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Article *in* Development · December 2016

DOI: 10.1057/s41301-016-0022-4

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The Impact of Climate Change on Human Security: The case of the Mau Forest Complex

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ABSTRACT *The Mau Forest Complex hosts ample variety of natural flora and fauna and plays a critical role in water catchment and energy generation, which millions of households use for their domestic as well as commercial needs. However, the ecosystem faces many threats mainly due to large-scale anthropogenic activities leading to climatic changes. This article examines climate change-led human security implications within and around the Mau Complex.*

KEYWORDS *climate change; resource scarcity; human security; Mau Forest Complex*

Introduction

The Mau Forest Complex (MFC) covers nearly 400,000 hectares, and is the largest closed canopy forest ecosystem in the East Africa sub-region. In particular, Mau's waters are of key significance for the trans-boundary Lake Victoria and the Nile River basin. Like all natural forests, major functions of the Mau forests are to store, filter and regulate underground water, control local as well as regional climate, protect soil from degradation and provide habitats for unique biological diversity. The Mau forests sustain variety of rare wild animals including Bongo, Yellow Duiker, Red Duiker, Golden Cat, Giant Forest Hog and Red-tailed blue monkey. The vegetation cover of the Mau forests consists of heterogeneous species with assorted trees, herbal plants, shrubs and climbers (Kigomo *et al.*, 2013: 1–5). In this manner, the complex is a source of unlimited wealth creation with a wide range of socio-economic services (Kinyanjui *et al.*, 2014), vital to sustain key dimensions of human security in Kenya and in the regional context.

Despite its strategic importance, the Mau Region has undergone processes of deforestation and degradation, resulting to loss in forest cover and a compromise in its biological, environmental and socio-economic roles. Moreover, the area has undergone severe changes in the local climate with massive ecological challenges and associated human security implications. This article seeks to explore key issues that have compromised the human security of the people living in and around the Mau Complex, with special emphasis on forest degradation and associated climatic changes. These effects have been documented to specifically express the grievances of the weak and marginalized, and the poor peasant forest-adjacent communities who were entirely reliant on the Mau's ecosystem.

Development (2015) **58**(2–3), 390–398. doi:10.1057/s41301-016-0022-4;
published online 21 December 2016

Data collection tools for this article included published materials, government documents and first-hand interviews using semi- and unstructured questionnaires and focus group discussions. The first section of this article examines some fundamental factors that have led to substantial loss of forestland. The second section discusses the major consequences caused by the forest destruction and degradation, and the arising resource scarcity and human impacts. The third and the last sections shed light on the relevance and ineffectiveness of national, regional and global mechanisms to deal with climate change and human security in the MFC.

Colonial legacy and land politics in Kenya

Historical factors underlying the Mau's degradation are rooted in the colonial legacy. During the early years of the British rule in Kenya, the European settlers established labour and agrarian laws. Specifically, the Crown Lands Bill of 1908 and the Crown Land Ordinance of 1915 marked the abrogation of the native land rights and gave the settlers highest authority to occupy much of the agrarian land in Kenya, including forests and reserves (Okoth-Ogendo, 1991: 40–44). In the early years of 1930s, the colonial government degazetted parts of the Mau Complex for private ownership and thousands of hectares of the virgin forests were converted to ranches and tea farms. Due to growing population and land scarcity, in the late 1940s and early 1950s, the colonial administration used the Mau (such as Olenguruone in Narok Forest) for human settlements, which specifically marked the beginning of human invasion and encroachment on the MFC.[1]

Post-independence land politics

After Kenya's independence in 1963, all Crown land came under the care of the president. In the early 1960s, Kenya's new government introduced various resettlement schemes for the displaced and landless communities. These schemes were based on high as well as low density schemes (Odingo, 1971: 200–201; Von Haugvwitz, 1972: 12). Due to lack of clear land distribution policies, the independent government of Kenya distributed land in a manner that was not based on need. In addition, they did not consider sustainability of forest resources. For example, sections of the Mau Forest Complex were used to develop commercial tea farming and human settlements.[1] In the independent Constitution, forestland could be degazetted for certain developmental purposes, and this clause was applied to excise various parts of the MFC (Southhall, 2005: 149; Boone, 2012). Fortunately, this procedure has been changed in the Kenyan Constitution of 2010, backed by the Forest Act 2005.

