority over humans. This is mainly because there are only a few areas where wildlife could survive, owing to their contribution to the national economy, the constitutional order and institutional arrangements render the normative behavioural codes subservient to these higher authorities, thus creating conflict in resource management in this particular ecosystem. Failure to intervene could lead to increasing degradation, poverty and conflict, thus further endangering the wildlife and the ecosystem which is targeted in the conservation process (Mwangi, 2007).

3. Materials and Methods

This study used secondary data through literature review to address the objectives of the study. Through literature review, it was possible to understand the operations of pastoralists in the Mara-Serengeti ecosystem within climate change contexts. Other important factors such as poverty, human and livestock population increases, conflict, and competition between farmland and grazing were considered. It was also possible to understand the use of livelihood assets, livestock and occasionally supported by small enterprises and tourism activities, in the presence of vulnerability and national and local policies, and how such actions resonate with the conservation of the Mara ecosystem. The use of livelihood assets to develop a range of livelihood strategies such as the sale of livestock during drought or grazing in wildlife zones/conservancies or pooling of farms for graz-

ing, among others to achieve desired outcomes, is important in understanding the role of the community in the face of changing climate change. Literature review enabled the application of the Sustainable Livelihoods Approach and Property Rights Theory which relate closely with the livelihood systems to guide the outcomes of the study in the Mara.

4. Results and Discussion

This paper relied heavily on literature review. Content analysis of reviewed literature was carried out. Some of the issues emerging from the literature review include sustainability of pastoralism in the face of climate change, alternative land uses, conflict between pastoralism and wildlife conservation, rangelands access, the impact of settlement, tenure and credit in the Mara ecosystem. These issues have serious implications on the sustainability of livelihood systems. For instance, climate change may lead to frequent and severe droughts that may decimate livestock, thereby jeopardising the pastoral livelihoods of the Maasai. Drought may lead to scarcity of grazing and water for livestock. The growing scarcity of grazing and water may trigger intra and interethnic conflicts in the Mara. To ensure their survival, the pastoralists may turn to other alternative land uses such as conservancies and small scale farming, among others. The sections that follow discuss the findings from literature review.

Pastoralism, livelihoods and conservation nexus

Pastoral rangelands, conservation and development projects build on the premise that wildlife and pastoralism are compatible and complementary forms of land uses. This observation is correct given that in the pastoral savannas of East Africa, wildlife and livestock have coexisted for millennia, and traditional pastoralism has been considered to be compatible with wildlife conservation (Homewood, 2001; Vetter, 2005; McCabe et al., 1992). Synergies between mobile pastoralism and wildlife conservation keep rangeland open and allow wildlife and livestock to live side by side. This finding is consistent with the views expressed by (McAllister, 2011) and (Reid et al., 2016). These authors noted that African savannas have until recently maintained thriving pastoral economies and densities of wildlife is a testament to their potential compatibility. This is the case with pastoral pursuits in the Maasai Mara ecosystem.

Pastoralism is still portrayed in official government and conservation literature as an irrational, archaic and primitive form of livelihood. Common misconceptions regarding pastoralism have viewed it as unproductive and uneconomic land use, in need of modernising. Pastoralism has been undervalued as a land use and pastoral policies have been dominated by negative perceptions (Hesse and MacGregor, 2006).

Many conservationists and some government officers do not comprehend that pastoralists such as the Maasai are well

adapted to their landscapes and variable conditions. They have deeply entrenched indigenous knowledge and practices suited to the Maasai Mara ecosystem. From the available literature review, it was established that pastoralism is detrimental to the environment and the cause of rangeland degradation is inaccurate (Vetter, 2005; Fan & International Food Policy Research Institute, 2014). The modernisation policies advocated by conservationists and government officials have undermined traditional forms of management and coping strategies of pastoralists, ignoring pastoralists' social, cultural, political and ecological complexities. An essential coping strategy to ensure the sustainability of the pastoral economy is mobility (Moritz, 2006). Restricting mobility increases the risk of degradation as it leads to continuous, heavy utilisation of only a part of the range, and also increases pastoralists' susceptibility to droughts. Rather than pastoral degradation, arguably, it is the socio-political processes that transform these landscapes by displacing pastoralists, reducing mobility, and preventing them from using their traditional knowledge and practices (Vetter, 2005).

