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Land Use By People Living Around Protected Areas: The Case of Lake Manyara National Park

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Abstract

The paper discusses socio-economic trends of human activities around Lake Manyara, a declared world heritage site. It reveals the resulting conflicts in land use between crop cultivation, pastoralism, and conservation, all of which are important. Information gathered from satellite imagery and aerial photographs of the area between the 960's and the 1980's is used to show changes in land use that favour crop cultivation at the expense of wildlife conservation and livestock development. Three development scenarios are discussed and a middle-way strategy that is consistent with the concept and practice of sustainable development is suggested. The paper calls for the idea of an integrated management plan for Lake Manyara Basin to be taken beyond the applied research stage into actual policy and implementation by relevant institutions such as the Regional Administration in Arusha, Ministry of Natural Resources and Tourism and the Environment Division of Vice-Presidents Office in collaboration with partners such as the African Wildlife Foundation (AWF), IUCN and the Man and Biosphere Programme (MAB).

1. Introduction

The Lake Manyara Basin (LMB) is an important ecosystem in Tanzania that clearly illustrates the challenge to policy makers of achieving sustainable development through balancing conservation objectives with economic and social development. In 1981, the Man and Biosphere (MAB) programme of UNESCO declared the park a world heritage. In order to achieve the conservation objectives of the ecosystem, it is essential to understand the socio-economic dynamics of the surrounding communities and take these into account when charting out policies, programmes and project activities in the area.

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The LMB extends approximately 6942 sq. km. within Mbulu, Monduli, Ngorongoro and Babati Districts of Arusha Region - Northern Tanzania (Figure 1). The boundaries of the basin constitute a water divide (watershed) of the area drained by Lake Manyara, extending from 3.^{05} to 4.^{05} degrees south and 35.^{51} to 36.^{37} degrees east (Figure 1).

