



*LUCID's Land Use Change Analysis as an Approach
for Investigating Biodiversity Loss and Land Degradation Project*

**Comparing the Kenyan and Tanzanian Slopes of Mt. Kilimanjaro:
Why are the neighbouring land uses so different?**

LUCID Project Working Paper 44

By

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June 2004

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The Land Use Change, Impacts and Dynamics Project
Working Paper Number 44

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1. INTRODUCTION

Mount Kilimanjaro rises majestically from the surrounding savannah lowlands. Its range of ecological zones from glaciers, through tundra and forest, to savannah is clearly visible from the air and from space. The ecological gradient offers a range of resources and over thousands of years a variety of land use systems have developed including wildlife, herding and farming.

One of the remarkable contemporary features of the landscape on the slopes of Mt. Kilimanjaro is the sharp land use-land cover boundary that cuts across the gradient coinciding with the political boundary between Tanzania and Kenya (Photograph 1). The general similarities in ecological conditions and potential land use on both the Kenyan and Tanzanian sides of the boundary raise the question as to why the contrast in land use-cover is so marked?



Photograph 1. The Tanzania (on left) and Kenya (on right) border on the N.E. slopes of Mt. Kilimanjaro. Photo by D.J. Campbell, 1995.

This paper seeks to address this question. It adopts an approach that explores the recent history of land use, dynamics and distribution of wildlife, herding and farming, and the interactions among and within them, in a nested system in which local processes are examined in their wider national and international context.

Both ecological and socio-economic conditions and processes define this context. Ecological characteristics include topography, rainfall, hydrology, vegetation, and fauna. There are differences between north and south sides of the mountain such as the presence of rain shadow on the northwest side, and more swamps northern side. The socio-economic context reflects the patterns of land use (farming, herding, and wildlife), interactions and exchanges between them within the study area and particularly their relationships with broader regional, national, and international processes such as trade and migration, and economic, social and environmental policies.

2. CONCEPTUAL FRAMEWORK

This paper is written within the conceptual framework of regional political ecology (Blaikie and Brookfield 1987; Peet and Watts 1996; Zimmerer and Young 1998). This framework is represented schematically by the Kite (Figure 1) (Campbell and Olson 1991). Application of the framework requires attention to the dynamics of interaction between societal and biophysical processes at multiple spatial scales (Levin 1992) and within an historical time frame that permits identification of the most important processes contributing to contemporary land use-cover change. These dynamics involve issues of complexity and uncertainty (Campbell 1998) that have also been addressed by frameworks derived from ecological approaches such as panarchy (Holling 2001; Gunderson and Holling 2001). Among the most important elements, though too frequently not addressed explicitly, is the exercise of power by individuals, institutions, and governments that individually or in alliances influence the application and formulation of laws and policies to facilitate desired outcomes. Land use change reflects this process of the application of power.

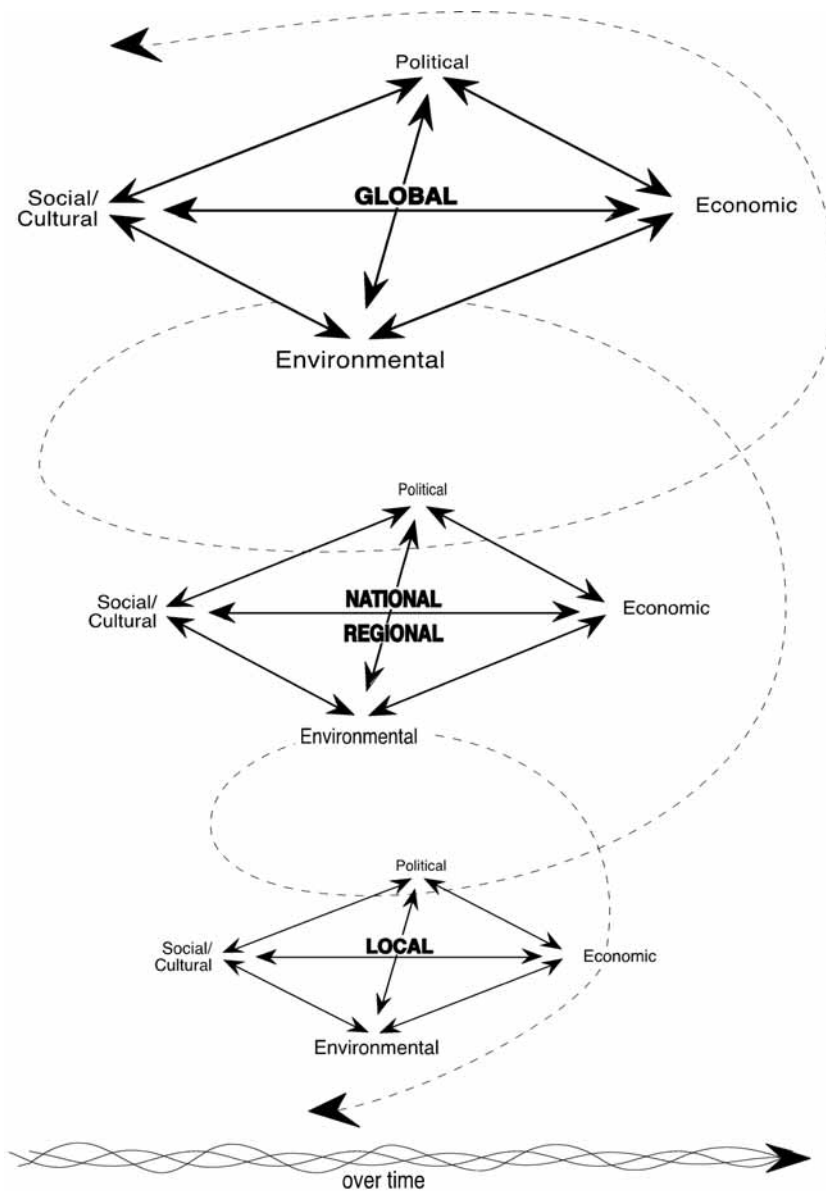


Figure 1. The “Kite” conceptual framework (source: Campbell and Olson 1991)

This conceptual framework is applied to land use change on the northern slopes of Mt. Kilimanjaro in Campbell et al. (2003). This paper discusses for both northern and southern slopes of Mt. Kilimanjaro the relative importance of categories of driving forces of land use change identified for semi-arid Africa by Campbell (1999), Table 1, and specified for East Africa by Olson et al. (2004), Table 2.

3. LAND USE CHANGE

This section does not attempt a detailed discussion of land use change as this is discussed in individual papers (Campbell et al. 2003; Mbonile et al. 2003). The purpose is to provide a broad-brush overview that allows a discussion of similarities and differences of the dynamics of land use change on the Kenyan and Tanzanian sides of Mt. Kilimanjaro.

