

UNITED REPUBLIC OF TANZANIA



**THE MULTIPLE LAND USE MODEL OF NGORONGORO CONSERVATION AREA:
ACHIEVEMENTS AND LESSONS LEARNT, CHALLENGES AND OPTIONS FOR
THE FUTURE**

FINAL REPORT



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Dodoma**

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ABBREVIATIONS

AIDS	-	Acquired Immuno-deficiency Syndrome
CAP	-	Chapter
CBC	-	Community-Based Conservation
CBD	-	Convention on Biological Diversity
CBPP	-	Contagious Bovine Pleuropneumonia
CCPP	-	Contagious Caprine Pleuropneumonia
CITES	-	Convention on International Trade in Endangered Species of Flora and Fauna
CMS	-	Convention on Conservation of Migratory Species of Wild Animals
CMT	-	Council Management Team
CSOs	-	Civil Society Organizations
CSP	-	Corporate Strategic Plan
DOA	-	Division of Antiquities
DS	-	Dry Season
EAC	-	East African Community
ECF	-	East Cost Fever
EIA	-	Environmental Impact Assessment
EMA	-	Environmental Management Act
FAO	-	Food and Agriculture Organization
GCAAs	-	Game Controlled Areas
GDP	-	Gross Domestic Product
GIS	-	Geographical Information System
GMP	-	General Management Plan
GRs	-	Game Reserve
HIV	-	Human Immuno-deficiency Virus
ILRI	-	International Livestock Research Institute
IPPC	-	International Plant Protection Convention
IRA	-	Institute of Resource Assessment
ITCZ	-	Inter - Tropical Convergence Zone
IUCN	-	International Union for Conservation of Nature and Natural Resources
Kg		Kilogramme
Km ²		Square Kilometre
LGAs	-	Local Government Authorities
CGA	-	Loliondo Game Controlled Area
LHUs	-	Large Herbivore Unit
LULC	-	Land Use and Land Cover
MAB	-	Man and the Biosphere Program
MCF	-	Malignant Catarrh Fever

MDAs	-	Ministerial Departments and Agencies
MLUM	-	Multiple Land Use Model
MNRT	-	Ministry of Natural Resources and Tourism
MTS	-	Multilateral Trading System
NBS	-	National Bureau of Statistics
NCA	-	Ngorongoro Conservation Area
NCAA	-	Ngorongoro Conservation Area Authority
NDC	-	Ngorongoro District Council
NEMC	-	National Environment Management Council
NFRA	-	National Food Reserve Agency
NGOs	-	Non-Governmental Organizations
NHFR	-	Northern Highland Forest Reserve
NPC	-	Ngorongoro Pastoral Council
NSGPR	-	National Strategy for Growth and Poverty Reduction
PAs	-	Protected Areas
PO-RALG	-	President's Office Regional Administration and Local Government
PRA	-	Participatory Rural Appraisal
PPR	-	Peste des Petit Ruminants
RDP	-	Rural Development Policy
RDS	-	Rural Development Strategy
R.E.	-	Revised Edition
SEA	-	Strategic Environmental Assessment
SDGs	-	Sustainable Development Goals
SENAPA	-	Serengeti National Park
SME	-	Serengeti-Mara Ecosystem
SPFFE	-	Society for the Preservation of Flora and Fauna of the Empire
SWOC	-	Strengths, Weaknesses, Opportunities and Challenges
TDV	-	Tanzania Development Vision
TANAPA	-	Tanzania National Parks
TARURA	-	Tanzania Rural and Urban Roads Agency
TAWA	-	Tanzania Wildlife Management Authority
TAWIRI	-	Tanzania Wildlife Research Institute
TFS	-	Tanzania Forest Services Agency
TLU	-	Tropical Livestock Unit
TTB	-	Tanzania Tourist Board
TZS	-	Tanzania Shilling
UN	-	United Nations
UNEP	-	United Nations Environment Programme
UNFCCC	-	United Nations Framework Convention on Climate Change
UNDP	-	United Nations Development Programme
UNESCO	-	United Nations Education, Scientific and Culture Organization
URT	-	United Republic of Tanzania
VPO	-	Vice President's Office

WTO	-	World Tourism Organization
WFP	-	World Food Programme
WHC	-	World Heritage Committee
WHO	-	World Health Organization
WHS	-	World Heritage Site
WMAs	-	Wildlife Management Areas
WS	-	Wet Season

EXECUTIVE SUMMARY

Various stakeholders have increasingly been raising concern over the future of NCA in the face of increasing management challenges under the current multiple land use model (MLUM). Many facets have changed over the past 60 years of existence of NCA under the Model. These changes include, but not limited to, human demographics and spatial distribution across the landscape; land use types and levels of use within and adjacent areas; climatic conditions in terms of magnitude and duration of rainfall patterns and temperature regimes; human and livestock diseases; and socio-ecology of the people. Likewise, tourism types, products, the nature and contexts are different today unlike early years of NCA establishment. These changes have significantly influenced wildlife habitats, migratory routes and breeding sites and, consequently, the types and composition of flora and fauna of the area.

In view of the above concerns, in August 2018, MNRT formed a Team of Experts composed of experts from different disciplines to review the current MLUM and recommend management options that will address the current concerns and translate them into the desired future of NCA in terms of promoting natural resources conservation, safeguarding the interests of indigenous residents and promoting tourism.

The Team employed a variety of approaches, tools and techniques to accomplish this assignment. The exercise started by flying over the area to get its snapshot followed by a series of field visits in villages falling within NCA and consultations with Council Management Teams in bordering districts of Karatu, Longido, Meatu, Monduli and Ngorongoro district itself, and other key stakeholders. Review of available documents from both published and grey literature, and assessment of Satellite Images were done to gather relevant information and establish historical trends of the changes that have taken place in NCA since its establishment.

The findings in this assignment uncovered that the Ngorongoro Conservation Area Authority (NCAA) had had some mixed successes and challenges in pursuing its legal mandates under MLUM. The NCA has maintained three major different UNESCO designations - namely the World Mixed Natural and Cultural Heritage Site, Man and Biosphere Reserve and Ngorongoro- Lengai Global Geo-park. Other designations include cradle of mankind and one of the 7th wonders of Africa. This implies that the Management and the indigenous residents have continued to make efforts in ensuring the integrity and quality of the outstanding resources and values of NCA are maintained. The area is a stronghold of the highest population of black rhino (*Diceros bicornis michaeli*) in Tanzania, hosting nearly half of the country's population. The number of this important keystone species swelled from 12 individuals in 1980s, when UNESCO inscribed the area on the list of World Heritage Sites in danger to 60 rhinos in 2018. The NCA, unlike most of the protected areas in Tanzania has minimal levels of wildlife

poaching. The area has, therefore, albeit these changes, continued to maintain international standards of conservation, management of biodiversity, cultural heritage and geological landscape.

In safeguarding the interests of the indigenous residents (Maasai, Datoga and Hadzabe), NCAA has continued to support NCA community through provision of services such as, education, health, water and veterinary service. NCAA also provides food at subsidized price to the community annually to complement pastoral food shortage. Besides the recorded achievements, local people in NCA indicated to have reservations regarding their level of involvement in the decision making process on matters related to governance and management of NCA. Support from NCAA has not been able to cope with increasing demands, most likely due to high human population growth, effect of climate change and ecological stresses. Indigenous residents' socio-economic conditions have deteriorated due to food insecurity, water scarcity, income poverty, increasing human-wildlife conflicts, unfavourable laws, poor health and high illiteracy level. Increased human-wildlife conflicts are associated with increased interactions among people, wildlife and livestock. The Tropical Livestock Units (TLUs) per person have declined over years from 11.6 in 1959 to 2.3 in 2017, partly due to high livestock mortality exacerbated by deterioration of rangelands concurrent with high human population growth. Residents associate livestock mortality with inadequate grazing land caused by restrictions imposed by the Authority. They gave an example on recent restrictions or ban to track livestock into the Ngorongoro Crater for salt lick and in Empakaai and Olmoti craters as well as Northern Highland Forest Reserve (NHFR) for dry season grazing. Other reasons cited include insufficient veterinary services, livestock depredation, deteriorating rangelands, particularly the invasion of both alien plant species and indigenous pioneer weeds. Overall, satellite images have shown extensive deterioration of vegetation particularly grasslands, shrubland, woodland and NHFR.

Tourism growth is manifested by notable increase in tourist facilities, introduction of new tourist products as well as increase in tourist numbers and revenue. Tourism products have increased in recent years from the well-known and traditional products to walking safaris, horse riding, hot-air balloon flights and geo tourism. Communities engage in different tourism-based activities as part of livelihood strategy including the sale of souvenirs, sharing culture with tourists such as traditional dances, tour guiding and translation as well as provision of security services.

In a situation where conservation of natural and cultural resources and tourism are fairly improving, while conditions of resident pastoralists are deteriorating, it is unlikely for MLUM to bring the desired outcomes that will benefit conservation and indigenous residents. The need for review of the model to better harness conservation, community and tourism development was therefore imperative.

During consultations the following five different options were suggested by stakeholders for the future management of NCA; (i) maintaining the status quo i.e., allowing people to continue with their activities as it is now; (ii) annexing adjacent land areas to provide

more space for humans, livestock, and tourism activities; (iii) establishing two distinctive zones; one for human settlement and livestock keeping, and the other exclusive for conservation; (iv) reducing human and livestock population by relocating people to other areas outside Ngorongoro; and (v) abolishing MLUM and relocating people and livestock outside the area.

SAVANNA Model was used to predict changes in rangelands condition under three different utilization scenarios. Analysis of maintaining the status quo revealed that with an average annual growth rate of 3.5%, human population will reach 200,000 people by 2038. This implies worsening of the well-being of the people as resources can hardly sustain this number and their livestock. Assuming total TLUs will remain 213,040 as it was in 2017 (excluding donkeys), TLUs/per capita will drop to 1.0 by 2038. This means that the community in NCA will need supplementary food from other sources of about 87%, which is far worse than the current situation of 70%. Even if the area was to be left solely for livestock and exclude wildlife, TLUs will grow up to 1,150,000 by 2032, but thereafter start to decline due to rangeland degradation and deterioration, and reach 800,000 by 2038. However, beyond year 2022, forbs will dominate the rangelands followed by herbs both of them replacing palatable grasses. This suggests that many grazer populations both wild and livestock species will continue to decline. This option was therefore ruled out by the Team because it was not feasible for sustaining trio objectives of establishing NCA in particular, and the Serengeti ecosystem in general and the ultimate reduction of tourists and revenue by about 50% of expected number and income respectively.