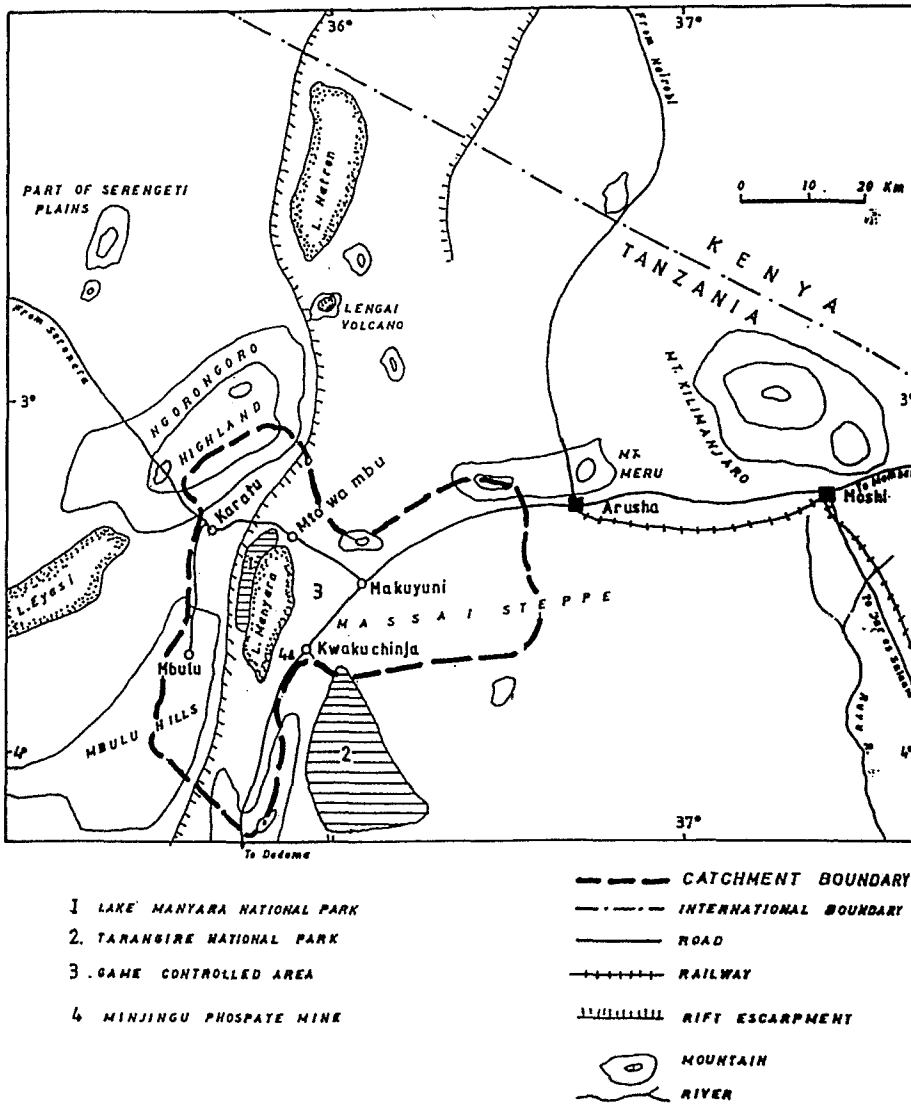

Figure 1: Lake Manyara Catchment Basin and Environs

One of the major features of the basin is the Great Rift Valley with only the western escarpment being conspicuous, in some areas rising to over 200m. The Ngorongoro Massive (3650m) forms the northwestern boundary, while Mbulu plateau (2135 m) forms the western boundary. In the south, the conspicuous boundary feature is the Kwahara mountain (2415 m). In the east is the Lolkisale hill, while in the north and north-east are the volcanic peaks of Lossiminguri, Burko and Monduli ranging between 2130 m and 2660 m. In the central part of the basin is Lake Manyara (920 m above sea level).

Lake Manyara Basin is semi-arid with mean annual rainfall 829.5mm, varying from 644.9 mm (Tarangire) to 1306.0 mm (Ngorongoro). Most of the rain falls in March-April (the long monsoon rains) and little in November-December (the short orographic rains). Rainfall is highly unreliable with pseudo-cycles of periodicity between 15 and 25 yeas (Prins, 1987), and often falling in thunderstorms. Drought periods are very common. There is probability of one year out of ten having the minimum precipitation of between 250 and 500 mm (Mwalyosi, 1988). Most of the basin is highly susceptible to soil erosion (Lundgrein, 1975; Hathout, 1983).

1.2 The Problem

The Lake Manyara Basin is part of the Masai Steppe (35,000 sq.km.) that was formerly occupied by large herds of wild animals and Masai livestock at the turn of the century (Lamprey, 1964; Kjaerby, 1987). It has been argued that the most suitable and traditional land use of the area is *transhumance livestock husbandry and wildlife conservation* (Earth Satellite Corporation, 1975; Ecosystems, 1980; Borner, 1985; Prins, 1987). This is because many studies of agricultural systems have shown that traditional land use systems are ecologically stable and adapted to the environment (Geerling and Breman, 1986; Timberlake, 1988).

However, such traditional systems are inefficient because of high risks and the generally low level of technology involved, such that attempts towards technological modernization usually result in severe resource degradation (Geerling and Breman, 1986; Cloudesley-Thompson, 1988). In recent times, population explosion has led to migration from the densely populated humid highlands within and outside the basin, to colonize and cultivate the marginal lowlands (Gulliver, 1969; Ecosystems, 1980).

Furthermore, the introduction of Tanzanian village agricultural production system has, in the past rapidly transformed pastoral into agro-pastoral societies

in marginal areas (Fukui, 1968). Also, large scale mechanized farms have been opened in the area and there are plans to increase acreage. These trends undermine traditional social organization of the indigenous pastoral people, and aggravate ecological impacts of overstocking and population pressure. The observed decline of wildlife in recent years has been attributed to increased agricultural settlement, removal of dry season water supplies and blockade of animal migration routes (Ecosystems, 1980; Borner, 1989, Mwalyosi, 1988). Under these circumstances land use conflicts between wildlife conservation, livestock grazing, and the infringing cultivation are to be expected.

Available literature on the LMB suggests that the main problems in the area include: over-exploitation of resources, land use conflicts and consequent resource degradation, expansion of agricultural settlement around protected area, leading to the isolation the latter. This, together with increased illegal wildlife consumptive exploitation, threatens the long-term survival wildlife in the area. Poor land use is causing severe soil erosion in upland/undulating areas and flooding and siltation in the lowlands. Floods damage wildlife habitats, crops, property and other infrastructure. The conflicting interests in land use as well misuse and over-exploitation of resources in the basin is likely to cause further resource degradation and impoverishment of local people.