This discussion is structured chronologically by pre-colonial, colonial, and post-independence patterns, and by groups of people.

3.1. Pre colonial land use

3.1.1. The Chagga

Historical evidence suggests that the Chagga people have occupied the southern slopes of Mt. Kilimanjaro in what is now Tanzania, at least since the 1600s (Moore and Puritt 1977; Wimmelbücker 2002). They settled on the slopes between 3500 and 6000 feet, where they were able to take advantage of fertile volcanic soils and reliable rainfall, and avoid conflict with the Maasai who dominated the lowlands¹. See an elevation map of the area in Figure 2.

They developed the complex *Kihamba* land use system that included permanent home gardens around the homestead, some fed by irrigation systems, temporary swidden fields, and livestock, the latter often being stall fed. They grew bananas, vegetables and grains, and the livestock provided manure that was used as fertilizer (Moore and Puritt 1977:21-22; Wimmelbücker 2002:51). Collecting grasses to feed the stall fed cattle involved considerable labour (Wimmelbücker 2002:56-57).

In the 18th and 19th centuries the Chagga were actively engaged in regional trade. From groups to the south they acquired metal hoes and spears. They were also heavily involved in trade with Kamba to the north who were trading with the Mazrui empire out of Mombassa. The Chagga were an important source of ivory from the killing of elephants on the mountain and surrounding lowlands (Moore and Puritt 1977:9).

With decline of the Mazrui in the Indian Ocean port of Mombassa and the rise of the trade out of Zanzibar Island further south in what is now Tanzania, the caravan trade into the interior through Ukambani in the north declined. Trade caravans moving between the coast and Lake Victoria sought to avoid the hostile Kamba in Ukambani and adopted a southerly route that took them across the southern slopes of Mt. Kilimanjaro. The Chagga then developed an active role in provisioning caravans and providing safe passage. This gave rise to accumulation of power, wealth, and a vibrant agricultural economy (Moore and Puritt 1977:11-15; Stahl 1964: 46-50).

¹ The authors acknowledge with thanks the bibliographic support provided by Marian Mitchell.

ECONOMIC DRIVING FORCES	SOCIAL CULTURAL DRIVING FORCES
<p>International</p> <ul style="list-style-type: none"> • Market Forces • Trade Agreements • Structural Adjustments <p>National</p> <ul style="list-style-type: none"> • National <i>Economic Policy</i> - agricultural pricing, transport, exchange rates • National <i>Land-use Policy</i> – coherent land-use plan lacking. Sectoral bureaucracies implement uncoordinated strategies with conflicting goals. • <i>Land Tenure Policy</i> - Explicit and Perceptual • Land Tenure Laws • Customary Tenure: continuity and change • Dynamics of <i>Primary Production</i> (dependent on soil and water resources) • Modified Subsistence –Dynamics of Cropping and Livestock Systems • <i>Economic Policy</i> • SAP and economic liberalization • Exports: meat, horticulture, coffee etc. • Imports – import substitution • <i>Urbanization</i> - Urban demand for meat and vegetables encourages commercial production • <i>Irrigation policy</i> - chemical pollution, salinization • <i>Cash crops</i> - chemical pollution of water • <i>Mineral production</i> - effluent, siltation <p>Local</p> <ul style="list-style-type: none"> • Markets • Herding - diversifying to include agriculture, particularly at perennial water sites (fadama/bas fonds; swamp edges; streams; mountain slopes) • Rainfed <i>agriculture</i> - immigration, intensification/ • Extensification • Irrigated <i>agriculture</i> - market demand, wholesalers • <i>Economic differentiation</i> - options in land, labour and capital 	<p>National</p> <ul style="list-style-type: none"> • Urbanization • Immigration • Leadership - governance issues <p>Local</p> <ul style="list-style-type: none"> • Population dynamics: growth, migration (gender and age specific), decline (AIDS) - intensification/extensification; maintenance of erosion control measures, cropping patterns, health and food security • Diversification of herders into agriculture changes mobility and settlement patters. Altered land cover (natural vegetation decline, cropping increase). • Cultural change - leadership issues debated (age, gender); ethnic heterogeneity, religious diversity. • Less trust in and recourse to traditional institutions. Disputes formerly settled by discussion; now more recourse to chiefs, police, courts and violence • Redefinition of established cultural and economic categories - e.g. herders become herder-farmers; farmers become farmer-herders; economic and power relations between groups change.
<p>INSTITUTIONAL/POLICY DRIVING FORCES</p> <p>International</p> <ul style="list-style-type: none"> • International Conventions: Biodiversity, Climate Change, Desertification e.t.c. • Bilateral and multilateral governmental and commercial interests; NGOs Warfare <p>National</p> <ul style="list-style-type: none"> • Centralization versus decentralization • Uncoordinated policy – lack of land-use planning • Land tenure policy • Political and economic power: interests of government, commerce, NGOs, and individuals • SAPs and Economic liberalization <p>Local</p> <ul style="list-style-type: none"> • Land tenure - communal versus individual rights to land, trees and water • Social differentiation in land rights - gender, young/old, tenants and squatters • Informal land claims: Tenants/renters/squatters claim land rights • Local NGO 	<p>ENVIRONMENTAL FACTORS</p> <p>Rainfall</p> <ul style="list-style-type: none"> • Variability of Rainfall: long-term, inter-annual, seasonal, within growing season <p>Surface Water and Groundwater</p> <ul style="list-style-type: none"> • Swamp margins/ riparian zones/hillsides - occupied and crops vulnerable to damage by livestock and wildlife • Water quality - chemical pollutions of water in irrigated areas - implications for the health of people, livestock and wildlife • Water quantity - irrigation water in reduced supply • Access to water more difficult for domestic use, agriculture, livestock and wildlife • Change in hydrological cycle <p>Land Cover And Soils</p> <ul style="list-style-type: none"> • Vegetation - change in species composition; availability of fodder, medicinal plants, shade etc. • Woodland - change in species mix, change in spatial pattern - biodiversity of flora; potential for trees to replace grasses under less extensive grazing • Soils: Fertility decline- Evidence of land being taken out of production; enforced fallow Management - stall fed cattle - application of manure; chemical fertilizer • Soil Erosion - increased runoff, siltation, wind erosion, dust <p>Wildlife</p> <ul style="list-style-type: none"> • Habitat Depletion and Fragmentation - biodiversity of fauna

Table 1. Drivers of Land-use Change in African Semi Arid Lands.
Source: after Campbell 1999