The Team considered stakeholders' distinct suggestions of annexing adjacent land areas to provide more space, establishing two distinctive zones and reducing human and livestock population by relocating people to other areas outside NCA as processes rather than options, which were therefore combined to form one option, which is, to maintain multiple land use model with some adjustments. Under this option a total of 4,304km² from Loliondo and Lake Natron Game Controlled Areas is proposed for annexation and increase the total area of NCA to 12,404km². With enlarged land area, population of wild herbivores will increase and exceed the 1994 estimate of 121,742 Large Herbivore Units (LHUs), and the optimal stocking capacity of the area will surpass 250,925 LHUs, that was estimated in 1994. A maximum of 20,000 people (about 5,000 households) will continue to reside in NCA with land use restrictions pursuant to delineated zones. At a minimum of 8.0 TLUs per capita, pastoral food requirements for 20,000 people will be 160,000 TLUs, which will require only 256,000ha of rangelands to guarantee health animals with market value. Initially shrubs and forbs will continue to decline giving way for grasses to recover up to around 2028 when re-appearance of forbs and herbs will be detected. Natural succession and replacement process of grazing and browsing vegetation in the proposed new NCA depending on climatic conditions and seasonal utilization of habitats under a revitalized traditional transhumance mode of livestock production will sustainably support all herbivore categories, i.e. grazers, browsers and mixed feeders of both wild and livestock. This means that despite interactions between wildlife and livestock, the proposed new NCA

will be enough to accommodate both domestic and wild herbivores even in bad years of severe drought while ensuring minimum pastoral food requirements.

On the other hand, changing NCA into a different protected area category will involve resettling all people and livestock outside NCA and leave the area exclusive for wildlife and habitat conservation; an action which may be costly economically, socially and culturally while disrupting inherent dependence of rangeland progression on domestic herbivores that has existed for many centuries. The availability of land to accommodate about 100,000 people and ensure that new comers and the hosting community amicably live in harmony could be challenging. However, advantage of this option is that condition of the rangeland in NCA, which has currently deteriorated will improve giving way to grassland vegetation to recover while shrubs and forbs will disappear at least up to 2028 when they will re-appear and maintain a rangeland of mixed grazing and browsing vegetation and support, wild bowsers, grazers and mixed feeders. With this scenario, wild herbivore populations, composition and distribution will be ecologically be regulated by enhancing upward trend up to 2038.

Economically, without annexation of the proposed part of Loliondo and Natron Game Controlled Areas to encompass the Kleins-Mto wa Mbu tarmac road, which is currently under construction, once completed NCAA may lose an estimated 25% of the expected tourist income from entry fee as many visitors may opt to explore attraction through a different route from the one they used to enter in NCA. In addition to that loss, another 3.0% may be lost being half of the 6.0% tourists who attached their visit to NCA in 2008 to co-existence between wildlife and people as the major attraction that influenced them to visit the area.

In order for one of the two options i. e. either to maintain multiple land use model with some adjustments or changing NCA into a different protected area category to work and cater for the interests of conservation, community and tourism development, the Team proposed critical conditions and considerations. Based on the findings from various analyses and taking into consideration different aspects including future income, conservation and tourism sustainability as well as resident pastoralists' welfare and human rights, the Team recommends the option of maintaining MLUM with some adjustments. In view of that, immediate, medium and long term actions for realizing this proposal in order to enhance conservation and tourism status of the area and increase income from tourism without compromising the rights of legal residents of NCA and a few who are inhabiting the proposed area for annexation are recommended. The main critical actions include education and awareness creation, enhancing NCA and sectoral capacities and coordination, reviewing Ngorongoro Conservation Area Act, enhancing law enforcement, and introducing rangelands rehabilitation programme.

CHAPTER ONE BACKGROUND INFORMATION

1. Historical background

The history of NCA dates back to 1914 when the German Administration accorded conservation status to the current NHFR of NCA in order to protect the watershed. However, control of the area was short-lived following the World War I. In 1928, the British Administration gazetted Ngorongoro Crater as closed game reserve. Although hunting and cultivation was prohibited; local people were allowed to live and conduct other customary land use practices.

In 1930, the Society for the Preservation of the Flora and Fauna of the Empire (SPFFE) sent Major Richard Hingston to Africa to investigate the need and potential for developing a nature protection program. He recommended for the establishment of a system of national parks citing Serengeti, Selous and Kilimanjaro as potential areas for this category. The 1933 London Convention on Flora and Fauna of Africa reinforced this recommendation by urging all signatories including Tanganyika to investigate the possibility of creating a system of national parks.

In 1940 the first game ordinance that gave the governor a mandate to declare any area a national park was enacted and Serengeti including the current NCA was established as the first national park. However, it remained a “park on paper” that is without effective enforcement of the laws and regulations governing the national parks for almost a decade, a delay that was attributed to World War II of 1939 to 1945.

The Fauna Conservation Ordinance No.17 of 1951 re-established the Serengeti National Park (SENAPA) in 1951. The Maasai responded with categorical refusal to obey government orders, which required them to vacate their homeland. The prohibitive policies imposed by the national park caused resentment among the natives who accused the British Administration for disregarding their interests. The resentment was manifested through sabotage and vandalism, for example, by spearing the rhinos and setting fires with malicious intent (Neumann, 1992). Negotiations therefore started between a special committee of trustees of the national parks and the then provincial administration. The result of these negotiations was a proposal to remove vested interests from all of the more important game areas in the national park. As a result, the Tanganyika Government in Sessional Paper No. 1 of 1956 outlined a projected modification of the Serengeti National Park.

Following increasing conflicts between the Maasai and conservation interests, the guaranteed right to the land and the priority of interests were promised by the government in 1958 and by the Governor himself in 1959. The British Administration excised the eastern part of the Park to form the current NCA - a multiple land use category of protected area which allowed wildlife conservation to be pursued along with pastoralism and tourism. The excision of NCA from Serengeti National Park resulted into formation of two management authorities, Tanganyika National Parks (TANAPA)

and NCA under the governance of TANAPA Ordinance(Cap. 412) and NCA Ordinance (Cap. 413) of 1959, respectively.

TANAPA Ordinance prohibited human settlements and any forms of consumptive use within national parks while NCA Ordinance sought to meet three objectives - conservation of natural resources, promoting the interests of indigenous residents and fostering tourism development. Following the establishment of the two authorities, about 4,000 people from Serengeti were moved to NCA. Together with the other 4,000 people who inhabited the Ngorongoro Highlands, were guaranteed that their interests will be safeguarded. When NCA Ordinance was revised in 1975, supervision of the area was vested to the Board of Directors, NCA which was managed as a Unit under MNRT became an autonomous organization under the management of NCAA, and cultivation was prohibited throughout the area. However, the original policy objective was retained, and NCAA was charged with the responsibility to: (i) conserve and develop the natural resources of the area; (ii) promote tourism; (iii) safeguard and promote the interests of Maasai citizens of Tanzania engaged in cattle ranching and dairy industry; and (iv) promote and regulate the development of forestry (Parkipuny, 1997). Following reorganization of the laws by the Parliament, NCA Act was reviewed and changed to Chapter 284 [R.E. 2002].

2. Justification for the Review

The MLUM has rendered NCA vulnerable to constant stresses from numerous factors. This has prompted a debate on whether the model can still be a viable conservation option and accommodate the interests of indigenous residents or it calls for some adjustments. The notable changes likely to cause stresses in NCA include human population growth and their spatial distribution over the landscape, social structure, change of lifestyles of the indigenous people and neighbouring communities, land use patterns and effect of climate change,. With these changes, demands for resources have increased, and the livelihood patterns have changed. Livestock (cattle, small stock and donkey) populations have also increased, though not at the same pace with humans. While the livestock population is increasingly exerting pressure on rangelands and forage resources, the pastoral economy is collapsing as indicated by Tropical Livestock Units (TLUs). According to McCabe *et al.*, (1992), a member of a household requires at least 8.0 TLUs for sustenance. However, average TLUs per person in 2017 were 2.3 (excluding donkeys), which accounted for about 30% of the minimum requirement. The declining trend in livestock per capita causes pastoral food shortage, as NCA communities rely solely on livestock for livelihoods. Trends in humans and livestock populations between 1959 and 2017 are shown in Table 1.

Table 1: Human and livestock population change in the past 60 years of the model

Unit	1959	2017	Percentage change
Humans	8,000	93,136	1,064.2
Cattle	161,034	238,826	48.3
Small stock	100,689	570,633	466.7
Donkeys	-	22,104	-
TLUs/person excluding donkeys	11.6	2.3	-80.2

Source: NBS (2017)

Further, tourist numbers and associated facilities have increased, with some of the facilities located in unplanned sites. Spatial and temporal use of the area by livestock and wild animals has changed and, subsequently, causing alteration of vegetation structure and composition. Unique features and ecologically sensitive areas including wildlife migration routes, breeding sites and dispersal areas are progressively interfered causing a potential risk to endangered and threatened species. Levels of land suitability for different uses, including human settlements and tourism development have also been altered. Both human and wildlife diseases have increased following changes in climatic patterns and socio-ecology of the people through human-livestock-wildlife interface. Furthermore, increased proximity and physical contacts between wildlife and human landscape have exacerbated property loss and wildlife-related accidents including human deaths and injuries.

Changes in ecological, demographic and climatic conditions have colossal influence on MLUM of NCA. Initially, the model was promising, but following the above ecological and socio-economic changes, their interests have run into conflict with those of wildlife conservation. The previous assumption that indigenous residents would limit their economic activities to transhumance pastoralism, which was considered compatible with natural resource conservation, did not work out. The model seems to have failed to recognize the dynamic nature of the three competing components - humans, livestock and wildlife populations - hosted in a fixed land.