As this trend continued gradually, and especially in the post-1986 period, the MFC lost thousands of hectares for subsistence agricultural activities. Additionally, parts of the excised Mau forest were cleared for new settlements. However, such schemes were introduced without looking into the wider social, political, economic and environmental challenges, including local and regional climate changes and human security implication. However, tribal division and political motives drove many of these settlement schemes. Specifically, thousands of hectares of the Mau forest were utilized in the tea production zones and newly established tea-processing factories. In early 2001, more than 61,000 hectares of the degraded sections of the Mau forest were excised to settle the Ogieks forest dwelling communities whose presence inside the forest was considered a threat to the Mau Complex (Kagwanja *et al.*, 2010).

In many cases, parcels from the Mau forest were cleared and subjected to infrastructural and development projects as well as expansion of group ranches. As a result, various stakeholders and civil society groups raised their concerns for the encroachment and destruction of Kenya's major water towers, leading to loss of biodiversity, irregular water flow, environmental instability and climate change. It is important to note that much of the Mau's land has been occupied through two different processes. One way was to

hold legal documentation supporting the ownership of the forestland, which has been the case with the settlement schemes. Secondly, the encroachers claimed land through illegal access and did not hold any documents of ownership.[2]

By the time Kenya elected President Kibaki in 2003, MFC had already lost more than 100,000 hectares of its forest cover. In early 2004, the issue of Mau's legal and illegal encroachments underwent many inquiries. The land commission of the Ndungu Report, for instance, pointed out key public and private figures that had played major roles in Kenya's historic illegal land allocations, including the forestlands such as the MFC. However, with continuous assaults, the key issues remained unresolved and the Mau Complex surfaced as a topic of major global political discourse in the 2009 Copenhagen Conference (Kagwanja *et al.*, 2010).[3]

As a response, the government of Kenya ordered massive evictions, especially from Mau's eastern and southwest forest blocks and offered alternate land or compensations to the displaced persons. Nevertheless, the land ownership remains unresolved, especially for the forest dwelling communities, many of these still being landless (Kagwanja *et al.*, 2010). The issue of land has been at the core of Mau Forest's destruction, as people want to own land legally and have their right to use and protect it.[4] In 2010, with the new Constitution of Kenya, land ownership of the indigenous communities remained controversial and an undecided agenda.[5]

At the same time, the Mau Complex is still under constant human encroachment and source of political battle between the interested parties, including the Kenyan government, farming communities, various non-governmental organizations (NGOs) and the forest dwelling communities. Given the high levels of encroachment and degradation of the MFC, there are also concerns such as critical changes in the functions of the forests and the consequent human impacts at local, national and regional levels.

Climate change, resource scarcity and human security in the Mau Forest Complex: challenges and implications

Data reveals that major implications of the land use/cover changes in and around the MFC manifest as abrupt rise in the average temperatures, rainfall variability and severe frost spells. Since the 1960s and 70s, climate of the area has been changing with gradual temperature rise and normal rainfall pattern. However, especially from the late 1980s and the following years, there has been progressive change in the average day and night temperature with increased warming. Meteorological data demonstrates that since 1960s there is substantial temperatures rise in Kenya's major Counties like Nakuru, Narok and Kericho, which are adjacent to the Eastern, Southwest and Maasai Mau forest blocks. For instance, during the study period (1963–2012), the average temperature in Nakuru increased from 16.5 to 19.4 °C. Similar trends have also been observed in Kericho and Narok.[6]

More importantly, climate change and unpredictable precipitation patterns have led to more frequent and prolonged droughts and flash floods. More than often, such disasters increase the scarcity of vital resources that are precondition to sustain human life and biodiversity. The spillover effects of these changes significantly challenge people's livelihoods with severe food insecurity followed by famines. The study suggests that in the pre-independence period, when much of the MFC was least degraded, the area received regular rainfall with two peaks during the year, especially within Narok and Nakuru Counties.[7]

Similarly, highlands such as Kericho and the surroundings had a normal pattern of consistent rainfall and received daily showers throughout the year. However, as the Mau forests are constantly being cut, burnt and cleared, the temperature has been on the rise and rainfall pattern has become significantly more erratic and delayed. Occasionally, there is an off-season short rainy period. For instance, Narok and Nakuru Counties have been experiencing severely dry and

persistent drought cycles. Consequently, there has been drastic reduction in water flows in perennial rivers originating from the Mau Complex. On the other hand, unpredicted rainfall often leads to heavy flooding with key threats to local and regional human security, as demonstrated below.