UNDERLYING DRIVING FORCES	DIRECT DRIVING FORCES	KEY PROCESSES
<p><i>Policies/ government</i> Land policies (e.g., tenure, rights, gazettement of protected areas, villagisation) and how enforced Ag. policies: parastatals, cooperatives, plantations, support & marketing of crops and technologies Investment in education, health, infrastructure Industrial and urban policies Centralization/ decentralization of government Structural adjustment programmes: subsidy removals, institutional and monetary reforms International protocols, organisations, donor assistance Level of corruption, good governance Stability, elections, war Changing power relations between groups, regions</p> <p><i>Economic changes</i> Declining international prices and terms of trade Growing national demand for maize, other food Increasing/ decreasing private traders</p> <p><i>Regional characteristics</i> Relative wealth, availability of jobs Land availability Protected areas, tourism Agro-ecological potential Diseases (animal, plant, people) Ties to markets, national economy Existing land ownership, use and cover</p> <p><i>Individual or household characteristics</i> Wealth/ poverty, education, employment Age, gender, gender of head of household Ethnicity, Social ties/ networks</p>	<p><i>Demographic factors</i> In and out migration, labour migration (source & destination) Birth & death rates (health care, disease, education, culture) Growing population size and increasing density</p> <p><i>Local economic factors</i> Changing price, marketability and input costs of crops, animals Ag. technological change: ploughs, tractors, irrigation pumps, soil & water conservation, fertilisers and pesticides Changing crop choice Non- and off-farm income diversification Land scarcity: lack of pasture, small farm sizes Large scale public and private land managers Privatisation of former communal land (sub-division of ranches)</p> <p><i>Cultural factors</i> Inheritance and tenure system Acceptability of selling land Changing role and power of clans, chiefs Traditional livelihood strategy (e.g., Chagga home gardens, cropping, pastoralism, trading) Value placed on home land, sacred forests</p> <p><i>Social factors</i> Changing distribution of land, wealth, power Commercialization of labour, water, land and tree resources Competition / cooperation between groups Changing gender roles and responsibilities</p> <p><i>Environmental factors</i> Soil degradation/ improvement, pasture degradation/ imprv. Droughts, rainfall variability Diseases (human, animal, plant), wildlife (conflict)</p>	<p><i>Agricultural system processes</i> Sedentarisation of people conducting shifting agriculture, pastoralism</p> <p>Extensification of cropping to grazing land, adjacent to protected areas</p> <p>Intensification of crop-livestock systems, higher input of labour and capital, changing technologies and soil management</p> <p>Fragmentation of land holdings with inheritance, selling parcels</p> <p>Re-distribution of land holdings between generations, households, groups</p> <p>Von Thunen: land use affected by distance to road, market, and the price and perishability of product</p> <p><i>Other processes</i> Urbanisation, and rural-urban linkages</p> <p>Rural income diversification</p> <p>National economy evolution from agriculture to industry, commerce and services</p> <p>Gravity & other migration models: rural-rural migration with land availability as economic factor, temporary and permanent migration to urban centres</p>

Table 2 Driving Forces of Land Use Change and Processes in East Africa. Source: Olson et al., 2004.

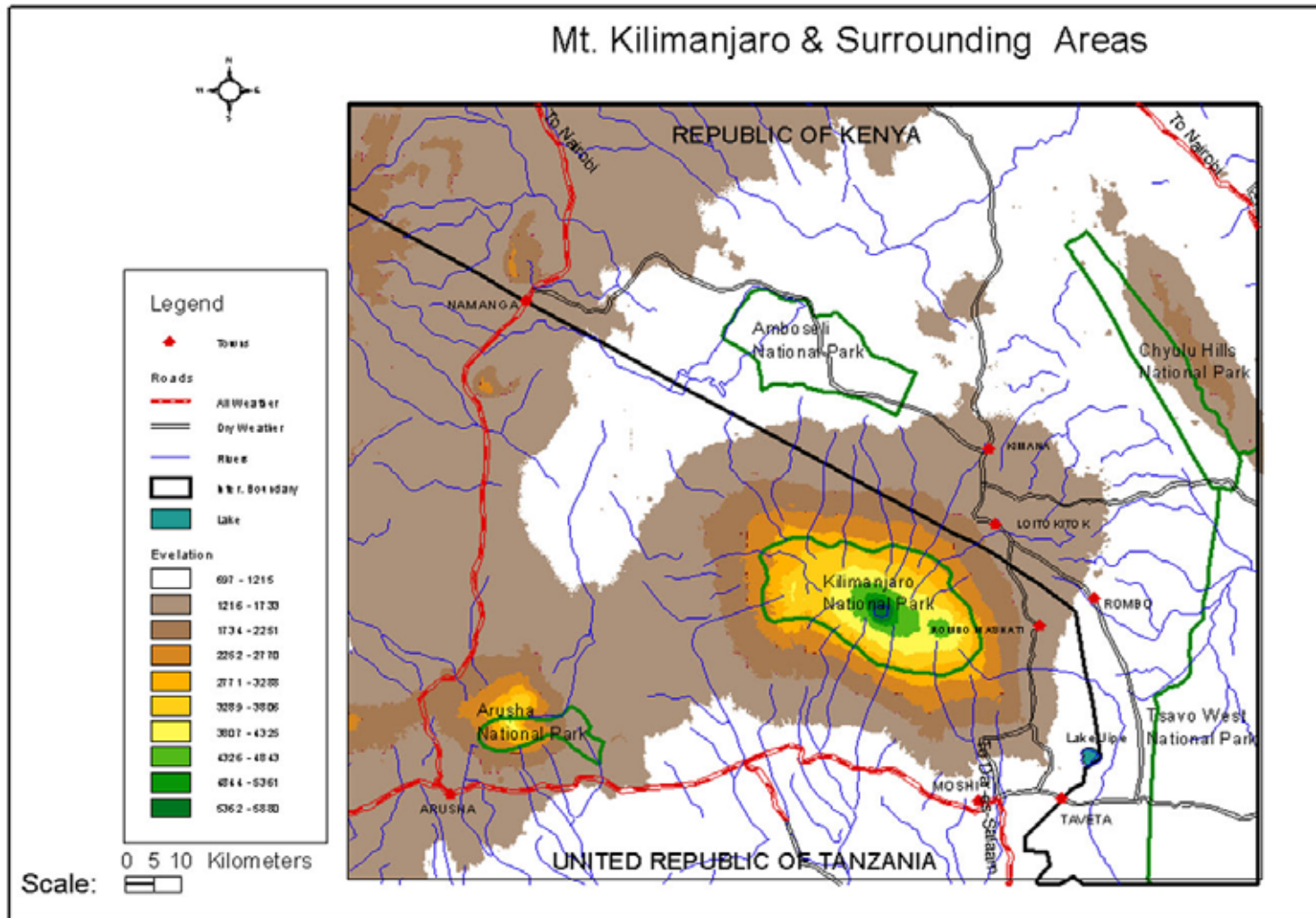


Figure 2. Map of Mt. Kilimanjaro and Surrounding Areas

3.1.2. The Maasai

Meanwhile the Maasai herders occupied the plains and adjacent lower slopes on both sides of the mountain. These areas were also the habitat of considerable populations of a variety of wildlife species. The ecology of the plains is characterized by lower and less reliable rainfall, with recurrent droughts. Access to water and grazing year round is essential to a herding economy, as it is to wildlife. This led the Maasai to value the water and grazing resources on the higher slopes of the mountain, where rainfall was more reliable and streams flowed permanently, as vital resources during annual dry seasons and periodic droughts. The Maasai also maintained a migration corridor on the upper slopes that allowed communication between the Maasai groups on north eastern and southern sides of the mountain. Access to these areas was maintained by force when necessary by the Maasai *moran* soldiers.