The declined pastoral economy and food insecurity have prompted some community members to adopt coping strategies including culturally unacceptable behaviours such as begging from tourists. Some have sought employment as guards within and outside NCA while others have resorted to illegal cultivation and wildlife poaching. Employment of individuals from the local community within and outside NCA has increased purchasing power, thus increasing demand for development opportunities (e.g. construction of decent houses) and buying more livestock. However, these options are rarely pursued due to restrictive and prohibitive regulations governing the area.

Despite the challenges facing management of the area under MLUM, NCA has remained one of the popular and leading tourist destinations in Tanzania. It has a significant share to Tanzania's tourism, whose contribution to the Gross Domestic Product (GDP) and foreign exchange is currently 17.6% and 25%, respectively. Tourist arrivals in NCA both residents and non-residents, increased from 54,935 in 1984 to 253,001 in 2006 and to 644,155 in 2018. During the financial year 2017/2018, NCAA generated 127 billion shillings, the highest revenue per unit area than any protected area in East Africa. Similarly, NCAA was among the highest Government institutions in contribution to the national consolidated fund with TZS 22.355 billion shillings.

Given its ecological, economic and cultural importance as a mixed Natural and Cultural World Heritage Site and having been disrupted by multifaceted factors, several World Heritage Committee decisions have been calling for an assessment of MLUM to address issues of sustainable livelihoods, natural and cultural resources conservation and tourism promotion within the limits of acceptable use as well as its administration and governance. As a result, in August 2018, the Permanent Secretary for MNRT formed a Team of Experts to review the current Model and recommend management options that will translate into the desired future based on the past trends and existing conditions.

3. The Objectives

The overall objective of the assignment was to review the existing NCA-MLUM to enhance conservation of natural and cultural heritage resources, community and tourism development. The study aimed at realizing the following specific objectives:-

- i. To identify factors affecting MLUM of NCA;
- ii. To analyze the extent to which NCAA has been integrated into existing government administrative structures;
- iii. To identify important ecological implications emanating from MLUM of NCA;
- iv. To identify lessons learnt from NCA's MLUM; and,
- v. To recommend the sound approach to manage NCA.

4. The Conceptual Framework

In carrying out this assignment the Team adopted the '*Egg of Sustainability Model*' to explain the scenarios under which NCA-MLUM can or cannot be viable for people and conservation (IUCN, 1994). The model illustrates the relationship between people and ecosystem as one circle inside another, like the yolk of an egg. This implies that people are within the ecosystem, and that ultimately one is entirely dependent on each other. Just as an egg is good only if both the albumen and yolk are good, so a society is well and sustainable only if both, people and the ecosystem, are well. According to this concept, sustainable development is realized when people and ecosystem well-beings are achieved. Deterioration in the well-beings of both or one of the two components (ecosystem and/or society) will lead to unsustainable development (Figure1).

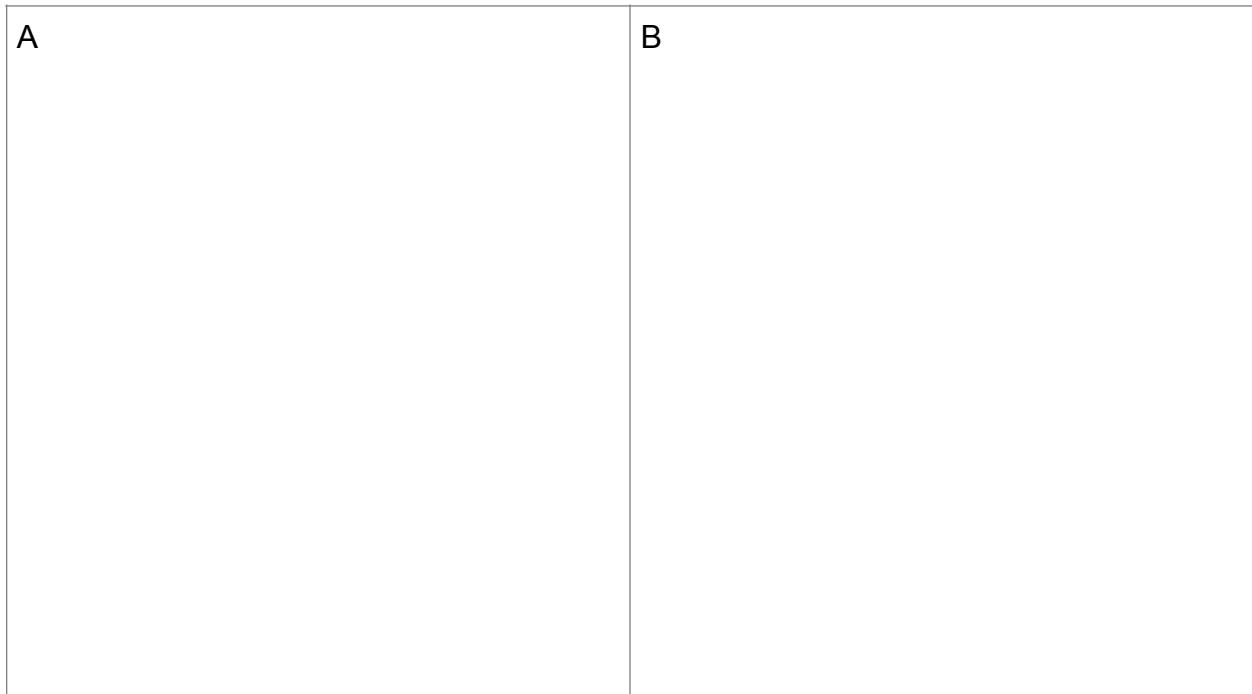


Figure 1: Egg of sustainability model, (A) shows the desired situation and (B) shows the current situation in NCA (IUCN 1994)

The egg of sustainability model explains the realities of MLUM in NCA. At the beginning, in 1959 when MLUM was adopted, the assumption was that the model would lead to sustainability where people and ecosystem would coexist harmoniously. However, the trends and condition of NCA suggest that the model disregarded some important variables. Some of these variables are people, livestock, wildlife, economic factors, land uses and human behavior.

In 1959, human population (8,000), cattle (161,034), and small stock (100,689) had minimal impact on ecological system. However, in 2017, increase in human population (93,136), cattle (238,826), and small stock (570,633) caused unsustainable use resulting into overutilization of natural and cultural resources which affect ecosystem services.

The situation in NCA indicates that both human and ecological conditions are deteriorating and, therefore, undermining the society well-being and sustainability of the area. The indicators of deteriorating human well-being in the area include poverty (50%), hunger (70%), illiteracy (64%) and diseases, among others (NBS 2017). According to Galvin et al. (2015), food insecurity to indigenous residents of NCA has resulted into poor health compared to Maasai residents of Loliondo Game Controlled Area (LGCA). In that study it was established that on average pastoral women in LGCA were slightly taller and weighed 3.4kg more than those in NCA (Table 2). Similarly,

infants of 1.5 to 2 years of age of LGCA weighed more than those of NCA by at least 1.5kg and the difference was statistically significant ($p < 0.001$).

Table 2: Mean body measures of pastoral mothers in LGCA and NCA

	Weight in kg (SD)	Height in cm (SD)	TSF* in mm (SD)	UAC* cm (SD)	BMI wt/ht² (SD)
LGCA	50.3(5.87)	160.5(6.24)	17.5(5.87)	25.2(2.17)	19.5(1.99)
NCA	46.9(6.29)	158.2(5.63)	13.8(4.86)	25.0(2.34)	18.7(2.11)
P	0.001	<0.02	<0.001	NS	<0.02

Source: Galvin et al. 2015; Note*: TFS=Triceps skinfold; UAC=Upper arm circumference; BMI=Body Mass Index; SD=standard deviation; NS=not significant

Poor ecological condition of NCA is depicted by range degradation, declined populations of some wildlife species and reduced quality of forage due to increase in invasive alien and pioneer weed species. Deterioration of ecological system translates into inadequate resources for society and therefore leads to competition for available scarce resources such as water and forage. This has consequently culminated into existing human-wildlife conflicts. The current ecological condition is very fragile, therefore, engaging in agricultural practices and poaching as alternative source of food for indigenous pastoralists will lead to loss of biological, scenic, archeological and other natural resource values of the area as well as running the risk of extensive soil erosion (See Figure 4).

CHAPTER TWO

AN OVERVIEW OF THE MULTIPLE LAND USE MODEL

1. Preamble

The MLUM entails three main components namely: i) conservation of natural resources, community development and tourism development. According to NCA-GMP (2006-2016), NCA is currently delineated into different management zones and sub zones. These are; i) development zone, ii) catchment forest zone, iii) external resources zone, and iv) craters zone and two sub zones, which are located in the development zone namely; archaeological sites (Oldupai and Laetoli) and short grass plains (NCAA, 2006). This Chapter provides an overview of NCA in the context of Serengeti – Mara Ecosystem (SME); conservation of natural resources; archaeological, paleontological and cultural Heritage; community development; tourism development; and cross-cutting issues. In cross cutting issues, the section pinpoints natural resources governance, Human Immuno-deficiency Virus (HIV)/Acquired Immuno-deficiency Syndrome (AIDS), national security and land use issues that influence MLUM in NCA.

2. NCA in the context of the Serengeti – Mara Ecosystem

The NCA, which is located at latitude 3^o15'S and longitude 35^o30'E, is part of SME, which is a cross border conservation area in East Africa. NCA covers 8,292 km² out of 25,000 km² of SME. Other protected areas in SME are SENAPA (14,763 km²), Maswa (2,200 km²), Kijereshi (300 km²), Ikorongo (563 km²) and Grumeti (416 km²) Game Reserves (GRs); LGCA (4,000 km²), Ikona Wildlife Management Area (WMA, 242 km²) and Makao WMA (768.9km²). The Kenyan part of the ecosystem is the Masai-Mara National Reserve (1,510 km²). Administratively, NCA is within Ngorongoro Division of Ngorongoro District, Arusha Region. Other Divisions of the District are Loliondo and Salei. NCA is bordered by three GCAs – Loliondo, Lake Natron to the north-east (7,756.76 km²) and Mto-wa-Mbu to the east (1,214.7 km²) (Figure 2). Each category of a protected area has objectives and specific uses defined by respective laws (Table 3).