2. Socio-Economic Dynamics in the LMB

2.1 Changes in Land Use/Land Cover

Over time, socio-economic activities of the people are believed to have caused major land use changes. The early 1990's reserved about 56% of the basin reserved to conservation. Game controlled areas occupied 2558 sq. km. while National Parks covered 265 sq. km. Forest Reserves approximate 1221 sq. km., while surface water (Lake Manyara) extends some 400 sq. km. All other human activities, except unlicensed hunting of game animals, are allowed in Game Controlled Areas. Therefore, land available for cultivation, settlement and livestock grazing is 5204 sq. km (75%). Out of this, about 547 sq. km is under leasehold. Actual land available to peasants is about 4657 sq. km (67%).

The area is rich in wildlife resources including zebra, wildebeest, giraffe, impala, elephant and thompson gazelles as revealed by the Serengeti Ecological Monitoring Project surveys (SEMP, 1988). The survey results suggest that, under normal circumstances, game animals tend to keep away from agricultural settlements but as the latter expand, animals are further restricted into smaller areas and traditional migration routes are blocked. The results also showed that

during the dry season, game animals concentrate in small moist enclaves including Tarangire and Lake Manyara National Parks. During the wet season, they dispersed over an area about 25,000 sq.km., with the highest concentrations in the south, southeast and northeast of Tarangire NP. A significant proportion of the migration still tracked northwest towards Lake Manyara NP and Selela Plains. Above the rift escarpment where agricultural settlement is more intensive, no large game mammals were recorded by the SEMP survey.

These wild animals are an important resource for the nation and the local people in terms of both consumptive and non-consumptive values. Current earnings from tourism in the area are relatively high and show an increasing trend. Game Controlled Areas offer good opportunities for sport hunting.

However, there have notable changes in the land use pattern over the years in terms of the extent of cropland, woody vegetation, grasslands and other uses. For example, analysis of aerial photographs and satellite SPOT imagery of the basin between 1958/63 and 1987 has revealed that the area under cropland increased by 118%, particularly in Mbulu and Babati areas (Mwalyosi and Mohamed, 1992). In Mto wa Mbu Irrigation Scheme for example, cultivated land increased from 218 hectares in 1957 to 543 hectares in 1988, an increase of about 150% while in the sub-catchment the same increased from 6% to 44% (Yanda and Mohamed, 1990).

On the other hand, the extent of woody cover was established to have decreased by 77% during the same period, giving way to cultivation and settlement. On the other hand, the extent of grasslands has increased by almost 16% during the 30 years.

The factors behind the changes in land use/land cover are varied but many are attributed to a broad range of human activities. An example is the dramatic increases in the population of subsistence farmers in the Mbulu plateau. By the time of the 1988 census, the population of the basin had increased at a rate of 5.6% over the 1957 value. Trends of migration into the area show that most of the migrants are cultivators (Mlay, 1981). It has also been noted that the villagization programme of the 1970's has induced and hastened changes in the traditional farming system. This is indicated by an increase in the number of ox-ploughs the area from 1983 onwards, as well as an increase in the use of tractors, particularly in the estates in the Lolkisale area.

The decrease in woody vegetation on the other hand is attributed to increase in cultivation particularly in the well-drained hills and ridge tops, which are

preferred to the low-lying and often saline flat grasslands. Another factor behind a decrease in woody vegetation is the increase in the demand for fuelwood and construction wood caused by the increase in population and change in life-styles brought about by the concentration of population under villagization. An increase in the extent of grassland cover is thus attributed to increased deforestation. A decline in the surface area of Lake Manyara is believed to have caused the observed increase in the area under grasslands. The reduction in the surface area of the lake on the other hand, is due to the fact that the flow of water particularly from the west has been declining over time on account of changes in the weather regime, while increased soil erosion brings down large quantities of silt. This is expected because the quantity and quality of water depends the land use activities in the drainage basin. The abstraction of water for irrigation activities in the Mto wa Mbu areas is a probable cause for the decline in water flows into the lake.