While the Maasai held considerable military power, the proximity of people whose livelihoods were based on agriculture and livestock resulted in considerable interaction between them. This included trade of meat and milk for grains, and some intermarriage with Chagga in Tanzania, and with other groups, e.g. the Kikuyu in Kenya.

Thus the Chagga dominated the middle slopes of the southern side of Mt. Kilimanjaro where fertile soils and reliable rainfall facilitated their agricultural land use system. They were restricted from expanding higher up the mountain both by ecological conditions and the presence of the Maasai corridor, and to the lower slopes of the mountain where they would have been met by forceful discouragement by the Maasai.

Thus it can be argued that the result of the interactions between the two groups was that a land use boundary came to exist between the Maasai pastoral land use system and the Chagga farming system. This boundary appears to have been institutionalised by the colonial demarcation of the national frontier between Kenya and Tanganyika, now Tanzania. The question may be posed, however, as to why the land use characteristics have been maintained? Is a national frontier sufficient to inhibit the emergence of similar land uses where ecological conditions and economic incentives would provide a basis for them?

3.2. The Colonial Period

The arrival of the German colonialists led to the establishment of coffee estates, the growth of Moshi as a market and administrative centre linking the southern slopes of Mt. Kilimanjaro to the coast by rail, and encouragement of the Chagga to produce coffee and market produce for Moshi and the coast. The system of home gardens intensified, and the increase of population led to a decline in availability of swidden lands on which shifting cultivation with long fallow was practised. Cotton was also introduced as a cash crop in the lower slopes.

This process of “economic development” continued and was amplified under the British, who became the colonial power after World War I. The centrality of the Chagga region in the economic system and its integration into the national polity led to the emergence of producer cooperatives among the Chagga, and to investments in education, health care, and road infrastructure. Substantial investment was made in coffee production, including the establishment of a coffee research and experimental station at Lyamungu on the southern slopes of the mountain aimed at improving the yield and quality of coffee. Thus, the southern slopes of Mt. Kilimanjaro became an important and closely integrated component of the colonial economy of Tanganyika.

In contrast, the northern slopes of Mt. Kilimanjaro represented a backwater in the Kenyan colonial economy. Not until the 1930s was a district officer assigned to Loitokitok, only following the establishment of a mission hospital in Illassit. With the colonial presence came administrative police, most of whom were Kamba who, being farmers, began to cultivate to provision the colonial staff and themselves.

The Maasai maintained their pre-colonial herding livelihoods and were seen as being outside the colonial economic interests. Official concern was expressed, however, about their lifestyle and about apparent environmental degradation that was blamed on their grazing practices (Campbell 1981).

After World War II a number of processes combined to reduce the access of the Maasai in Kenya to vital water and grazing resources. One was the increase in the area under agriculture resulting from the immigration of farmers from heavily populated areas elsewhere in Kenya, particularly those that had experienced the consequences of the alienation of the “White Highlands” and other areas for settlement of colonists. Further, colonial policies were enacted for wildlife conservation establishing protected areas in plains with reliable dry season water resources.

The colonial policy environment favoured farming relative to pastoral livestock production. Political, institutional and economic power shifted to farmers as they became integrated into the state in terms of their production system, and with increased access to infrastructure and markets. Herders could no longer control access to water and grazing by force and thus the vital dry season and drought period grazing refuges were reduced.

Concern with land degradation led to a national policy of demarcation of the Maasai grazing lands as individual and group ranches, with an assumption that privately owned land would be better managed than communally managed land. The continued population growth in the area and immigration of farmers led to a demand for land and many individual ranches were quickly subdivided and sold or rented to immigrant farmers. As most of the individual ranches were on the mountain slopes, this exacerbated the loss of vital grazing and water resources to the herding economy.

These local processes, stimulated by colonial economic and land allocation policies elsewhere in Kenya and by colonial allocation of local lands to conservation, inevitably led to issues of incompatibility, competition, and conflict between land uses and land users in the region.

The Maasai in Tanzania, as in Kenya, maintained their transhumance lifestyle during and following colonialism. Because the official thinking of the colonial and post-colonial administrators was centred on agriculture, pastoralism was looked at as being a marginal, if not outright counter productive, activity (Tenga, 1996). Even legislation that referred to pastoral rights was addressed to farmers. Thus policies were formulated that put the pastoral concerns at the periphery of policy-making. Consequently, while agriculture became modernized, the pastoral areas remained out of the national economic and political mainstream.

The pastoral nomadic way of life was perceived as being incompatible with the requirements of modern states and economic needs of modern societies. Even after independence, the pastoral land and resource use was seen as leading to environmental degradation, a view that continued from the colonial period. Thus, policies were put in place that led to alienation of pastoral lands for wildlife conservation and agricultural development. These policies were characterised by the creation of exclusive wildlife protected areas and state sponsored agricultural schemes – both large and small scale – and commercial ranching. The lands of the Maasai were confiscated in the process without much concern for their way of life on the pretext that they were no man’s lands (Lissu, 2000). These policies became a source of conflict among pastoralists, farmers and wildlife, an aspect that has continued today and is officially acknowledged by the new Land Policy of 1996, as illustrated by the following excerpt:

“There are growing social conflicts, environmental concerns and land use conflicts due to haphazard alienation of rangeland for large scale

agriculture. These extensive alienations frequently disown pastoralists of their grazing lands.”.....(United Republic of Tanzania (1995:35)

During the colonial period the land use boundary between Kenya and Tanzania was institutionalised as an international boundary. The strong contrast in land use and land cover on the two sides of the boundary was maintained. The agricultural land use systems on the southern slopes intensified while the land use systems on the Kenyan side began to diversify from strictly pastoralism to accommodate farmers and wildlife conservation. Exchanges between the two sides of the mountain remained limited to the established local interactions between livestock and cropping systems. Essentially, however, the contrast between the land use/cover characteristics across the boundary remained distinct due to the markedly different roles that the livelihood systems played in their respective national economies.

3.3. Independence

In both Kenya and Tanzania, independence led to an upsurge in economic investment. A variety of government policy initiatives were introduced in both countries. In Kenya, independent in 1963, the regional pattern of governmental investment continued to favour those areas that had received investments in the colonial period (Bigsten 1983) and thus the slopes of the mountain around Loitokitok remained out of the national economic and political mainstream.