Economic security

Economic security entails the provision of sustainable means of living through either work-related security with stable financial income or government-sponsored social security systems. Work-related security is built on seven interdependent dimensions: income security, representation security, job security, labour market security, work security, skill reproduction security and employment security.[8] In much of the developing and underdeveloped world, the majority of the unemployed population relies on primary economic activities such as farming, grazing, hunting and gathering, fishing, and mining and drilling, which are more than often inconsistent, therefore unreliable, sources of income generation.

Kenya is the financial and communication hub in the region and its market-oriented economy makes the country a better infrastructure provider than other states in the Greater Horn of Africa. Like many other developing states in Africa, agriculture and tourism are the main foreign exchange earners for Kenya, with the forestry sector adding significantly to the production of energy, manufacturing, construction and timber products. The Kenya National Human Development Report 2013 reveals that agriculture is the country's main employer and source of income; however, frequent climate change shocks significantly reduce average earnings and hinder possible gains in the long-term economic security (UNDP, 2013). Statistics indicate that during the 2008–2011 drought periods, Kenya lost 52 billion shillings, with 2.8 percent lower economic growth rate (*Daily Nation*, 2014).

Again, in 2013, due to dramatic climatic change and onset of Maize Lethal Narcosis, Kenya lost 12 billion shillings in the last planting season of the year (*Sunday Nation*, 2014: 12). These losses become more significant when Kenya needs to invest millions of dollars in climate change adaptation and mitigation plans. Secondly, while lower-middle income status was achieved in 2015, Kenya is still struggling to advance the transformation and diversification of its economy, given the still few manufacturing industries, and tackle old and new inequalities.

For instance, between 2003 and 2007, Kenya experienced one of the most distressing climate shocks that led to the loss of 70 percent of its livestock. Similarly, during 2008–2011 drought period, Kenya's economic growth slowed down by 2.8 percent annually, thus costing the country 968.6 billion shillings. Data suggests that due to temperature rise, lower production of key commercial crops such as pyrethrum and tea may impede economic growth at local and national levels. These crops require a certain level of temperature to retain the standard of quality and yields. In addition, climate change has significantly lowered incomes of the local farmers and wages of the labour force (UNDP, 2013: 1).

Over the last few decades, Kenyan farmers have lost substantial earnings due to drastic decline in the production of local cash crops such as sugar cane and coffee. With higher temperatures and fewer rains, farmers cannot harvest some of the traditional crops and resort for alternative crops that are costly and earn less market value (UNDP, 2013). Furthermore, due to climate change, new pests and crop diseases are becoming common. Other economic impacts are evident on the transporters, exporters and local traders. Ordinary citizens, being the main consumers, also feel the pinch when they have to pay more for their daily food priorities.[9]

Such situations exacerbate poverty, specifically among the rural communities who do not have any form of social welfare that can cushion economic insecurities and dilute the losses occurring from abrupt climatic shocks.[10] Likewise, flash floods often ruin the physical infrastructure such as roads, bridges, power supply and transportation system, with substantial economic and social costs. This translates into opportunity costs in terms of budget allocations on repairs, which otherwise could be spent on social services or developmental plans.[11]

Additionally, excessive rainfall often damages standing crops and at times, lowers the capability of farmers to transport their production to the markets. Consequently, fewer incomes threaten livelihoods of the local communities, as they have to face consequences in terms of lost revenues.[8] In future, if climate change remains uncontrolled, increased intensity of warming and climate events will further increase water scarcity. Reduced river water may also affect sustainability of the biological diversity in the game parks. As a result, Kenya's most attractive tourist sites such as the Maasai Mara National Reserve and Lake Nakuru National Park may not sustain the wildlife.