Ecologically, NCA is a critical calving ground for wildebeest (*Connochaetes taurinus*), and a refueling site for migratory birds between Europe/Asia and southern parts of Africa. It is a cradle of mankind and is famous for hosting the largest unbroken caldera in the world. The land use categories and activities taking place outside the boundaries have impacts both positive and negative on the ecology and management of NCA. Correspondingly, NCA ecology and activities taking place within the boundaries can affect land use categories and activities outside. For example, on one hand, destruction of water source and/or calving/breeding grounds for wildlife species in LGCA can affect the population of wildlife species in NCA. On the other hand, wildlife from NCA can inflict economic costs to adjacent communities through crop damage, livestock depredation, diseases transmission, and wildlife-induced accidents. Therefore, planning and management of NCA always need to take on board the activities taking place

beyond the boundaries including wildlife conservation in the entire SME and economic activities conducted by the communities (Table 3).

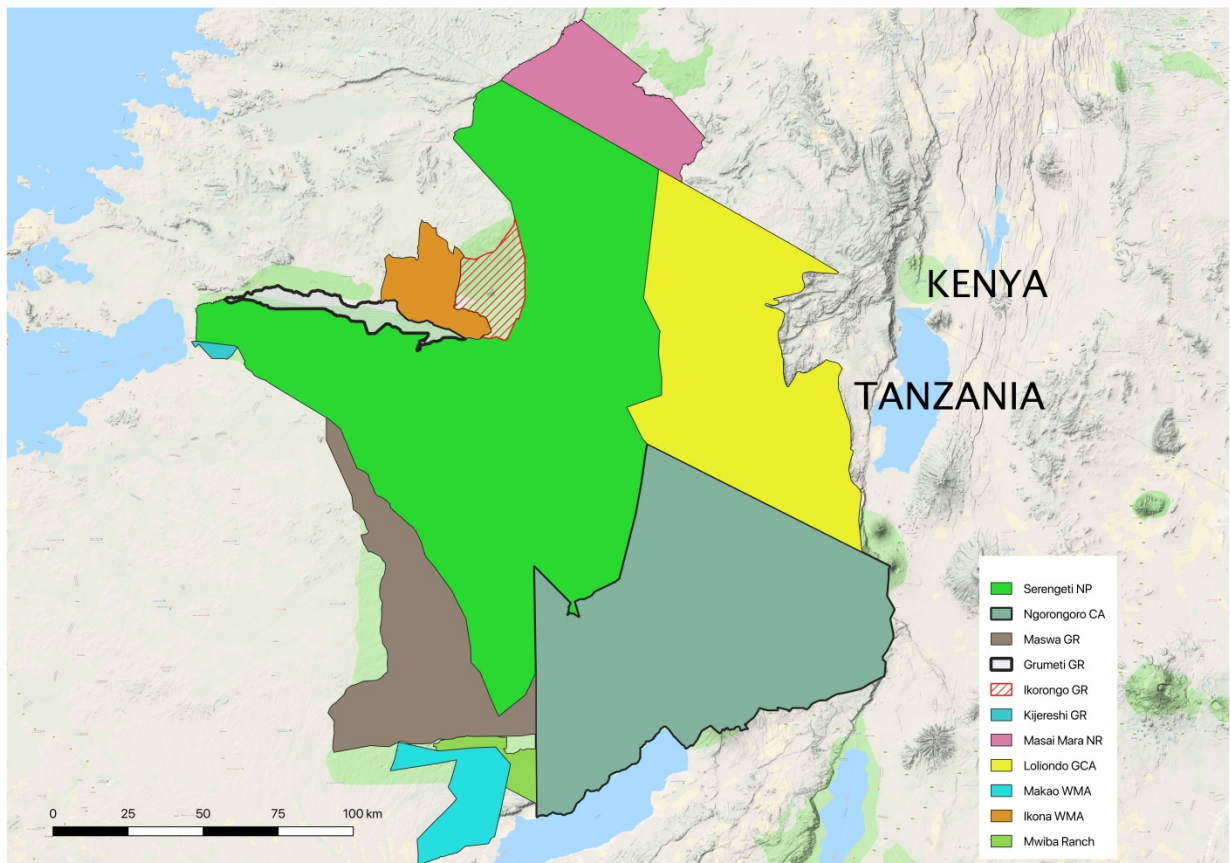


Figure 2: Protected Areas in the Serengeti Mara Ecosystem

NCA is important in the ecosystem as the calving ground for wildebeest, one of the refueling sites for migratory birds, a cradle of mankind, has the largest and unbroken caldera in the world and is a unique area that practices MLUM.

Table 3: Permitted and prohibited uses under different categories of PAs

S/N.			
	National park	Photographic tourism, game viewing and research	Consumptive use including hunting and cultivation
	NCA	Photographic tourism, game viewing, settlements, pastoralism, and research	Hunting and cultivation
	GRs	Photographic tourism, resident and tourist hunting (licensed), and research	Livestock grazing, human settlements, and cultivation
	GCAAs	Photographic tourism, game viewing, resident and tourist hunting (licensed), and research	Human settlements
	WMAs	Photographic tourism, game viewing, resident and tourist hunting (licensed), and research	Livestock grazing, human settlements, and cultivation

3. NCA and adjacent land uses

In Tanzania, land is a public property and vested under the President as trustee on behalf of all citizens. There are three categories of land namely: village land, general land and reserved land. In SME, both categories of land are present and include protected areas, villages; and general land. Land use in NCA is influenced by adjacent land use categories. Agriculture is the main land use practiced by communities adjoining NCA to the south and south-east in Lositete, Upper Kitete, Mbulumbulu, Kilimatambo, Rhotia, Marela, Tloma, Ayalabe, Kambi ya Simba, Slahamo, Kambi ya Nyoka, Oldean, Nitin (Mang'ola Juu), Makhoromba and Endamaghan villages in Karatu District as well as Selela, and Engaruka in Monduli District. Large-scale coffee plantations are found in Oldeani and Nitin villages. The existing interactions motivate people to engage in poaching, illegal cutting of trees, and encroachment. Also, livestock depredation, crop raiding and wildlife attacks are common due to proximity between people and protected areas. Edge effect caused by lack of buffer zone between villages and NCA amplifies risks on conservation.

There is also an increasing trend of urbanization around NCA. The economic opportunities within and around NCA are important population pull-factors to adjacent areas and, therefore, leading to rapid urbanizations in Karatu, Loliondo, Makao and Endamaghan. Urbanization and population growth around NCA threaten the natural resources of the Conservation Area through poaching, illegal logging and over extraction of water resource. Furthermore, these towns provide market for natural resources products from NCA such as bush meat, poles and fuel wood.

Comparatively, conservation challenges in the Masai-Mara National Reserve in Kenya are exacerbated by the recent changes in land uses. The sub-division of land outside the reserve has increased mushrooming of conservancies, tourist lodges, human settlements, ranching, fencing, agriculture and other developments that have reduced

wilderness and buffer zone for the Reserve. In addition, increase in livestock puts pressure on grazing areas where livestock compete with wildlife. The contractual condition to move out livestock except during certain specified periods (usually during the tourism low season) has resulted in significant increases in livestock stocking densities in the areas outside, with knock-on effects on the environment and the livelihoods of those holding land outside, including NCA. As such, if measures are not taken to regulate the increasing anthropogenic activities in SME, natural and cultural resources conservation, community and tourism development may not be sustainable.

4. Conservation of Natural Resources

The NCA is home to a variety of natural and cultural resources of international significance. Ngorongoro Crater, which is the most visited site in NCA harbors a population of some 25,000 large animals, mostly ungulates, alongside the highest density of mammalian predators in Africa including lion (*Panthera leo*), currently standing at about 86 animals and spotted hyena (*Crocuta crocuta*), which are over 300 individuals in the crater. A range of endangered species including black rhino (*Diceros bicornis michaeli*), wild dog (*Lycaon pictus*) and Cheetah (*Acinonyx jubatus*) are found in NCA. There is an estimated 560 bird species including European migrants (Baker and Baker, 2004). Along with other protected areas in the ecosystem, the NCA supports one of the largest mammal migrations on earth, which includes over a million wildebeest, 260,000 plain zebras (*Equus burchelli*) and about 460,000 Thompson gazelles (*Eudorcas thomsonii*) (Campbell and Borner, 1995).

High diversity of wildlife species in NCA is a function of variations in climate, landforms and altitude, which consequently lead to distinct habitats, with short grass plains, highland catchment forests, savanna woodlands, montane long grasslands and high open moorlands. NHFR is the major source of water for Karatu District and the ground water forest of Lake Manyara National Park. It also provides a critical habitat for elephants (*Loxodonta africana*), buffalo (*Syncerus caffer*), rhinos, wild dogs and leopards (*Panthera pardus*).

Besides the high diversity of wildlife species, Ngorongoro's significance is distinguished by three spectacular craters - Ngorongoro (250 km²), Olmoti (3.7 km²) and Empakaai (8.0 km²). These Craters are also critical habitats for wildlife populations. Ngorongoro Crater, which is 600 m deep, is the world largest unbroken caldera. It offers unique scenery in East Africa and diversity of wildlife species in a confined space. The Empakaai Crater, mostly covered with saline water for approximately 90% of the floor, it supports population of lesser flamingos (*Phoenicopterus minor*), especially during the months of May and June. These birds migrate to Lake Natron for breeding. The Crater slopes contain a scenically beautiful forest that is dominated by Cedar tree species (*Juniperous procera*).

The highest point of Olmoti Crater is situated to the northern rim of Ngorongoro Crater at 3,090m above sea level (NCAA, 1994). At the top of this extinct mountain is found an almost circular crater, which is 6.5km in diameter. The walls of this crater, which is an important source of water for wildlife, livestock and people rise at an average of about

91.5m high (NCAA, 1994). The Munge River flows from the floor of Olmoti, which collects into a spectacular waterfall that passes through a crevice of the crater before discharging into Lake Magadi in the Ngorongoro Crater.