A similar governmental investment pattern was made in Tanzania, then Tanganyika, independent in 1961, favouring areas of high agricultural potential. Thus the southern slopes continued to thrive with new investments in agriculture, including the introduction of grade dairy cattle to small farms on the mountain (Brewin, 1965). An important new development in the area was the construction of central factories in order to improve the quality of coffee production.

This section presents a very brief synopsis of complex changes in land use that are documented in the specific studies prepared by LUCID researchers in Tanzania and Kenya (Campbell et al. 2000, 2003; Mbonile et al. 2003).

3.3.1. Livestock Systems

Continuity and diversification characterize the contemporary Maasai livelihood systems. In both Kenya and Tanzania many herders continue their “traditional” livestock-based system while others have become herder-farmers responding to the impact of recurrent droughts, diseases and the opportunities afforded by rain fed and irrigated crop production (see Photograph 2) (Campbell et al 2000, 2003; Noe, 2003).

In Tanzania, cultivators have now settled in the corridor previously used only for grazing. There is also settlement of herders in the lowlands where some are engaged in farming activities. There has also been a movement of farmers down slope, and this together with the governmental establishment of large and smallholder irrigation schemes has disrupted livestock production by curtailing access to grazing and water.

Many Tanzanian Maasai are therefore moving out of the Mt. Kilimanjaro area. *Morans* (young men) are migrating to urban areas and some to Zanzibar Island where they sell their medicines and cloths (*shukas*), and seek employment as security guards. They tend to buy livestock with their money. Others are moving with their animals south to the Usangu plains, towards Morogoro, and even to the Zambia border. This migration to new areas often leads to conflict with resident farmers.



Photograph 2. Maasai *boma* (homestead) on the right with cultivated fields on the left, near Kimana in Kenya. Photo by J.M. Olson, 2004.



Photograph 3. Chaaga farms on the eastern slopes of Mt. Kilimanjaro in Tanzania. Photo by J.M. Olson, 2004.

3.3.2. Cropping Systems

Both in Kenya and Tanzania the cropping systems of the slopes and of the areas under irrigation in the lowlands are experiencing intensification, as a result of both population growth and the gains of the horticultural economy. In Kenya this has been a relatively simple process as horticulture has expanded under SAP and the increased access of the area to domestic urban markets and to airports for export.

In Tanzania changes in the national and international economy have resulted in a decline in coffee production and an increase in the growing of horticultural crops on the mountain slopes (Photograph 3). This change has been facilitated by policies under SAP that have increased farmers' access to markets.

In both countries, policies and economics have favoured agriculture over livestock production. This, combined with local population growth and, on the Kenya side, immigration, has led to an expansion of cropping from the highlands into former grazing lands on the lower slopes and now into the plains surrounding the mountain. This expansion of cropping into former grazing land is the largest land use/cover conversion on both sides of the mountain, but its impact in Kenya on the formerly dominant pastoralist land use is particularly dramatic. The ongoing process of subdivision of group ranches in Kenya documented by Ntiati (2002) will have a significant impact on land use, particularly with the likely emergence of a land market.

3.3.3. Wildlife

The changes in the human livelihood systems summarized above have had implications for wildlife populations through impacts upon access to water and grazing resources, fragmentation of habitats, and disruption of migration patterns.

The degree of conflict over access to resources that arose during and after the colonial period, particularly in the 1970s and 1980s, has not abated (Campbell et al. 2002; Noe 2003). The wildlife corridors have become foci of conflict between farming, herding, and wildlife-related land use systems. Tourism associated with wildlife viewing has become, however, an income source for some Maasai in the area in Kenya, and a few private wildlife viewing lodges and ranches have been developed (Photograph 4).



Photograph 4. Private Tourist Lodges near Kimana in Kenya.
Photo by J.M. Olson, 2004.

The distribution and interactions of livelihood systems and wildlife have been affected by a variety of processes associated with national and international economic policies. Ironically, at the time when economic opportunities in crop agriculture, particularly horticulture, began to expand on the northern slopes of the mountain in the late 1970s and particularly in the early 1980s, opportunities for increased cross-border interactions were restricted by the closing of the international border in 1976 following political disagreements between Kenya and Tanzania. By the time the border re-opened in 1983, the period of most rapid expansion of irrigated horticulture on the north side of the mountain had occurred and the marketing linkages were firmly established within Kenya. Horticulture thus expanded not towards the Tanzanian market, but north and east towards the Kenyan markets. Thus the distinctiveness of land use/cover at the border was maintained by political and economic circumstances.

More recently, changes in the circumstances in both Kenya and Tanzania have led to increased interaction across the border. On the Kenyan side horticultural production has flourished, and markets have expanded in Mombassa, Nairobi, and overseas. The demand for labour has been met not only from within Kenya, where immigration to the area has continued apace, but also from Tanzania as Chagga people have engaged in seasonal share-cropping and in the provision of day labour. In addition there has been an increase in the participation of people from both sides of the border in cross-border trade.

Horticultural producers have noted that they are experiencing increasing competition from Tanzania in the provision of horticultural products in the Mombassa market (Wangui 2003). There is evidence of a decline in production of coffee and cotton among Chagga farmers, occasioned by the decline of crop prices and removal of Tanzanian government subsidies that resulted in the cost of production exceeding the income from its sale (Mbonile et al. 2003). Many Chagga have turned to horticulture as an alternative.

With the expansion of cultivation on the Kenyan side, the continuing subdivision of livestock ranches in Kenya leading to a land market facilitating additional cultivation, and finally with greater interaction across the border, it is possible that the long standing distinctiveness of land covers on the two sides of the border will be diffused in the future.

4. SIMILARITIES AND DIFFERENCES IN DRIVING FORCES OF LAND USE CHANGE BETWEEN TANZANIAN AND KENYAN SLOPES

Categories of driving forces of land use change proved to be similar in both countries, despite different political philosophies, but the location of the two areas relative to the national space led to very different outcomes in terms of the patterns and dynamics of land use change.

4.1. Economic Centrality and the Direction of Trade

Fundamental to this difference are the history and respective location of the two sides of the mountain relative to regional economic and political systems. In the pre-colonial, colonial and post-independence periods, the southern slopes of Mt. Kilimanjaro were, and continue to be, well integrated into the broader economic-political systems of the region. In stark contrast, the livelihood systems of the northern slopes were and remain marginal to the economic and political structures of what is now Kenya.

The caravan trade inland from the coast never approached the northern slopes of the mountain. While Mombasa was the major trading port, caravans moved farther north through Ukambani. Later, when economic power shifted to Zanzibar, caravans trading with Lake Victoria took advantage of the opportunities for provisioning, protection and trade afforded by the Chagga, who even prior to this had engaged in the ivory trade with Mombassa via relationships with the Kamba.