These game parks are crucial for regional, national and local livelihoods and heavily contribute to strengthen economic security nationally as well as in the Narok and Nakuru Counties. Other economic implications include job insecurity for the thousands who work in the hotel and tourism industries.[12]

Food and health security

Food security entails the availability, accessibility, consistency and utilization of food (FAO, 2003). Lack of food can cause hunger and famine leading to severe health problems such as malnutrition (UNDP, 1994). Climatic changes of the Mau region have significantly affected food and health security of the local population. Being Narok and Nakuru semiarid areas of Kenya, the increased frequency of droughts and floods lowers cereal productivity and endangers sustainable food supply. For instance, after failure of rains or during flash floods, much of the farming community does not have any alternate sources of income. Due to the interconnectedness of all human security components, if incomes are affected, people are unable to afford sufficient and nutritious food (Commission on Human Security, 2003).

Although the Kenya Meteorological Department often predicts the onset of drought periods, lack of preparedness leaves people food-insecure. Recurring drought periods often leave people hungry, starving and dependent on food aid, which is often insufficient to satisfy dietary preferences. Every so often, food is available in storage, but poor infrastructure hinders timely supply to the affected areas.[7] Specifically, droughts cause loss of pastures and death of livestock. Similarly, heavy rains and flash floods destroy standing crops, leaving no food stocks for the rest of the year. Due to disrupted water supply, crop failure and loss of herds, pastoral communities and thousands of local inhabitants face malnourishment, hunger and starvation.

Likewise, lower precipitation adds to the suffering of forest dwelling communities such as the Ogieks. Due to changes in the forest cover and massive loss of biodiversity, these communities can no more rely on Mau's natural yields. For example, many trees species that provided food for the honeybees may have been affected by the degradation of the forest's floristic characteristics (Kinyanjui *et al.*, 2014). It should be noted that honey is a highly nutritious source of food, especially for forest dwelling communities. However, it is presently a rare commodity and, due to loss of flora, its traditional therapeutic roles may have been lost. Likewise, many of the Mau's animal species are threatened by the increased human influx that forced them deep inside the forests and reduced their habitats.

These changes, for instance, have left the forest communities food insecure and they have to opt for alternate foods like potatoes and other vegetables, which are not their primary food preferences. Increased poverty, high illiteracy level and poor coping strategies worsen the situation of food and health insecurity in the areas around the Mau Forest Complex (Kinyanjui *et al.*, 2014). Clean water scarcity is also seriously affecting people's health, as local community members suffer more than often from diseases such as cholera and other vector borne ailments. Due to poor public medical facilities, they usually rely on traditional healers who diagnose and address diseases with traditional methods ranging from herbal treatments to spiritual powers. While sometimes treating their problems, they habitually mislead patients and more than often complicate their situations.

Additionally, temperature rise is causing increased incidents of malaria and dengue fever in highlands such as Kericho, where these diseases never existed.[13] Simultaneously, large-scale deforestation and climate change in the Mau Forest have affected many medicinal plants and trees that local communities traditionally used for the treatment of some life-threatening diseases. For example, *Prunus Africana* is an evergreen indigenous tree found in the rainforests and highlands of Africa. It was also abundantly available in the Mau Forest Complex. This tree was an important source of timber and its bark was used to treat prostate disease. However, due to over use and climate change, it is now an endangered species (Mbinga *et al.*, 2013: 39). Thus, loss of forests has significantly caused abrupt climatic conditions, variability in the rainfall pattern with higher average temperature and consequent food crises and severe health issues.

Environmental security

Environmental security safeguards people from natural and manmade environmental hazards. Environmental security threats include natural disasters, ecosystem degradation, biodiversity loss, desertification, pollution, lack of access to clean water and deforestation. Forests are generally pollution-free and affluent with environmental resources and these have been major characteristics of the Mau Forest Complex as well. In addition, biodiversity is an invaluable environmental resource for the natural beauty of forests. Due to the critical role in the pollination process and food chain, it is also vital for ecological sustenance. Furthermore, environmental security of the local population has direct or indirect ties with plants and animals.