Like those of other pastoralists elsewhere, the Maasai pastoral areas have been considered underused and undeveloped lands likely to be grabbed. The increased needs for agriculture and biofuels (food, fuel, cash crops) and also for tourism have justified the expropriation of pastoral areas by outsider investors, governments, local elites for commercial investment, as these areas are seen as barren, idle, wastelands. Pastoralists have been displaced out of their range, leading to the permanent loss of land and the erosion of pastoral land rights (Mwangi, 2007; Pavanello, 2009). The ethical imperative of sustainable pastoral livelihood is for the Maasai to access their rangeland and use it for their wellbeing.

Pastoralist livelihoods and Diversification

Pastoralists have lost land to alternative uses, pastoral ranges are shrinking, and livestock per capita reducing. There are high levels of poverty in pastoral areas in Kenya. Fragmentation constrains mobility and access to key resources, thus increasing pastoral vulnerability (Galvin et al., 2006). In response, pastoralists are increasingly turning to alternative non-livestock sources of income for their livelihoods. Homewood and Brockington (1999) state that diversification of pastoral livelihoods is widely observed across Maasailand. The Maasai are turning to cultivation, business and trade, wage labour and tourism (Homewood et al., 2001). Farming in the pastoral rangelands is risky with unpredictable rainfall and low yields.

Coping mechanisms of the pastoralists in the Mara Region. Pastoralists employ several highly specialised risk-spreading strategies to safeguard their herds in the face of unpredictable and sometimes extreme climatic events, disease outbreaks and social unrest. Pastoralist resilience depends heavily on indigenous knowledge of the environment and the production system and the customary institutions that

enable pastoralists to capitalise on this knowledge. Strong social organisation and customary institutions are common features of many successful pastoral societies and have been critical for the effective management of unpredictable environments. These institutions enable herd mobility, pooling of labour for production or security, and spreading risk through reciprocity and obligation systems.

These strategies ensure the rational use of the natural resource base on which the herds depend and also build strong social networks. Hesse and MacGregor (2006) have identified the key strategies. They include building up herd size as insurance against times of hardship; splitting herds across different locations and movement patterns to spread risks from lack of grazing and exposure to diseases et cetera; keeping different species and breeds to make use of different ecological niches; selecting animals for different traits that enable survival in prevalent conditions; loaning surplus animals to family and friends for their subsistence requirements and building of their herd, to develop and strengthen social relations as a form of social capital; and matching the number of animals to the availability of natural pastures and water.

Coping strategies and mechanisms by the Maasai pastoralists in the study area have also been witnessed in regards to pasture. The pastoral areas have, over the years, been vulnerable to prolonged drought spells and other hazards such as the outgrowth of the invasive *Opuntia* plant species in the rangelands. In response to these climatic and ecological hazards, the Maasai pastoralists rely upon set down formal and informal rules and regulations established in their community group ranch constitutions. The constitutions have zoned pastoral lands into grazing, settlement, and conservation zones, and this guarantees preservation of given pasture lands for future use through the emphasis on the use of and adoption of holistic management of pasturelands. Moreover, to ensure that the enshrined rules and regulations are followed, the community group ranch management and elders have sanctions and punishments for offenders.

In the literature review, it was established that the first time offenders who take their livestock into the restricted and reserved pasturelands for grazing are given a warning, but second-time offenders are forced to part away with a he-goat as a fine for grazing in restricted zones and reserved pasturelands. For the third time and repeat offenders, legal actions, which involves notifying the local administration is taken, and a jail term is a possible outcome.