2.2Trends in Human Population Growth

By using available intercensal figures (between 1978 and 1988), a significant trend in population growth in the LMB is noted. Thus population size is projected to reach 445,340, almost double the 1988 figure. Population density in the area increased from 15.4 persons per sq.km. in 1957 to 42 in 1988 as shown in Table 1. The increase in population in the area is explained by the following main factors:

- The Arusha people who are sedentary agricultural group of Maasai origin have been observed to multiply fast and colonizing the former Maasai plains. Their population has now expanded within and beyond the Ardai Plains.
- Migration is also another factor that has contributed to rapid increase in the population of the LMB. The low population density of the plains attracts migrants from the more densely populated upper areas of Mount Meru and Kilimanjaro. It is on record that the period of highest influx of people was during the villagization period between 1973 and 1978 (Arens, 1979). However, migration slowed down during the 1980's when cultivable land had already been allocated.
- It is also on record that during the 1950' and 1960's, many people moved in to the area in search for wage earning opportunities caused by expanding commercial farms. Today, tourism and conservation activities are attracting more people into the area. Other reasons for people migrating include prolonged periods of drought, e.g., in 1997, which force pastoral communities to move into the area near the lake to graze their livestock.

- Population growth in the area is also attributed to high rates of natural increase. These high rates result from a relative reduction in death rates coupled with high birth rates. It will be observed that the age distribution in the area shows a high preponderance of young people who are entering the reproductive age. The population figures for the expected census of 1998 will provide a better picture of the changes in the last decade.

However, using the population growth rate of 2.9% for the study area, population projections for the next 20 years (year 2008) suggest dramatic increases in the population density to 82 persons per square kilometer from the present 42. For some zones of the LMB, figures of 207 persons per sq. km have been projected. The following table indicates some changes in population parameters from 1957 to 1998.

Table 1: Human Population Parameters in LMB

Year	1957	1967	1978	1988
Population	83,796	137,305	174,752	233,450
Area (sq.km)	5,454	5,454	5,454	5,454
Density	15.4	25.2	32	42.8
Growth rate		5.1	2.2	2.9

Source: Henin and Egero (1972) and Bureau of Statistics (1978 and 1988)

2.2.3 Changes in Livestock and Wildlife Populations

As already stated above, the whole of Lake Manyara Basin is believed to have been used for transhumance pastoralism at the turn of the century, which was a more sustainable farming given low human population pressure compared to the situation today. However, expansion of mixed farmers from Kainam Highlands into Mbulumbulu squeezed the area available for pastoralism. In the 1950's and 1960's, there was further expansion of estate farms in the Kiru valley, while in recent years, more land has been put to large-scale and smallholder farming in the particularly in the lowlands. The nation-wide the 1984 livestock census indicates that 571,410 cattle, goats/sheep and donkeys were counted in the LMB. Livestock density in the basin was found to be 215 Livestock Units/sq.km (Mwalyosi and Mohamed, 1992). This number must have increased by the time of the last livestock census in 1994. This, together with the existing wildlife population, is likely to have led into overgrazing and degradation of the rangelands as the carrying capacity of the area is far exceeded.

According to the Serengeti Ecological Monitoring Project (SEMP, 1988), between 90,000 and 92,000 animals were estimated to be in the area during the dry and wet seasons, respectively. The animals are concentrated in the plains rather than in the highlands where agricultural activities are concentrated. Despite these large numbers, significant declines in elephant populations were recorded between 1987 and 1990 probably due to illegal hunting (poaching).

3. Implications of the Changes for Biodiversity Value of the LMB

There are a number of policy challenges on Biodiversity conservation and sustainable development in the LMB arising out of the socio-economic changes noted above. These include: decrease in land holdings, decline in agricultural productivity, loss and deterioration of range lands, decline in water quantity and quality all of which conflict with conserving of the ecosystem for Biodiversity values.

Firstly, due to population increase, average household acreage is declining fast which leads to farmers wanting to expand land for cultivation. This means encroaching on land available for grazing and for wildlife conservation. In this way, land use conflicts are intensified and thus complicating the management of the basin as an ecosystem. Also the over-exploitation of wood for fuelwood and building materials leads to a decline in woody vegetation which could induce changes in the local climatic regime, e.g., less rainfall, more deforestation, more soil erosion, siltation, decline in the size of the lake, etc. It is pertinent to inquire into feasible options for halting the expansion of land for cultivation by for example intensifying agriculture in the surrounding area. Thus conservation is ultimately linked with agricultural policy.