Other features of outstanding importance in NCA are Lolmalasin Mountain, Oldupai Gorge, Alaetoli Foot Prints, Nasera Rock and spectacular shifting sands (ash-dunes) formed from volcanic ashes technically referred to as *barkan* (Figure 3). Lolmalasin Mountain stands at 3,648 meters above sea level and ranks the third highest mountain in Tanzania after Kilimanjaro and Meru. The Oldupai Gorge and Alaetoli Foot Prints are important archaeological and paleontological sites related to human evolution. The Nasera Rock is an exceptional stone standing at about 100 meters above the ground. It is considered to be the tallest and biggest ancient stone in Tanzania and it provides a spectacular view for visitors in NCA. The shifting sands move about 10-18 meters a year towards the western side of NCA depending on the strength and direction of the wind.

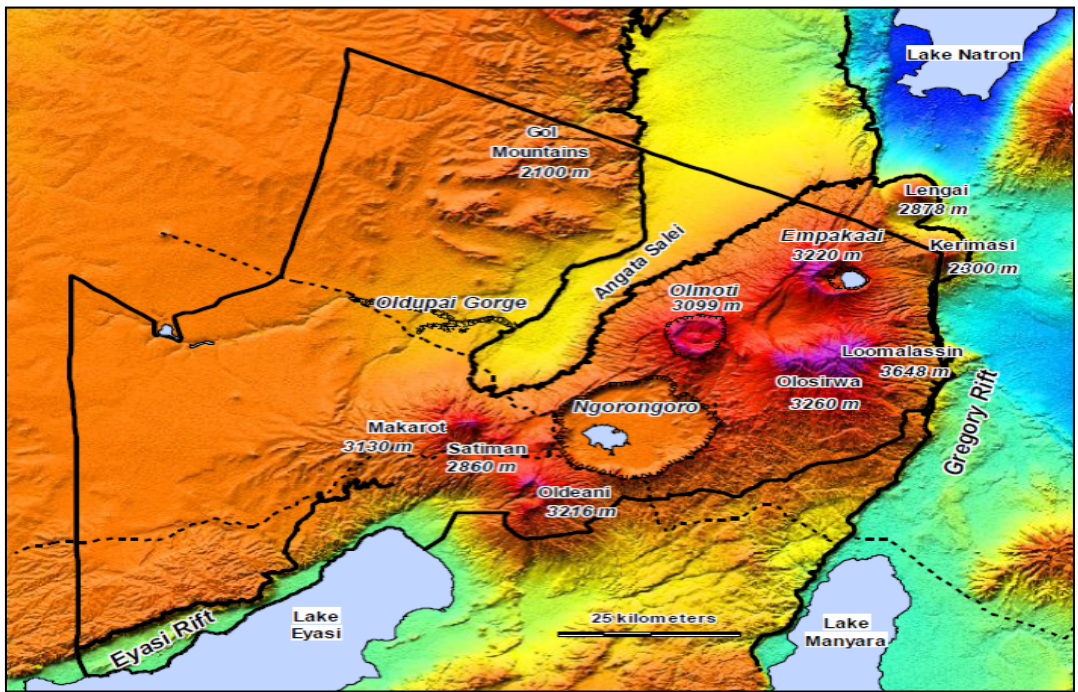


Figure 3: Significant topographic features in NCA

5. Archaeological, Paleontological and Cultural Heritage

NCA has been subject to extensive archaeological research for over 80 years and has yielded a long sequence of evidence of human evolution and human-environment dynamics, collectively extending over a span of almost four million years to the early modern era. This evidence includes fossilized footprints at Laetoli, associated with the development of human bipedalism, a sequence of diverse, evolving hominin species within Olduvai Gorge, which range from *Australopiths* such as *Zinjanthropus boisei* to the Homo lineage that includes *Homo habilis*, *Homo erectus* and *Homo sapiens*; an

early form of *Homo sapiens* at Lake Ndutu; and, in the Ngorongoro crater symbolize the development of stone technology and the transition to the use of iron. The overall landscape of the area is seen to have the potential to reveal much more evidence concerning the rise of anatomically modern humans, modern behavior and human ecology.

The management and conservation of cultural heritage in terms of archaeological and paleontological resources has been transferred from the Division of Antiquities (DOA) of MNRT to NCAA. This transfer has improved the institutional capacity to manage cultural heritages in terms of infrastructure, human resources, and information and technology. As a result, number of tourists visiting cultural heritage sites has increased and consequently income. Also, Maasai cultural bomas, where their history and cultural values are exhibited to tourists a part of Community Based Tourism.

6. Conservation status

NCA was inscribed in the World Heritage List under natural criteria in 1979. In 2010, the World Heritage Committee of UNESCO re-inscribed NCA as a mixed property on the list of World Heritage Sites (WHS). NCA's inscription in the World Heritage List was based on its outstanding universal value and criteria set by the Committee for selection of the sites. NCA had met five out of ten criteria: **Criterion (iv)** - to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; **Criterion (vii)** - to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; **Criterion (viii)** - to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features; **Criterion (ix)** - to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals; **Criterion (x)** - to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

In 1981, NCA was also recognized internationally as a part of the Serengeti-Ngorongoro Biosphere Reserve, under UNESCO's Man and the Biosphere Program (MAB). In 2013, NCA was voted as one of the seventh natural wonders of Africa, and in April 2018, it was nominated as one of the Global Geo-parks.

7. Community Development

Community development is concerned with people and livelihoods and provision of social services. In the perspective of this review, social services include education, health, water and energy.

7.1. Ethnography

Maasai are the best known of the ethnic groups in Ngorongoro, and today they make up about 98% of the resident population. The remaining 3.2% are Datoga and few Hadzabe families that live on the very edge of Ngorongoro by Lake Eyasi basin. Maasai and their livestock wandered into this area around two centuries ago after pushing out the Datoga (Mang’ati) who have remained as minority in the east and south of NCA. Maasai and Datoga are traditional pastoralists, who lived almost solely on their livestock and revered above anything else. Traditionally, these pastoralists were nomadic, moving with their livestock in a continuous search for pasture and water. They have since become more settled as they are now obliged to send children to school or require regular health services. Additionally, these people have less available space as their populations increase within the limited landscape of NCA. The Hadzabe have remained purely traditional hunter-gatherers using bow and arrow, feeding on roots and fruits, dressing in animal hides, living in caves and thatches trying to stay in remote areas away from other people.

7.2. Livestock Production System

Transhumance mode of livestock production system, which indigenous residents practiced for many decades allowed pastoralists to move from one area to another within and outside NCA in search of pasture and water basing on seasonality. Extensive pastoral land use is important for maintaining savannah ecosystems. However, increase in human and livestock populations is disrupting traditional pastoral systems, which is detrimental to natural resources and leads to ecological changes. Thus, maintaining acceptable limits in livestock production is advocated.

Plate 1A below shows movements of livestock in NCA going to watering point during the dry season.



Plate 1: Movements of cattle herds in the highland during the dry season in NCA

7.3. Crop Production

Historically, crop production was not prohibited in NCA Ordinance of 1959; therefore, few pastoralists produced crops legally to complement pastoral food shortage. However, Ngorongoro Conservation Area Act of 1975 prohibited crop production in the area. Temporary permission to allow crop production from 1992 to 2013 was caused by increase in human population, which did not correspond with livestock production, leading to decline in livestock per capita from 12.5 in 1960s to 3.23 in early 1990s (Galvin et al., 2015). Generally, crop production is one of the pull factors that motivated immigrants to settle in NCA since indigenous residents are not agro-pastoralists. Usually, crop fields interfere with wildlife and livestock movement and rangelands (Runyoro, 2007).

8. Tourism Development

NCA is known for its tourist attractions such as the Ngorongoro, Empakaai and Olmoti craters, Lolmalasin Mountain (the third highest mountain in Tanzania after Kilimanjaro and Meru), and annual wildlife migration. The Ngorongoro Crater harbours high concentration of wildlife including endangered black rhinos, densest known population of lions and variety of birds including migrant species. The lowlands provide calving grounds for migratory wildebeest population. Other significant geological features, which are important tourist attractions, include Olkarien Gorge, which is a vital nesting site for the Ruppell's Griffon Vulture and Nasera Rock; a huge monolith jutting out from the plains to an elevation of 100m on western side of the Gol Mountains and 27 kilometres north of Olduvai Gorge. In addition, the area has Shifting Sands, which are spectacular moving dunes known as "barkan" with remarkable crescent-shaped and black in colour composed of volcanic ashes that originated from active Oldoinyo Lengai. Also, the area contains globally renowned archaeological and paleontological sites; the Olduvai Gorge and Laetoli footprints as well as indigenous residents who are pastoralists and hunter-gatherers.

The developed tourism infrastructure and facilities facilitate tourism development in the conservation area. The main infrastructures and facilities in the area include roads, airstrips, lodges and tented camps, campsites, cultural bomas and walking trails.

8.1. Roads, airstrips and communication towers

Besides serving a number of purposes such as administration, anti-poaching and delivering community services, roads and airstrips play a crucial role in enabling tourists to access attraction sites. NCA has about 500 kilometres of roads and 800 kilometres of tracks and walking trails. There are six airstrips at Olbalbal, Oldupai, Kapenjiro, Endulen, Ndotu and near NCAA Headquarters. Nonetheless, only the last two airstrips are regularly maintained and used. There are more than 10 communication towers in the area located at Oldean, Mokilal; Kayepus; Meshili, Endulen, Nasipaorong', rhino lodge, Gol Mountains and Nainokanoka. Apart from tourism development, these infrastructures support natural resources conservation and community development.

8.2. Accommodation facilities

NCA has several accommodation facilities including six lodges, 12 permanent tented camps, and 48 campsites both special and public campsites. In addition, there are 52 accommodation facilities that are located in Karatu District. The available accommodation facilities located both in NCA and Karatu District are currently not sufficient to satisfy the growing number of tourists that has continued to increase steadily from 54,935 in year 1984 to 644,155 in year 2017.