Conclusions and Policy implications

It has been established from the literature review that climate change poses a big threat to the pastoral livelihoods in the Mara ecosystem. As drought becomes more frequent and severe in the study area, pastoralism as a viable and sustainable livelihood is now at risk. Pastoralists need to adopt strategies to enable them to cope with climate change. Some

pastoralists engage in other land uses such as crop production, tourism, or produce fodder for selling to pastoralists during drought. To ensure adequate water resources downstream for livestock, there is need to curb deforestation in the Mau area. Private landowners should allow pastoralists easy passage to grazing areas to reduce deaths likely to result from drought. Wildlife conservation should not be given preference over the pastoral pursuits of the Maasai community. The pastoral Maasai have coexisted with wildlife for aeons. The two economic activities should continue to coexist harmoniously even today.

Some of the imperatives for conservation of the Mara include close monitoring of the catchment area to prevent deforestation, continuous research and monitoring, especially on sustainable livelihoods of the pastoralists, dealing with poverty among the pastoralists, and the need to find a working formula for integrating pastoralism, wildlife and crop cultivation.

Sustainability can be promoted by enhancing the compatibility of local pastoralists' livestock management practices with the maintenance of wildlife habitats, and promotion of private-community tourism ventures in the area and partnering with local communities.

There is also need to encourage communal land ownership instead of private tenure. This would ensure the sustainability of pastoralism as a livelihood. Attempts should be made to alleviate poverty among pastoralists and integrating indigenous knowledge of the communities with information derived from research. Carefully formulated livestock-grazing plans are needed to allow for better integration of, and space for, livestock within and outside conservancies. These should recognise the need to conserve good-quality rangeland for livestock, similar to how the conservancies expand and conserve habitat for wildlife. This should occur through a participatory process, not just with conservancy members but also with women, herders and other non-members who reside next to a conservancy.

An early warning system for drought combined with timely market interventions and the establishment of financial institutions can increase herders' ability to transform that livestock that cannot withstand the stress of the drought into other assets such as cash, fodder, or food grain. Risk coping strategies that offer incentives to destitute pastoralists to invest in alternative income generating activities outside the pastoral sector not only help these pastoralists to cope with the loss of their main livelihood supporting activity, but also mitigate the negative effects of growing pastoral populations on shrinking rangelands.

References

- Adano, W. R., Witsenburg, T. D. K. & Zaa, I. F. (2012). Climate change, violent conflict and local institutions in Kenya's drylands. *Journal of Peace Research*, 49(1), 65-80. <https://doi.org/10.1177/0022343311427344>
- Baird, T. D. (2015). Conservation implications of the diffusion of Christian religious ideals in rural Africa. *Population and Environment*, 36(4), 373-399. <https://doi.org/10.1007/s11111-014-0222-3>