Due to the great variety of vegetation cover, Mau forests were originally zoned according to altitude. The montane forest, for instance, existed below 2300 metres, and above this level, there was mixed bamboo and grasslands forest. At higher levels and near the peak of the Mau escarpment, much of the forest had variety of *Juniperus–Podocarpus–Olea* (Kinyanjui *et al.*, 2014). During the last three decades, heavy encroachment and large-scale destruction have ultimately influenced the loss of biological diversity of the Mau Forest Complex. For instance, many parts of the South Western Mau reserve are still rich in montane forests, while other sections have largely been cleared. Consequently, with climate change and loss of forest, many animal and tree species are disappearing. For example, *Juniperus procera* (African Pencil cedar), *Albizia gummifera* (Peacock Flower tree) and *Polyscias fulva* (Parasol tree) are some important native tree species which were used for construction, furniture wood, bee hives, food boxes, paper and pulp industry, fuel wood and medicinal uses (Mbinga *et al.*, 2013).

Studies reveal that due to over-exploitation, the status of many of the indigenous trees of the MFC has significantly decreased and ecological services associated with them have been lost (Kinyanjui *et al.*, 2014). Furthermore, with increased human influx, illegal hunting and livestock keeping, some wild animals and bird species have disappeared permanently into the nearby forests (Centre for Biodiversity, 2009). Extensive deforestation, land excisions and loss of vegetation cover in the Mau have significantly reduced rainfall and water infiltration with substantial water runoff and soil erosion. The latter takes away important plant nutrients necessary for good productivity. In addition, soil erosion is a major factor causing siltation of rivers and dams as well as flooding in plains, especially in cases of poor mechanisms to store rainwater.

Due to forest excisions, growing settlements and increased industrial activities have affected the quantity and quality of water in the key catchments of the Mau complex, including River Njoro, Mara, Ewaso Ngiro, Sondu and Nyando as well as the Lakes in the area. For example, before the 1990s, water flow of the rivers used to be crystal clear and free from bacteria. Therefore, people made direct use of river water, especially for household purposes.[14] However, due to increased industrial activities and human influx, these rivers are polluted with chemicals and other waste materials as well as highly contaminated

with bacteria/viruses. The compound impact of these activities causes environmental degradation and heavily affects human security.[14]

Political, personal and communal security

Political security provides protection from human rights abuses, while personal security shields people from all kinds of threats that can lead to bodily harm. These threats may include street crimes, wars, discrimination, exploitation, gender-based violence and state oppression. Political and personal security intricately complements each other and any threat to political security automatically weakens personal security. Likewise, communal security aims to free people from harmful traditional practices and protects people's rights, cultural values, identities and heritage as part of their belonging. In the process, the group leader provides personal protection and communal security to its extended members.

Since early 1900s, much of the colonial and post-colonial government policies created landed and landless classes in Kenya. This vicious cycle continued to foster a milieu for legal and illegal encroachment on public land, including forests. In the process, government-sponsored settlement schemes caused a lot of resentment among certain communities and failed due to political motives and pervasive corruption. Simultaneously, inadequate and inequitable settlement plans allocated much of the land to the friends and families of the political elites and forced the landless to use the forests for 'illegal' logging, farming and housing.

In addition, due to population influx and growing demand for arable land, land grabbing and repeated evictions of local communities intensified gross human rights violations and suppression, especially in the Rift Valley area and around the MFC. The colonial land appropriations and politically instigated ethnic clashes led to progressive violent and bloody conflicts in the area. Specifically, during the 1990s and the 2007/08 period, ethnic and land-based conflicts in the area destabilized national peace with increased episodes of violent crimes. In the 2007/08 post-election days, the Mau forests became battle-grounds and thousands of local inhabitants had to leave the area. During these conflicts, their houses and property were torched with the apparent motives of post-election retaliations, though these violent acts were in fact driven by the explicit intent of grabbing the Mau resources. Taking advantage of the situation, the local militia groups looted and burnt crops and many lives were lost.[15]