The economy of the Chagga thus grew under the caravan trade, while during the colonial

period it expanded further as its agricultural and locational advantages proved attractive. Moshi became a growth centre linked by rail to the coastal ports, and Chagga produce was widely marketed. In contrast, the north of the mountain was neglected in the Kenyan economy, except for the building of a pipeline to carry water from the mountain streams to furnish the steam trains on the Kenya-Uganda railway. While the livelihood systems on the southern slopes profited, and urban, educational, medical and transportation infrastructure developed, no such developments occurred to the north.

The contrast between the northern and southern slopes of Kilimanjaro continues in the contemporary situation. In Tanzania the area remains closely integrated into the national economy, urbanization has proceeded apace, and infrastructure is well developed. On the Kenyan side of the border the roads are still murrum, and while a number of market towns have emerged, both they and the divisional headquarters town of Loitokitok remain small.

4.2. Government Policy and Investment

During and after the colonial period, governments on both sides of the border have designed and implemented a variety of policies that have influenced patterns of land use. These include those associated with administrative structures, economic objectives, regional development, and land tenure.

The administrative structure in Kenya has been relatively consistent, while that in Tanzania experienced significant changes, particularly after independence. In Tanzania, for example, the definition of land property rights changed from customary (traditional community rights), to government owned, and now towards freehold (formal titling by private holders). These changes have resulted in a degree of uncertainty in continuing investment in landesque capital among the Chagga. For example, community authority over maintenance of irrigation infrastructure was denied and eventually privatised. Similarly, sacred forests lost the protection afforded by community authority and many were depleted for timber and charcoal.

The framework for economic development has also remained more consistent in Kenya than in Tanzania. In Kenya, while a number of specific policies re taxation, currency control, and parastatal organization have evolved, and regional development approaches such as Integrated Rural Development and District Development have been tried, the overall context has consistently been one of a capitalist strategy responsive to competitive forces.

After Independence in Tanzania, the colonial structure was replaced by first a decentralized and later a centralized administrative structure, with the local and central governments, respectively, assuming all the powers to make decisions. This framework gave a greater role for the government bureaucracy in managing implementation of policy at local and regional levels. Thus, control of natural resources reverted from the local chiefs and other traditional rulers to government bureaucrats and party authorities, people who were not indigenous to that locality. The consequences for the Chagga were that local protection of forests declined. There were invasions of the Kilimanjaro Forest Reserve, especially the half-mile forestry buffer strip, and much woodcutting that reduced the protection afforded to river catchments. In addition, the movement of farmers into adjacent pastoral areas accelerated.

The Ujamaa policy adopted in 1967 gave greater emphasis to basic needs than to development driven entirely by market forces, and led to rural communities being moved into central villages. This however, did not directly affect the higher mountain slopes, as there was no land to accommodate Ujamaa villages. This meant continuity of the development path already in place. The lowlands, however, underwent change as Ujamaa villages were established, and additional people migrating into these areas from the highlands and other parts of the region. This meant further spread of rain fed agriculture into pastoral areas.

Local control was re-established under the 1982 Act that decentralized administration, and

this was reinforced by the enactment of the Regional Administration Act in 1997, and the Land Act of 1999 that strengthened the role of local communities in environmental management (Mbonile et al. 2003).

In Kenya the divisional headquarters in Loitokitok housed representatives of governmental administration and ministries. There was however little government investment in agriculture or livestock production, and agricultural extension services were limited. Non-farm opportunities are confined to small service and trade enterprises.

The implementation of Structural Adjustment Programmes (SAPs) had a similar impact on livelihoods on both sides of the mountain, but of greater intensity in Tanzania where production systems were more deeply integrated in the export economy. In particular the removal of agricultural input subsidies led to a marked decrease in coffee production as production costs exceeded returns, and many farmers took up horticulture. This has been further supported by the liberalization of trade that has increased access of farmers to internal and external markets. In the Loitokitok, Kenya area, SAPs and associated relaxation of currency controls, together with improved transportation, stimulated the emergence of a vibrant horticultural system based on irrigation. Its impact was not only to stimulate production, but led to additional migration into the area and the involvement of many Maasai in crop production. The economic opportunities also motivated an acceleration of the process of land adjudication from group to individual tenure.

Since the 1980s, economic stimulus and population growth has resulted in expansion of cultivation into the lowlands on both sides of the mountain. In Kenya it has essentially represented spontaneous settlement on the lower slopes where rain fed agriculture is marginal, and to the riparian areas along streams and around swamps for irrigation. Similar settlement has occurred in Tanzania, although much of it began earlier in the 1960s with the expansion of rain fed agriculture into the lowlands spontaneously by smallholders, and the expansion of irrigated agriculture by formal large-scale irrigation projects and by informal small-scale developments. In both countries conflict between farmers and herders over access to water and grazing has ensued. On the Kenya side in particular the expansion of agriculture has also raised concerns about the viability of wildlife populations.

4.3. Exercise of Power and Land Use

Land use changes result from the intersection of many driving forces. As mentioned in the introduction, one of the most important but often neglected drivers of land use change is the exercise of power. A critical force affecting the drivers of change is the exercise of power by governments, institutions and individuals. Policy makers see policy as a means of achieving desired futures, yet there is a reluctance to recognize that it is thus inevitably a driver of change and as such has potential negative, as well as positive, outcomes.

Policy formulation reflects the influence of power, and thus power needs to be explicitly recognized as a driving force of land use change. Singly or in association, stakeholders seek to influence conditions to achieve their desired goals. Laws and government policies reflect these influences at the national level. Their implementation at the local level is mediated by local societal processes and by biophysical conditions. Institutions and individuals thus seek to implement their goals on the ground by allying themselves with powerful local people and groups, and by seeking to influence local social and political practices and organizations.

In the following section aspects of the role of power in contributing to land use change on both sides of the mountain are illustrated.

4.3.1. The Kenya Side of the Border

At the national level in Kenya, since the colonial period power has been manifested through policies that have favoured crop agriculture and wildlife conservation, and that have had little

positive impact upon the livestock economy. Policy has consistently promoted crop agriculture as the main driver of the Kenyan economy. Over time a number of development strategies were attempted under this policy framework, including Integrated Rural Development, District Development Planning, and later under Structural Adjustment Plans.

A constant theme in all these strategies has been the promotion of land adjudication. It has been primarily implemented in areas of high agricultural potential. The savannah lands, where herding is the principal livelihood, had been left under group rather than individual control, except where parks and reserves have been demarcated for wildlife conservation, or where land was set aside for government controlled irrigation schemes.