- Bedelian, C. & Ogotu, J. O. (2017). Trade-offs for climate-resilient pastoral livelihoods in wildlife conservancies in the Mara ecosystem, Kenya. *Pastoralism: Research, Policy and Practice*, 7(10). <https://doi.org/10.1186/s13570-017-0085-1>
- Börjeson, L., Hodgson, D.L. & Yanda, P.Z. (2008). Northeast Tanzania's Disappearing Range-lands: Historical Perspectives on Recent Land Use Change. *The International Journal of African Historical Studies*, 41(3), 523-556. <http://196.44.162.10:8080/xmlui/handle/123456789/836>
- Browne-Nuñez, C., Jacobson, S. K., & Vaske, J. J. (2013). Beliefs, attitudes, and intentions for allowing elephants in group ranches around amboseli national park, Kenya: Allowing Elephants Outside Protected Area. *Wildlife Society Bulletin*, n/a-n/a. <https://doi.org/10.1002/wsb.296>
- Department for International Development (DFID) (2000). *Sustainable Livelihoods Guidance Sheets*.
- Dybas, D.L. (2011). Saving the Serengeti–Masai Mara: Can ecohydrology rescue a key East African ecosystem? *BioScience*, 61(11), 850-855. <https://doi.org/10.1525/bio.2011.61.11.4>
- Fan, S. & International Food Policy Research Institute (2014). Resilience for food and nutrition security. Washington, DC: International Food Policy Research Institute (IFPRI). <http://dx.doi.org/10.2499/9780896296787>
- Feder, G. & Feeny, D. (1991). Land tenure and Property Rights: Theory and Implications for Development Policy. *The World Bank Economic Review*, 5(1), 135-153. <https://doi.org/10.1093/wber/5.1.135>
- Fratkin, E. & Mearns, R. (2003). Sustainability and Pastoral Livelihoods: Lessons from East African Maasai and Mongolia. *Human Organization*, 62(2), 112-122. <https://doi.org/10.17730/humo.62.2.am1qpp36eqgxh3h1>
- Fratkin, E. (2001). East African Pastoralism in Transition: Maasai, Boran, and Rendille Cases. *African Studies Review*, 44(3), 1-25. <https://doi.org/10.2307/525591>
- Galvin, K. A., Thornton, P. K., de Pinho, J. R., Sunderland, J. & Boone, R.B. (2006). Integrated Modeling and Its Potential for Resolving Conflicts between Conservation and People in the Rangelands of East Africa. *Human Ecology*, 34(2), 155-183. <https://doi.org/10.1007/s10745-006-9012-6>
- GLOPP (2008). DFID's Sustainable Livelihood Approach and its Framework, United Kingdom, DFID. http://www.glopp.ch/B7/en/html/unit_1_present_2.html
- Goldman, M. (2009). Constructing Connectivity: Conservation Corridors and Conservation Politics in East African Rangelands. *Annals of the Association of American Geographers*, 99(2), 335-359. <https://doi.org/10.1080/00045600802708325>
- Government of Kenya (GoK) (2010). *Constitution of Kenya 2010*. Government Printer
- Hesse, C., & MacGregor, J. (2006). *Pastoralism: Drylands' invisible asset?: developing a frame-work for assessing the value of pastoralism in East Africa*. IIED.
- Homewood, K. M. (1992). Development and the ecology of Maasai pastoralist food and nutrition. *Ecology of Food and Nutrition*, 29, 61–80. <https://doi.org/10.1080/03670244.1992.9991291>
- Homewood, K. & Brockington, D. (1999). Biodiversity, conservation and development in Mkomazi Game Reserve, Tanzania. *Global Ecology and Biogeography* 8, 301–313. <https://doi.org/10.1046/j.1365-2699.1999.00144.x>
- Homewood, K., Lambin, E. F., Coast, E., Kariuki, A., Kikula, I., Kivelia, J., Said, M., Serneels, S., & Thompson, M. (2001). Long-term changes in Serengeti-Mara wildebeest and land cover: Pastoralism, population, or policies? *Proceedings of the National Academy of Sciences*, 98(22), 12544–12549. <https://doi.org/10.1073/pnas.221053998>
- Idris, A. (2011). Taking the camel through the eye of a needle: Enhancing pastoral resilience through education policy in Kenya. *Resil. Interdiscip. Perspect. Sci. Humanit.* 2, 25–38. (Google Scholar)
- Kaye-Zwiebel, E., & King, E. (2014). Kenyan pastoralist societies in transition: varying perceptions of the value of ecosystem services. *Ecology and Society* 19(3), 17. <http://dx.doi.org/10.5751/ES-06753-190317>
- Løvschal, M., Bøcher, P. K., Pilgaard, J., Amoke, I., Odingo, A., Thuo, A., & Svenning, J.-C. (2017). Fencing bodes a rapid collapse of the unique Greater Mara ecosystem. *Scientific Reports*, 7(1), 41450. <https://doi.org/10.1038/srep41450>