8.3. Walking Safaris

As tourists are increasingly seeking exploration and remoteness, several tour companies are offering short hikes and walking safaris in the area. Olmoti and Empakaai craters have long been used for walking safaris and during interview with tour companies, discussants proposed to open new walking trails in areas most preferred by tourists to provide visitors with enough experience and satisfaction. During field visits it was observed that sometimes large herds of cattle and small stocks were interfering walking expeditions.

9. Cross-cutting issues

9.1. Natural Resources Governance

The way in which natural resources are managed is in principle a governance issue. Governance is defined as the process by which public officials and institutions acquire and execute their authority to provide public goods and services (Mfunda, 2010). The roles of NCAA and other authorities are statutory and malfunction in the application of instruments means twisting resource use mechanisms. As a result, unsustainable use, degradation of natural resources and environment, and conflicts could be observed in the conservation area. Good governance practices through:-transparency and accountability, access to information, rule of law, bureaucratic efficiency, and avoiding conflict of interest among staff, non-residents and other participating stakeholders would always ensure sustainable conservation, economic growth and improved livelihoods.

9.2. HIV/AIDS

HIV/AIDS is a pandemic problem but it impacts is more serious in developing countries particularly in Africa. The main mode of transmission is unsafe heterosexual relationship, and having sexual relationship with many partners is a major risk. Majority of indigenous residents in NCA are polygamists, therefore, they are at high risk of contracting HIV infection if one member of a family is infected. Also, high interaction of indigenous residents with other visitors such as tourists, tour guides, and other non-residents increases the risk of exposure to the infection. Education and awareness on health sex and regular screening to understand the exposure status to the infection is vital to safeguard the labour force of NCA indigenous pastoralists.

9.3. National Security

The security of nations depends on security of natural resources, since people and economies of countries depend on the availability of ecosystem services for livelihoods and economic growth (Mfunda, 2015). Based on the national security concerns, the primary goal of protecting NCA is to ensure the integrity of national border and internal security. As a cross border conservation ecosystem, it is necessary to protect natural resources and biodiversity for the interest of economic growth, livelihoods and national sovereignty as stipulated in the Natural Wealth and Resources (Permanent Sovereignty) Act of 2017.

9.4. Land use conflicts

Several boundary-related conflicts between NCA and neighboring villages were also noticed during this survey. This was evident in Olpiro village, which borders Endamaghan village in Karatu District, Kakesio that adjoins Makao village in Meatu District and Naiyobi that borders Piyaya and Malambo in Loliondo Division in Ngorongoro District as well as Kerimasi boundary in Monduli District. This was also the case in villages of Karatu that border NHFR. Local stakeholders claimed that beacons delineating NCA administrative boundaries were erected by NCAA without involvement of respective local communities. In some places where NCA fall in neighboring district administrative boundaries, conflicts have become intense to the point of causing physical fights. In areas around Ndutu, the boundary between NCA and SENAPA was also not clear. This causes tour drivers who unknowingly cross the boundary to either side be fined by relevant authority.

Information available at Ngorongoro District Council (NDC) indicates that while all 25 villages in NCA are not surveyed, only 16 villages had registration numbers. Those with registration numbers are Meshili, Osinoni, Kakesio, Irkeekpus, Bulati, Nainokanoka, Naiyobi, Kapenjiro, Alailelai, Sendui, Esere, Endulen, Oloirobi, Mokilal, Olpiro and Ngoile. Those without registration numbers but which existed in terms of elected or appointed leadership are, Iltulele, Alchaniomelock, Alaitole, Nasiporiong, Kayapusi, Masamburai, Misigiyo, Loongojoo and Kaitakiteng. Further, the Commissioner of Land provided names of 18 villages in NCA, which are part of the 366 villages across the country that have been earmarked for survey and legalization. The villages located in NCA contained in the President decree of 15th January 2019 are, Oloipiri, Alailelai, Alchaniomelock, Bulati, Endulen, Esere, Irkeekpus, Kakesio, Kapenjiro, Meshili, Misigiyo, Nainokanoka, Naiyobi, Ngoile, Oloirobi, Olpiro, Osinoni and Sendui. However, Oloipiri ward and village is in LGCA and not in NCA.

In a bid to reduce human population in NCA, 159 families that were recognized to be immigrants were resettled at Jema Village in Sale Division, Ngorongoro District. Before resettlement NCA established infrastructure for social services including a primary school, a dispensary, police post and piped water. Because there was no Memorandum of Understanding between either NDC or NCAA with either Jema Village or Sale Division, residents from the nearby Oldonyo Sambu Village invaded the new developed area and started to harass new comers including depriving land that was set aside for them. Between 50 and 70 families that were settled in the village and still staying there

are harassed to the extent that are also planning to leave. Others have moved either back into NCA while others have gone as far as Handeni and Kilindi districts in Tanga Region.

CHAPTER THREE METHODOLOGY

1. Data Collection Techniques

The study was carried out in five stages: (i) understanding Terms of Reference and preparation of inception report; (ii) Reconnaissance survey including flying over the area to get an overview of NCA in terms of natural and cultural resources management, human settlements and socio-economic activities, tourism development, and other forms of land uses; (iii) literature review including assessment of land use changes using satellite images; (iv) stakeholders' consultations using checklist and Participatory Rural Appraisal (PRA) and participant observation. Consultations involved key informants including natural resources management institutions, policy and decision makers, village governments' leaders, NDC, NPC, academic and research institutions, private sector, civil society organizations, religious institutions, Council Management Teams of neighbouring districts including Karatu, Meatu, Monduli and Longido, Arusha Region Secretariat Office and indigenous residents (Maasai, Hadzabe and Datoga tribes) (Appendix 1); and v) validation meetings to share the study findings and receive feelings of stakeholders on issues of common interest.

Existing information including published and unpublished reports were used to predict the status of NCA in the next 20 years with some assumptions. The Team of Experts consulted the National Land Use Planning Commission, which was reviewing the 2006-2016 NCA-GMP on issues pertaining to climate, bio-physical description, and cultural heritages. Consultation with indigenous residents involved representatives from women, youths, village leaders and elders with a minimum of 30 people from each of the 25 villages. The consulted institutions were pre-determined based on their relevance to NCA, and participation in consultation was open according to stakeholders' desire. In total, 1,382 people from 40 groups and 25 villages were consulted (Plate 2).

Validation meetings involved MNRT, NCAA, Parliamentary Committee on Lands, Natural Resources and Tourism, Arusha Regional Commissioner and government representatives from Ngorongoro, Monduli, Longido and Karatu districts; Permanent Secretaries and Deputy Permanent Secretaries of all ministries in Tanzania and indigenous residents. Other stakeholders were representatives of higher learning institutions, research institutions, TANAPA, TAWA, Civil Society Organizations (CSOs), Non-Governmental Organizations (NGOs) and private sector.

3.1.1 Revisit to Ngorongoro, Longido and Monduli districts

After the validation meetings with different stakeholders, the Minister-MNRT asked the team to revisit the three CMTs of Ngorongoro, Longido and Monduli to seek their opinion on the proposed annexation of part of the land from respective districts that have conservation potential. The team was also instructed to visit communities in NCA but restricting itself at ward level for all 11 wards to collect more opinions with regards to proposed zoning of NCA including conservation core zone, transition zone and settlement and development zones. During this phase of opinion gathering, a total of

2,170 resident pastoralists and three management teams for Longido, Monduli and Ngorongoro districts were contacted.

2. Data analysis

Data collected by using checklist were analyzed through content analysis. The recorded discussions were broken down into meaningful themes and inference made to fit the main and specific objectives. Quantitative data were recorded as information from secondary sources and key informants. Minimal statistical analysis was applied in this study. For instance, content assessment using the Geographical Information System (GIS) computer program was conducted to analyze qualitative information and prepare maps to show spatial information. Simulation of change in NCA rangelands referring to different management scenarios that were recommended by stakeholders was performed using SAVANNA model. The model was developed in 1993 (Coughenour, 1993) and modified in 2000 (Boone and Coughenour (2000) to suit NCA situation for assessing interaction between livestock and wildlife in terms of spatial-dynamic competition for forage and disease transmission. SAVANNA model is also used to quantify the impacts of population increase and conservation policy on pastoral welfare, livestock production and ecosystem integrity. Collected information was used to determine achievements, challenges, lessons learnt, and different options for the future of NCA.

The second collected opinions from communities at 11 ward level and three CMTs, were also analysed and incorporated in the main report.



Plate 2: Community participation in consultative meeting (A) and a group photo (B) at Sendui village in Alailelai ward

3. Limitation of the Study

The only limitation to the study was difficult in accessing some important documents including an agreement between the Maasai and British Government of 1959 and a list of illegal immigrants into NCA who were identified in 2006. To address this limitation, for the former, the Team relied on information from key informants particularly Maasai elders, and for the latter it was suggested that identification of immigrants should be done as part of the implementation process.

CHAPTER FOUR POLICIES, LEGAL AND INSTITUTIONAL FRAMEWORKS

1. Preamble

NCA Ordinance of 1959 underwent major amendments in 1975 through Act No.14 of 1975 (CAP. 284 R.E. 2002). The Act as per section 6 provides functions and management of NCA with full responsibility for the administration and management. The area is designated as a protected area and bares its boundaries. However, NCA Act is conflicting with other legislations hence puts NCAA into difficulties in exercising its mandate. For instance, the Local Government (District Authorities) Act No. 7 of 1982 [CAP. 287 R.E. 2002] section 22, empowers district authorities to establish villages as the corporate entity with all mandate to own land pursuant to the Village Land Act No. 5 of 1999 [CAP. 114 R.E. 2002]. NCA Act is also inconsistency with the Constitution of the United Republic of Tanzania (URT) of 1977. While Article 24 gives the rights to the people to own property as one of the fundamental right, the indigenous residents in NCA are deprived the right to own land due to the conservation status of the area. Further to that, NCA Act conflicts with the Land Use Planning Act No.6 of 2007 which among other issues requires all land in the country to be used for the benefit of people referred to as "beneficial use" meaning that land be conducive to public welfare and safety; and the Grazing-land and Animal Feed Resources Act No. 13 of 2010, which among other issues stipulates that grazing land should be demarcated within village land. However, villages in NCA do not have village land.