A related implication results from observed declines in agricultural productivity throughout the basin, e.g., wheat yields dropping from 3780 kg/ha in 1955 to 700 kg/ha in 1989. The decline in yields is attributed to gradual soil degradation and unsustainable agricultural practices, e.g., wider spacing of maize plants than recommended practice thus exposing the soil to run-off. The trend in declining yields of crops leads to expansion of cultivated area in order to compensate for the decline in yields (Shechambo and Kulindwa, 1995).

It is clear that the expansion of cultivation is taking place at the expense of livestock development and wildlife conservation as all three economic activities are competing for the same land. The result is that livestock and game are restricted into smaller areas and traditional migration routes are blocked. Thus

there is bound to be fragmentation, loss of natural habitat, insulation of nature reserves and increased land use conflicts. This is a challenge for the MAB programme to come up with a management strategy that will ensure no further degradation of the ecosystem.

Another implication of the change in land use/land cover on Biodiversity conservation is the deterioration of rangelands. Assessment of the rangelands of the Maasai plains indicate significant loss of traditional plant species due to overgrazing by livestock and game and change in burning practices. Also the plains are characterized by high deposition of sediment caused by soil erosion in the hilly surrounding hilly areas. This fact is confirmed by the observation that the extent of bare land has increased area during the period between 1957 and 1987.

Related to the above is the fact that the quantity of water flowing into the lake has been declining, while the amplitude of variation between high and low water discharge has increased. Thus measurements at Makuyuni River for example, show very low or total absence of water discharge during the dry season compared to high discharges during the rainy season. Also due to soil erosion, the water carries with it large quantities of silt and is subject to carrying chemicals (fertilizers, pesticides, leachetes, etc) washed away from farms in the Mto wa Mbu Irrigation Scheme thus altering the salinity levels of the soils (Yanda, 1990).

4. Concluding Remark and Recommendation

The paper has reiterated the disturbing trend in the status of the Lake Manyara Basin ecosystem if present land uses and management of the basin continue, e.g., *business as usual* scenario. The trends are such that agriculture will continue to expand at the expense of pastoral livestock development and conservation. In the early 1990's, a basin management strategy was recommended for action to try and harmonize conservation and economic development (Mwalyosi, 1991). In that strategy, the demerits two extreme options were analyzed, e.g., *an extended development option* which favours irrigation agriculture, tourism and block/ private ranching but which is, likely to result in aggravating environmental impacts on the basin, and thus undermining the conservation objective.

The alternative was the *maximum conservation option,* which would favour wildlife conservation, limited tourism and pastoral livestock development. This strategy implies limiting human population growth and settlement and agriculture and thus undermining the livelihood strategies of the residents.

A third option named *optimum development* aims at reconciling the two extremes. It would strive to limit population growth and settlement but seek to improve existing land tenure rules and techno-economic services that are sensitive to existing ecological capabilities. The main objective is to raise the carrying capacity of the respective ecological zones of the basin and enable local people to meet their basic needs.

The *middle-way* strategy has the virtue of starting from where the people are and trying to transform and improve upon the agro-pastoral farming system into a mixed farming system. Indeed this strategy is consistent with the concept of *sustainable development*. Under this principle, no uniformity is envisaged but each agro-ecological sub-zone within the basin will be utilized according to its potential. For example, in the humid areas, organic integration of crop and animal husbandry will be promoted, whereas in marginal areas emphasis would be placed on livestock development and communal wildlife management. A big component and assumption should be to increase awareness at community level so that such communities have the incentive and are empowered to promote sustainable resource use practices. The ultimate goal is to reduce pressure on the protected area while stabilizing agricultural and livestock production systems that are crucial source of livelihood. This paper contends that the idea of a management plan for Lake Manyara Basin has not gone beyond the applied research stage. It needs to be taken to the planning drawing tables of the Regional Administration in Arusha, Ministry of Natural Resources and Tourism and the Environment Division of Vice-Presidents Office. Partners such as the African Wildlife Foundation (AWF), IUCN and the Man and Biosphere Programme (MAB) can play a catalytic role to assist in the preparation of a integrated management plan for the Lake Manyara basin ecosystem.

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