The area around Loitokitok has been perceived at the national level as dominated by Maasai herding, and has therefore remained at the margins of the Kenyan economy with little investment in infrastructure or stimulus to the livestock economy. As with other livestock producing areas of the country, the infrastructure for marketing livestock, such as slaughterhouses and markets, was not developed to facilitate broad participation in the potentially lucrative meat trade. The crop agriculture that has evolved there has been the result of spontaneous development and has not received government investment comparable to other areas of the country. Until the recent emergence of small-scale horticultural production, the area's crop agriculture activity was not integrated into the national economy.

The government has however supported wildlife conservation and the related tourist trade. Amboseli National Park and Tsavo National Park represent two of Kenya's most popular tourist attractions. The combination of limited returns to local populations from the tourist industry combined with a lack of compensation for wildlife damage to crops and predation of livestock has led to local attitudes to wildlife conservation being generally antagonistic (Campbell et al. 2002).

Until recently, the local power structure supported and complemented the national power structure. Local Maasai elites represented the area as members of parliament for the ruling party, and indeed served as cabinet ministers. They based their local authority in the traditional age set system, and accumulated significant power. Their personal maintenance of the traditional perception of the Maasai, owning cattle, carrying a spear and wearing a *shuka*, facilitated their control of power by not posing any threat to the national elites, and by playing on the pride of the local people. The perception of Maasai remaining traditional and picturesque, superbly illustrated in "coffee table" books, was also useful to wildlife conservationists and the tourist trade. Wildlife conservation was promoted alongside cultural tourism, and the conservationists in the Kenya Wildlife Service and in NGOs, enlisted the powerful Maasai elites to provide support for their wildlife conservation goals.

For over 30 years this "collegial triumvirate" of national elites, Maasai leaders, and conservationists has influenced policy towards the area's development to promote their collective ends. Even as the reality of land use and population has changed, they have sought to perpetuate the myth of the Maasai as herder and herders being the only relevant stakeholder in order to influence policy at the national level.

Locally, however, reality defies the myth. Within Maasai society younger Maasai have been expressing frustration at their lack of inclusion on membership rolls of group ranches since the late 1970s (Campbell 1993). Over the past decade they have succeeded in challenging the authority of the age set system. They are now formally included as members of the ranches, and have elected people of their own age to positions of authority on group ranch committees. This is an important outcome as the group ranches are in the process of subdivision (Ntiati 2002) and land will be allocated to all registered members of the ranches irrespective of age or status. It should be noted however that informal subdivision has been taking place over the past decade, and savvy individuals have staked claims to the better-watered lands. Whether

these informal claims become legally ratified remains to be seen.

The process of subdivision highlights the tenuous nature of land holding of many of the recent migrant farmers to the area, particularly among the poorer non-Maasai. These migrants have cultivated the lower slopes of the mountain and the irrigated areas under a variety of arrangements with Maasai who have asserted informal land claims on the group ranches. These arrangements include short-term leases, sharecropping, and seasonal and daily labour agreements. The migrant farmers have no long-term claim to these lands, and little to gain from subdivision. They have thus had little incentive to invest in landesque capital, and their production strategy has focused on short-term output. The emerging pattern of a decline in river and swamp water quantity and quality, and of reduced soil fertility reflects these circumstances, and calls into question the longer-term viability of the system (Gachimbi 2002; Githaiga et al 2004).

The migrants represent one category of farmers. Others have been farming for decades on the upper slopes of the mountain below the Kenya-Tanzania border, and many Maasai are now themselves farmers, albeit with a significant investment in livestock. It is likely, however, that people who farm now form a majority, and people who do not identify themselves as Maasai represent about half of the population in SE Kajiado District. Only in the small towns, such as Kimana (Southgate and Hulme 2000), are non-Maasai represented in the administrative and political structure by non-Maasai officials.

While at the local level in towns and on group ranches a broader political representation of the population is emerging, this has yet to permeate at the provincial and national level where the “collegial triumvirate” still holds sway over policies and programmes that affect the area. It is possible, if not probable, that this power structure will change with the emergence of a land market in the aftermath of subdivision. The economic vitality that has been demonstrated particularly in the horticultural sector over the past decade will likely attract investors from outside the area to purchase land and gain access to this activity.

Eventually, larger-scale production units may emerge through land purchases and large-scale producers may call for better water management, fencing to protect crops from livestock and wildlife, and a paid labour force. The owners of these units would assert political power to promote their enterprises, and as many would be members of the economic and political elite, they would either have or know how to acquire the necessary influence.

All existing land uses and livelihood systems would be affected by such an outcome. Wildlife would suffer fragmentation of habitats, disruption of migration patterns, and curtailed access to water due to fencing along streams and around swamps. Access to grazing and water would also be denied to livestock with implications for the livestock economy. Having sold their land, Maasai would have to find employment, as would those farmers who currently contribute to the agricultural economy but have no rights to land. It is questionable whether the large-scale production units would be able to absorb the existing labour force.

The new landowners would inevitably come to conflict with the established “collegial triumvirate” of national elites, Maasai leaders and conservationists, and the outcome of competition or compromise would determine future land use patterns.

4.3.2. The Tanzanian Side of the Border

On the southern slopes of the mountain, different power relations have existed among the Chagga although not between the Kenyan and Tanzanian Maasai in the lowlands. Since colonial times, policies have favoured agricultural development, which made the Chagga important to the national economy. The administrative structure imposed by the colonial government, which sanctioned the nomination of several traditional rulers, was in support of the local chiefs as custodians of land and natural resources. Land belonged to a clan and could

not be sold.

With the abolition of Chiefdoms in 1962, the whole structure of local government and land tenure changed. The allocation of land and protection of natural resources shifted from Chiefs and communities to formal government structures. Only land in the lower slopes and lowlands, traditionally the Maasai land, was however available for government allocation. In the highlands where clan land was being maintained, the elders still had some control and a say on land matters. Land prospecting was almost absent because the elders would not allow the sale of land. However, land fragmentation continued because of the inheritance system in which all sons inherited land, while out-migration to the lower slopes and the lowlands ensued. Thus these lower areas became multi-ethnic, as migrants from the highlands and other parts of the country settled in the traditionally Maasai areas.

The migrants were mostly farmers. But as was the case in the Loitokitok area, the newer, non-Maasai migrants represented only one category of farmers. Others had been farming for decades on the lower slopes of the mountain, and many Maasai are now themselves farmers although they still invest significantly in livestock.