On one hand, in order to lessen land use conflicts, which are currently prevailing in NCA, the future MLUM should consider delineating the area into zones where socio-economic activities including schools, health, livestock infrastructure and other social facilities shall be allowed. On the other hand, the model conflicts with the Animal Diseases Act No. 17 of 2003, which stipulates that in order to prevent the spread of animal diseases, there shall be barriers for institution of quarantine for a place or area for animals that are deemed to be potentially infected with notifiable diseases.

This chapter presents review of legal frameworks including national and international policies, agreements, conventions and Acts, which have relevancy to NCA management. Institutional framework with respect to management of the area is also discussed in this chapter. The policy, legal and institutional frameworks provide basic principles, which guide the design or formulation of the future MLUM.

2. The Constitution of the United Republic of Tanzania (1977)

The protection of natural resources is insisted in the Constitution of the United Republic of Tanzania of 1977. According to Article 8 (1), 9(i) and 27 (1) and (2) of the Constitution:-

- i. Every person has the duty to protect natural resources of the United Republic, the property of the state authority, all property collectively owned by the people, and also to respect another person's property; and

- ii. All persons shall be required by law to safeguard the property of the state authority and all property collectively owned by the people, to combat all forms of waste and squander, and to manage the national economy assiduously with the attitude of people who are masters of the destiny of their nation.

In addition, Article 26 states that “every person has the duty to observe and to abide by this Constitution and the laws of the United Republic”.

3. National Policies

For the past few years, the Government of Tanzania has been implementing policy reforms aimed at addressing development problems affecting social and economic conditions of rural populations and the local environments. The reforms are designed to directly improve the capacity at local levels to serve the local population and to support the fundamental level of governance in Tanzania. Reforms were initiated through the launching of the broad policy framework; the Tanzania Development Vision 2025, which stipulates the vision, mission, goals and targets to be achieved with respect to economic growth and poverty eradication by the year 2025. Since then several policies have been formulated for different development sectors. Policies and strategies, which are relevant to the management of NCA include:-

3.1. The Tanzania Development Vision 2025

Tanzania’s Development Vision (TDV), 2025, which provides the overall national policy framework, advocates “Sustainable socio-economic development by the year 2025”. TDV is an economic and social development visualization, which emanates from reforms that were pursued since 1986. In 2005 the government launched the National Strategy for Growth and Reduction of Poverty (NSGRP) as the second national strategy for coordinating and ensuring attainment of Development Vision 2025 by focusing on poverty reduction through enhanced economic growth. Accordingly, NSGRP recognizes the contribution of all sectors towards growth and poverty reduction and stresses the cross-sector collaboration and inter-sector linkages and synergies. NSGRP is categorized into three main clusters namely (i) Growth and reduction of income poverty, (ii) Improvement in quality of life and social well-being, and (iii) Governance and accountability.

Actions that are undertaken within NCA should aim at balancing the three management objectives, which MLUM was established to achieve namely the conservation of natural resources, promoting resident pastoralists’ development and fostering tourism sector. Planning and decision making towards the realization of this balance should ensure active participation of NCA pastoralists with the aim of contributing to improved food security, high quality livelihoods, increased life expectancy and the ultimate reduction of abject poverty among NCA pastoralists as well as increasing the contribution of the tourist industry to the country’s GDP thus accomplishing the three 2025 vision’s targets.

3.2. National Environmental Policy (1997)

Tanzania is currently aiming at achieving sustainable development through rational use of natural resources and incorporating measures in any development activities in order to safeguard the environment. The National Environmental Policy seeks to provide a framework for making fundamental changes that are needed to bringing environment consideration into the mainstream of decision-making in the country. Two out of the major environmental problems, which the policy outlines, are environmental pollution and land degradation (URT, 1997). It emphasizes that environmental considerations should not become an afterthought in planning and decision making; rather it should be part of a conscious awareness of Tanzania's development realities.

The policy puts more emphasis on public consultations as the most effective way during the process of initiating development projects (URT, 1997). The Environmental Policy states that wildlife resources shall be protected and utilised in a sustainable manner on the basis of careful assessment of natural heritage in flora and fauna, fragile ecosystems, sites under pressure and endangered species, with participation of, and benefit to, the local communities. The Policy advocates further that tourism development will be promoted based on careful assessment of limits of acceptable use and prior to Environmental Impact Assessment (EIA) application.

Environmentally friendly tourism (eco-tourism) and diversification of tourism activities will be promoted, e.g. conservation and promotion of cultural heritage sites, in order to decrease pressure on heavily impacted areas. Financial benefits from tourism activities shall accrue in part to the local community to motivate them in conservation of tourism resources. It was revealed during the consultation process when undertaking this review that some of the tourist projects in NCA in particular accommodation facilities were either established without close consultation with stakeholders particularly resident pastoralists or were developed in areas contrary to provisions of the area's GMP. In view of that, any future management approach of NCA's MLUM should consider the limits of acceptable use as provided in GMP for achieving suitable balance of community development, natural and cultural resources and tourism development interests.

3.3. National Land Policy (1995)

One of the major clauses in the National Land Policy of 1995 states that during the implementation of any development project, the aim will be *"to promote and ensure a secure land tenure system that will encourage the optimal use of land resources, and to facilitate broad-based social and economic development without upsetting or endangering the ecological balance of the environment"* (URT, 1995). In order to ensure that NCA is utilized optimally and facilitates a broad-based socio-economic development, any land uses including the establishment of tourism development, community and natural and cultural resources conservation facilities as well as grazing and game viewing patterns should be designed in an environmentally and sustainable manner. The aim is to preserve the inherent natural, cultural-historical and wilderness characteristics and engendering regional self-sufficiency for the purpose of benefiting NCA local community and Tanzanians without compromising international interests.

3.4. National Rural Development Policy (1996)

The Rural Development Policy (RDP) augments the National Development Vision of 2025 and serves to lay down the parameters for the Rural Development Strategy (RDS). Both RDP and RDS strive to improve the well-being of rural dwellers with a view to eradicating poverty. An important provision in this policy relevant to the ideal MLUM for NCA states that *“for the planning of development projects, the government shall ensure sustainable and profitable utilisation of natural resources for the benefit of rural people by involving local communities in the management and utilisation of these resources”* (URT, 1996). RDP focuses on four key issues namely, promotion of widely shared economic growth, increasing opportunities and access to social and economic services, reducing risks and vulnerability and enhancing good governance. One of the significant tactics to ensuring that benefits from living with wildlife is embraced will be the provision of training to pastoralists on livestock husbandry and modern breeding practices so as to increase milk yield and fatten cattle for slaughtering within possible shortest time thus, contribute to improving the livelihoods of this community, which largely depend on livestock production economy. Other important actions will include involvement of resident pastoralists in the production of goods and services, promotion of small business, getting better communication facilities and roads as well as improvement of markets and rural marketing facilities.

3.5. National Wildlife Policy (2007)

According to the National Wildlife Policy, wildlife is a natural resource of great biological, environmental cleaning, climate ameliorating, water and soil conservation, nutritional, and economic values (URT, 2007). The policy promotes conservation of biological diversity; participatory management and benefit sharing; sustainable use; capacity building; institutional collaboration; engagement of private sector; and revenue generation. Based on the Policy, NCA interventions include;

- i. Involving rural communities and other stakeholders in taking joint responsibility for the sustainable management of wildlife and other natural resources;
- ii. Working in partnership with rural communities;
- iii. Enhancing the use of indigenous knowledge in the conservation and management of natural resources;
- iv. Continuing to control dangerous/problem animal species as a matter of priority; and
- v. Devolving progressively the responsibility for problem animal control to rural communities, operating community based conservation schemes, and continuing to give assistance where rural communities have not developed capacity.

3.6. National Forest Policy (1998)

The National Forest Policy emphasizes on sustainable forest Management, which entails strategic sectoral planning. The Policy takes into account changes in the macro-economic policies towards market economy and participation of the private sector and

other relevant stakeholders. Based on the Policy, in 2001, Tanzania developed a National Forest Programme to promote conservation and sustainable use of forests to meet local, national and international needs. The Programme, which is relevant to NCA where a vital NHFR for water catchment exists, is also meant to increase the forest and sectors' contribution to the national economy and poverty reduction as outlined in NSGRP.

3.7. National Beekeeping Policy (2012)

The Bee-Keeping Policy of directs appropriate beekeeping practices, maintenance of quality bee products, and protection of bee resources, bee fodder and consumers of bee products (URT, 2012). Five main areas are addressed to move the bee-keeping sector towards the goal of sustainable development of Tanzania and the conservation and management of her natural resources. These are:-

- i. Establishment and sustainable management of bee reserves;
- ii. Apiary management;
- iii. Beekeeping based industries and products;
- iv. Beekeeping in cross-sectoral areas;
- v. Beekeeping for ecosystem conservation and management; and
- vi. Institutions and human resources.

Of importance to NCA is a provision, which states that; *“formal, cross-sectoral coordination mechanism between bee-keeping and wildlife authorities will be established to improve coordination of activities under approved management plans of specific protected area”*. In order to diversify livelihood alternatives in the face of deteriorating livestock production in the conservation area, NCA legislation should encourage bee-keeping in appropriate locations so as to improve the socio-economic situation of resident pastoralists under the future management of NCA's MLUM. The formal establishment of bee reserves will also be an important strategy to alleviate poverty and increase food security among NCA resident pastoralists and in adjacent areas. These bee reserves can take the pressure off actual use of NCA by bee-keepers, and enhance habitat conservation.

3.8. National Tourism Policy (1999)

The National Tourism Policy seeks to support efforts, which promote the economy and livelihood of the people, essentially poverty alleviation, through encouraging the improvement of sustainable and quality development projects that are culturally and socially acceptable, ecologically friendly, environmentally sustainable, and economically viable. It also seeks to market Tanzania as a preferred tourist destination and thus increase progressively the number of capable tourists to visit the country with the aim of increasing its contribution to the country's GDP (URT, 1999).