Other threats to people's personal and political security arise due to the competition for dwindling resources of Mau's land. With climate change, incidents of frequent droughts and heavy downpours are constantly adding pressure on land, water and pastures. Given the continued climate change-related disasters, the pastoralist and agriculturist communities around the Mau often experience incidents of cattle rustling and theft of crops, giving rise to resource-based conflicts.[16] These commonly occur during the dry seasons when the majority of the poor people cannot find sufficient means to feed their families. However, this has also become habitual with growing intensity of cattle thefts even during the wet seasons when there is abundance of water, pasture and healthy livestock. Evidently, this is imputable to poor governance, weak enforcement of laws and widespread corruption in an area where justice is rarely found and the culture of crimes perseveres, with continued threats to personal, political as well as community security.[17]

In 2009, the government of Kenya launched a strategic rehabilitation plan, which led to massive evictions of the squatters and forest dwelling communities (Kagwanja *et al.*, 2010). However, the issue of the Mau Forest Complex became greatly politicized, with multi-ethnic alliances, elite fragmentation and significant vested interests. For instance, the Maasai wanted to evict the squatters and support the government in the process of restoration of the Mau, whereas the Kalenjin have been opposing the evictions, causing uncertainty for the implementation of the proposed plans (Kagwanja *et al.*, 2010). Therefore, saving East Africa's biggest water towers has become extremely sensitive and controversial, despite its critical local, national and regional climate change and human security implications.

The case of the Mau Forest Complex evidently shows that Kenya is in dire need to establish a comprehensive policy response to climate change challenges. At the very least, Kenya needs to amend or replace the existing national environmental policies and integrate them with climate change-led human insecurities. More importantly, there is a substantial need to develop appropriate regulatory legal frameworks to address climate change in Kenya, aiming to control illegal human activities and tackle peoples' behaviour that poses threats to natural climate. Thus, afresh climate change policy, with adequate law embodiments, would directly enhance the protection of Kenya's environmental resources, including the Mau Forest Complex. Furthermore, climate change policy and related legal instruments could oversee and contrast irresponsible human actions, especially the illegal use of forestlands and large-scale deforestation and logging leading to unsustainable forest cover changes.

Notes

1 Interview with Dr. H. A. M. Ole Kamwaro, Former Chairman of the Narok County, Nairobi, 25 June 2014.
2 Interview with Mr. E. O. Omollo, Deputy Director, Forest Conservation and Management, Kenya Forest Services, Nairobi, 3 February 2014.
3 15th session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC).
4 Interview with Mr. J. Kioli, Chairman Kenya climate Change Working Group and Executive Director Green Africa Foundation, Nairobi, 28 April 2014.
5 See Kenya Constitution 2010.
6 Data Sourced from the Kenya Meteorological Department, Nairobi, April 2014.
7 Focus Group Discussions.
8 http://www.ilo.org/public/english/protection/ses/download/docs/definition.pdf. Retrieved online 13 April 2014.
9 Interview with Mr. J. M. Mbinga, Deputy Director Kenya Forestry Research Institute, Londiani, 13 February 2014.
10 Interview with Miss B. Cheserek, Environmentalist, Tea Research Foundation of Kenya, Kericho, 14 February 2014.
11 Interview with Mr. J. Kioli, Chairman Kenya Climate Change Working Group, 28 April 2014.
12 Interview with Mr. K. Korir, Manager Sarova Lion Hill, Lake Nakuru National Park, Nakuru, 17 May 2014.
13 Interview with Mr. N. Keshei, Cabinet Secretary Narok County Council, 12 June 2013.
14 Interview with Mr. O. Simanto, Senior Assistant Director, Kenya Forest Services, 8 April 2014.
15 Focus Group Discussion No. 2, (Mixed Community members), The Discussion was held in Oloikirirai village located on the boundary of the Maasai Mau, Narok County Council, 13 June 2013.
16 Interview with D. Ole Tamooh, Chairman Kenya National Climate Change Steering Committee, Former Warden Narok County, 13 June 2013.
17 Focus Group Discussion No. 1, (The Ogiek Community members) the Group consisted of five members; Peter Maikobi, Francis Nkoiko, Wilson Kursai, Ruth Musilo and Joylene Ngoisilo, The Discussion was held in Oloikirirai village located on the boundary of the Maasai Mau, Narok County Council, 14 June 2013.

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