In these lower areas, policies continued to favour settled agriculture and wildlife conservation over pastoralism despite its contribution to the national economy. The policy framework was governed by the common belief that common land tenure was inefficient and potentially destructive to the environment. This has often resulted in social, political and economic discrimination of the pastoral communities, especially the Maasai. The villagisation programme, which imposed an alien system of government, statutory law and decision-making structures on to indigenous socio-political systems, completely undermined the administrative and political functions of traditional leadership (Bradbury et al., 1995). The customary land tenure arrangements were completely disrupted and decision-making over the management of natural resources within the Maasai localities was passed on to village councils, leading to complete breakdown of management systems that had hitherto worked out successfully. The replacement of the traditional authorities with modern political entities thus changed the resource use patterns of the Maasai (Noe, 2003)

Since the mid 1980s, Tanzania has undergone a significant political and power transformation following the adoption of the SAP. Neo-liberal economic policies, with market forces at play, have replaced the socialist orientation of the economy. The liberalisation of the economy has resulted in a growing interest of Tanzanian and foreign businessmen to invest in commercial farming and tourism. Supported by the 1995 Land Policy, which supports privatisation of land, this has created a conducive environment for further alienation of Maasai land, and has encouraged individuals to acquire land for commercial farming. Therefore, as government and private interests develop large areas of land for commercial farming and wildlife conservation for tourism purposes, the Maasai are increasingly losing access to their traditional pastures and finding their movements increasingly restricted.

Tanzania to-date does not have a specific policy on pastoralism. The current policy on agriculture and livestock of 1997 still favours farmers and peasants (agriculture) while the pastoralists continue to be marginalized. The introduction of Wildlife Management Areas (WMAs) outside protected areas through the 1998 Wildlife policy, though intended to diversify livelihoods, may further take land away from the Maasai for wildlife conservation.

The adoption of multi-party politics in the early 1990s has also changed the power structure. The potential exists for greater transparency in local government and the representation of local concerns, but some of the Maasai elites are alleged to have become involved in land grabbing in Maasailand on a grand scale (Bradbury et al., 1995). Thus the situation of the Maasai still remains precarious.

5. CONCLUSION

The importance of history, of culture, of interactions between livelihood systems and their ability to take advantage of ecological conditions, and geographical pattern of trade have contributed to the marked differences in land use/cover between the Kenyan and Tanzanian sides of the international border on Mt. Kilimanjaro. Even as economic and political circumstances have changed, the political border has remained a distinct land use/cover boundary.

The drivers of this outcome are complex, involving both local and external processes. Local land use systems have emerged through an interaction over time of societal and biophysical processes, influenced by external conditions. It is the latter, the national context, that has been the most consistent determinant since colonial times of the differences across the border. National policies, and the location of the two sides relative to their national economic and political centres of power have had a consistent impact.

Since pre-colonial times there has been a distinct land use/cover boundary on the slopes of Mt. Kilimanjaro defined by the distribution of livelihood systems dominated by livestock among the Maasai to the north, and by crop agriculture of the Chagga to the south. This boundary, reinforced by the colonial demarcation of the national border, has remained visibly intact until the present. The frontier has endured even though the livelihoods that gave the boundary its initial form have experienced significant changes in their structure, distribution, and interaction, and new land uses, such as plantations in Tanzania and the expansion of cultivation in Kenya, have complicated the picture. The ecological and cultural basis for the boundary has weakened over time while economic and political forces have become more important in maintaining it. The contemporary setting of anticipated cooperation between the East African countries, and the reality of increased interaction across the border, may serve to eventually diffuse the distinct land use/cover pattern at the border.

The effect of cooperation between the East African countries may not address the institutional and infrastructural conditions that have created the distinct development trajectories of Tanzania and Kenya. International cooperation is more likely to determine the shape of “high order functions” such as banking, trade policy, and investment in science and technology where economies of scale can yield significant returns. A joint policy on developing the transportation infrastructure (air, road, and rail) would, however, be highly influential in the area.

One field that could benefit from such coordination is that of environmental conservation. The LUCID case studies have clearly illustrated the linkages between land use, biodiversity, and land degradation, and the importance of policy as one of the driving forces influencing the status of biophysical conditions.

Opportunities for collaboration by both countries exist. For example, approaches to the conservation of wildlife have remained largely independent, even though three important wildlife corridors cross the border in the Kilimanjaro area. Recent efforts indicate that a shared concern over wildlife conservation exists as indicated by cooperation on the cross-border project funded by GEF.

A second example of an opportunity for collaboration is to develop a cross-border strategy for maintaining the Mt. Kilimanjaro forest which has a significant impact on the surface and ground hydrology of the mountain slopes and surrounding plains. On both sides of the border, streams provide water to people and animals, and supply the irrigated areas upon which an increasing number of people depend and which have considerable economic value. For example were the forest upslope of the border on the north side of Mt. Kilimanjaro to be reduced and stream flow affected, the consequences for the agricultural livelihoods in the Loitokitok area would be significant.

The persistence over centuries of a boundary initially established by distinctive livelihood systems interacting with each other and with the biophysical resource base is remarkable. It has endured while the processes, if not the categories, that gave rise to it have changed significantly.

The location of regional trade routes has remained a significant influence on local groups and economies, be it the trade in slaves and ivory in the pre-colonial period, or that in coffee, tobacco and horticulture more recently. The conditions of engagement with these trading systems involved the use of power by chiefs who negotiated with trading groups such as the Kamba, the caravan traders in the pre-colonial period, and the colonial and independent states and private traders in the 20th and 21st centuries.

Similarly, the location of the two sides of the border relative to the national economic and power centres have greatly affected development patterns. The Tanzanian side, especially in the agricultural area, was favoured with governmental road and rail transport infrastructure, education, agricultural programmes and schemes, and other investments as it was an important producer of export and domestically traded commodities. This level of governmental investment has been recently followed by private investments, for example in large-scale farms. The expansion of cropping and the loss of access to pasture land have forced many Maasai to out-migrate to urban centres and to distant grasslands. In contrast, the Kenyan side of the border has experienced low governmental investments in transport infrastructure, education, health or agricultural programmes. The Kenyan side of the border, therefore, has had a slower rate of agricultural development and a notably slower rate of urbanization. The Maasai retain political power and control over the land, despite the economic basis of the area undergoing a rapid change away from pastoralism and towards commercial agriculture.

The ability of livelihood systems to successfully maintain their subsistence and to effectively participate in wider economies and politics depended in good measure on the vitality of their production systems, which reflected access to the biophysical resources upon which production depended. Sustainable land management was essential to the herding and farming societies that established themselves centuries ago in the region. It remains so today, though current land use practices have been shown by research by LUCID scientists and others to call into question the sustainability of soil and water resources, grazing patterns, and of wildlife management strategies.

This study of the persistence of the land use/cover boundary on Mt. Kilimanjaro has illustrated the importance of understanding the dynamic interaction between societal and biophysical processes, over time and at different scales. The conceptual framework adopted by the LUCID Project has facilitated the identification of critical driving forces that shaped the dynamics of livelihood systems. It is these dynamic interactions that have determined, and will continue to determine, the future of land use on Mt. Kilimanjaro and the future configuration of one of the most striking attributes of the landscape – the instantly recognizable demarcation of the political and land use/cover boundary between Tanzania and Kenya.

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