- McCabe, J., Perkin, S., & Schofield, C. (1992). Can Conservation and Development be Coupled among Pastoral People? An Examination of the Maasai of the Ngorongoro Conservation Area, Tanzania. *Human Organization*, 51(4), 353–366. <https://doi.org/10.17730/humo.51.4.d20010q600v50240>
- McAllister, R. R. (2011). Review of Wild Rangelands: Conserving Wildlife While Maintaining Livestock in Semi-arid Ecosystems edited by Johan du Toit, Richard Kock and James Deutsch. *Pastoralism: Research, Policy and Practice*, 1(1), 15. <https://doi.org/10.1186/2041-7136-1-15>
- Mwangi, E. (2007). Socioeconomic change and land use in Africa: the transformation of property rights in Maasailand. 1st Ed. New York: Palgrave Macmillan. (Google Scholar)
- Nelson, F., Foley, C., Foley, L. S., Leposo, A., Loure, E., Peterson, D., Peterson, M., Peterson, T., Sachedina, H., & Williams, A. (2010). Payments for Ecosystem Services as a Framework for Community-Based Conservation in Northern Tanzania. *Conservation Biology*, 24(1), 78–85. <https://doi.org/10.1111/j.1523-1739.2009.01393.x>
- Moritz, M. (2006). Maryam Niamir-Fuller, ed. *Managing Mobility in African Rangelands: The Legitimization of Transhumance*. London: Intermediate Technology Publications, 1999. xiv + 314. Bibliography. Index. \$29.95. Paper. *African Studies Review*, 49(3), 61–62. <https://doi.org/10.1353/arw.2007.0051>
- Odingo, R.S., Irandu, E.M. and Oludhe (2015). Climate Change and the Survival of Maasai Mara Ecosystem. An invited paper presented at the Summit and Workshop held in the Maasai Mara University, organized by the Maasai Mara Science and Development Initiative, 21st – 24th April, 2015.
- Ole Seno, S. K., & Tome, S. (2013). Socioeconomic and Ecological Viability of Pastoralism in Loitokitok District, Southern Kenya. *Nomadic Peoples*, 17(1), 66–86. <https://doi.org/10.3167/np.2013.170104>
- Ottichilo, W. (2000). *Wildlife dynamics: An analysis of change in the Masai Mara ecosystem of Kenya*. ITC.
- Pavanello, S. (2009). Pastoralists' Vulnerability in the Horn of Africa: Exploring Political Marginalization, Donors' Policies and Cross-Border Issues. Literature Review. Humanitarian Policy Group, Overseas Development Institute, London. (Google Scholar)
- Radeny, M., Nkedianye, D., Kristjanson, P. & Herrero, M. (2007). Livelihood choices and returns among pastoralists: Evidence from Southern Kenya. *Nomadic Peoples*, 11(2), 31-55. (Google Scholar)
- Reid, R. S., Nkedianye, D., Said, M. Y., Kaelo, D., Neselle, M., Makui, O., Onetu, L., Kiruswa, S., Kamuar, N. O., Kristjanson, P., Ogotu, J., BurnSilver, S. B., Goldman, M. J., Boone, R. B., Galvin, K. A., Dickson, N. M., & Clark, W. C. (2016). Evolution of models to support community and policy action with science: Balancing pastoral livelihoods and wildlife conservation in savannas of East Africa. *Proceedings of the National Academy of Sciences*, 113 (17), 4579–4584. <https://doi.org/10.1073/pnas.0900313106>
- Stocker, T. (Ed.). (2014). *Climate change 2013: The physical science basis: Working Group I contribution to the Fifth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. (Google Scholar)
- Tarawali, S., Herrero, M., Descheemaeker, K., Grings, E., & Blümmel, M. (2011). Pathways for sustainable development of mixed crop livestock systems: Taking a livestock and pro-poor approach. *Livestock Science*, 139(1–2), 11–21. <https://doi.org/10.1016/j.livsci.2011.03.003>
- Pisupati, B., Mrema, E., & United Nations Environment Programme. (2016). *Role of multilateral environmental agreements (MEAs) in achieving the sustainable development goals (SDGs)*.
- United Nations (UN) Open-Working Group on Sustainable Development Goals. (2015). *Sustainable Development Goals*. UN New York.
- United Republic of Tanzania, 1977. *The Constitution of the United Republic of Tanzania (cap. 2)*. The United Republic of Tanzania, Dares salaam.
- Vetter, S. (2005). Rangelands at equilibrium and non-equilibrium: Recent developments in the debate. *Journal of Arid Environments*, 62 (2), 321-341. <https://doi.org/10.1016/j.jaridenv.2004.11.015>