3.9. National Livestock Policy (2010)

The National Livestock Policy takes cognisance of the importance of conservation of natural resources and environment. This is clearly indicated in one of its objectives

which states that, “*to balance the optimal use and conservation of natural resources i.e. land, soils, water and vegetation so as to conserve the environment*’ (URT, 2010). This policy statement has great implications to NCA where livestock production and natural resources are the major land uses, which need to be harmonized. In order to achieve that balance any approach to ensuring that MLUM remains sustainable, quality rather than quantity with regard to livestock production through cross-breeding the traditional zebu breed with improved races and ultimately have few livestock numbers of high productivity and profitability should be a prerequisite.

3.10. National Cultural Policy (1997)

The National Cultural Policy recognizes that cultural industries shall be identified and encouraged to contribute towards national economic development. The government shall also supervise the promotion of cultural heritage and their protection shall remain to be a public responsibility (URT, 1997a). The policy emphasizes on the close linkage between culture, natural resources, the environment and development programmes and recognizes that the public remains free to earn a living from cultural activities. All conservation and development activities in NCA should therefore, be undertaken in a manner that recognizes the cultural heritage potentials in the area.

3.11. National Water Policy (2002)

The National Water Policy of 2002 provides a comprehensive framework for management of water resources. Also, the policy provides a legal and institutional framework to guide protection and sustainable use of water. The Policy puts more emphasis on participatory management, engagement of private sector and in recognizing the role of local government authorities in management of water resource. Further, the policy identifies the danger of water scarcity in few years to come, by showing that, an annual average water availability per capita will decline by 45% from 2,700 cubic meters in 2002 to about 1,500 in 2021 (URT, 2002). This is in tandem with NCA, which faces acute scarcity of water both in quantity and quality, thus, if MLUM is to be sustained, intensive survey of water availability in NCA to uphold the growing resident human and livestock population should be conducted.

3.12. National Energy Policy (2015)

The National Energy Policy is geared to enhance provision of adequate, reliable and affordable modern energy services to Tanzanians in a sustainable manner. The policy is a basis for legal, regulatory and institutional frameworks for petroleum, electricity, renewable energies, and energy efficiency (URT, 2015). The implementation of Energy Policy will lead into improved socio - economic transformation of people and the country at-large. Therefore, if MLUM has to be upheld, detailed assessment of alternative energy sources that will be environmentally friendly, socially acceptable and economically viable without compromising the National Energy Policy requirements has to be undertaken.

3.13. National Trade Policy (2003)

The goal of the National Trade Policy is to facilitate smooth integration into the Multilateral Trading System (MTS) and reduce marginalization among her people (URT, 2003). The policy intends to ensure that liberalization offer meaningful, identifiable and measurable benefits to Tanzanians. The main objective of this policy is to raise efficiency, widen linkages in domestic production and build a diversified competition in export sector as means of stimulating higher rates of growth and development (URT, 2003). Chiefly, in order to maintain MLUM, production of quality livestock, which is the mainstay of NCA residents and their products, exploring reliable markets as well a protecting and promoting NCA's tourist attractions, should be a precondition. This attitude if accomplished will conform to the National Trade Policy in the sense that while meat and milk production for domestic uses will be increased and opportunity for selling surplus ensured, revenue generated from wild-based tourism will not be compromised.

3.14. National Investment Promotion Policy (1996)

The National Investment Promotion Policy is geared towards creating an open market economy, which among other things focuses on creating an enabling environment for private sector development and liberalizing the economy (URT, 1996a). Compliance of MLUM relates specifically to livestock industry, which supports NCA pastoralists under the guidance of NCAA and NPC to keep few livestock but of high production and profitability on relatively small production area that may ultimately result in surplus production for trading.

3.15. National Construction Industry Policy (2002)

One of the modernization aspects among NCA pastoralists is the construction of decent houses so as to enable them experience lifestyles similar to other Tanzanians. Among the major objectives of the National Construction Policy, which supports natural resources conservation interests are the promotion and application of cost-effective and innovative technologies and practices that sustain socio-economic development activities. The Policy aims to ensure the use of practices, technologies and products, which are not harmful to both the environment and human health (URT, 2002a). To uphold MLUM, building codes that will conform to the National Construction Policy need to be developed, disseminated and enforced.

3.16. National Health Policy (2007)

The National Health Policy envisions for a healthy community that contributes effectively to individual and nation development. The policy objectives include the need to reduce morbidity and mortality and increase life expectancy by delivering better health services, which focus on requirements for vulnerable groups such as infants, under-fives, pre and school children, youths, people with disability, women of reproductive age and elderly people to access health services (URT, 2007). In addition, the policy provides strategies to improve people's health physically, mentally and socially and their welfare through

promotion, prevention and/or reduction of diseases, disabilities and deaths. The policy is implemented in collaboration with the private sector, communities, Civil Society Organizations (CSOs), international organizations and development partners, which all these groups are key stakeholders to NCA.

3.17. National Education and Training Policy (2014)

The National Education and Training Policy emphasizes for Tanzania to have knowledge and worthwhile broad in depth modes of thought, skills, attitudes and understanding needed for the full development of the country. It ensures that people are aware of their own potentials and responsibility to change and improve their own conditions and that of the society. Also it embodies within it science and technology (URT, 2014). In NCA where illiteracy rate was around 64% in 2017, the implementation of this Policy is of paramount importance,

3.18. National Population Policy (2006)

The population policy is a set of measures taken by a State to modify the way its population is changing, either by promoting large families or immigration to increase its size, or by encouraging limitation of births to decrease it. In Tanzania, the policy provides guidelines that determine priorities in population and development programmes and strengthening the preparation and implementation of socio-economic development planning. The policy objective is to coordinate and influence other policies, strategies and programmes to ensure sustainable development of the people and promote gender equality as well as empowerment of women. Like other policies, it is implemented in collaboration with various stakeholders including Non-Governmental Organizations (NGOs), private sector, communities and development partners (URT, 2006). The population policy, TDV, other policies and population issues need to be implemented in an integrated manner. As such, the policy provides a good linkage between population dynamics and quality of life on one hand, and environmental protection and sustainable development on the other hand. Its implementation in NCA gives a new dimension to development programmes by ensuring that population issues are appropriately addressed.

3.19. National Employment Policy (1997)

Employment in Tanzania falls in two main categories namely, wage and self-employments. In both categories, employment is defined as any acceptable activity in which a workforce is actively engaged. Such activity yields payment in some form, which accrues to a worker as an income required to meet his/her basic needs (URT, 1997b). In view of that, the National Employment Policy advocates for effective ways and means of utilising available resources with ultimate objective of combating poverty. The policy also sets a venue for inculcating the culture of self-reliance through diligent and hard work among its people. To realize the policy provisions, opportunities should be made available for whoever is capable of working either in formal employment available in NCA and outside or informal sector like subsistence agriculture outside the area in order to do away with hand-outs. However, in case of difficulties NCAA may subsidize food requirements for those residing in the Conservation Area.

3.20. National Policy on Gender and Equality (1999)

The key objective of the National Policy on Gender and Equity is to provide guidelines that will ensure the development of gender sensitive plans and strategies in all sectors and institutions. While the policy aims at establishing strategies to eradicate poverty, it puts more emphasis on gender equality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of the society (URT, 1999). MLUM strategies should therefore, ensure that females will be given priority over men in all aspects that relate to employment and other income generating activities.

3.21. National Policy on HIV/AIDS (2001)

The National Policy on HIV/AIDS has been developed to deal with challenges emanating from social, cultural and economic issues. Women and girls are given extra consideration in this Policy aiming at protecting them from increased vulnerability to the disease infection (URT, 2001). Due to the fact that HIV infection is mainly through heterosexual intercourse, the problem touches on private life styles of individuals. But the risk is highest among young people and especially girls. Girls and women in our social and cultural environments are more vulnerable to HIV infection as they do not have control over sexuality. Poverty increases the vulnerability of HIV infection as some women engage in high risk sexual behaviour for survival (URT, 2001). In order to abide to the National Policy on HIV/AIDS, employment priority should be given to women in all jobs that can be done by them and emphasis be placed on females earning income from the sale of milk whereas men will be encouraged to the sale of meat. This will break down a tradition that has persisted since time immemorial among Maasai community whereby women are not allowed to own livestock and generate income. A change in this tradition will contribute to reducing the economic problems among females, which in most cases men have used as a tool to meeting their sexual desires.

4. International Conventions and Agreements

Tanzania as a part of international community has subscribed to a number of international agreements on natural and cultural resources, tourism, environment and human welfare rights. These agreements have been either signed and/or ratified between Tanzania and other individual countries and through United Nations Environmental Programme (UNEP), UNESCO, United Nations World Tourism Organization (UNWTO), United Nations Development Programme (UNDP), Food and Agriculture Organization (FAO), World Food Programme (WFP), World Health Organization (WHO) and United Nations Framework Convention on Climate Change (UNFCCC). As such, some decisions and actions on specific issues are based on international policies, agreements, common agreed goals, and principles or procedures. This section provides an overview of important agreements related to the management of NCA.

4.1. The Sustainable Development Goals (2016-2030)

As part of international obligations, in 2015, the United Nations (UN) launched new sustainable development agenda to guide global actions for the next 15 years. The

Sustainable Development Goals (SDGs-2016-2030) unanimously adopted by the UN's 193 Member States at a historic summit in September 2015, address the needs of people in both developed and developing countries. Broad and ambitious in scope, the Agenda addresses three dimensions of sustainable development: social, economic and environmental, as well as important aspects related to peace, justice and effective institutions. NCA mandates link very well with SDGs. The review of NCA's MLUM therefore considered 17 SDGs including poverty, hunger and food security, health, education, gender equality and women's empowerment, water and sanitation as well as energy and economic growth. Others are infrastructure and industrialization, inequality, cities; sustainable consumption and production, climate change, biodiversity, forests and desertification, peace and justice and partnerships.

Specifically, the review of MLUM puts more emphasis on Goal 1: No poverty; Goal 2: No hunger; Goal 3: Good health and well-being; Goal 4: Quality education; Goal 5: Gender equality; Goal 6: Clean water and sanitation; and Goal 15: Sustainable management of forests, combating desertification, halting and reversing land degradation, and halting biodiversity loss. The goals give facts and figures regarding poverty, hunger, health, education, gender equality, water and sanitation and forests. For instance, Goal 15 clearly states that around 1.6 billion people depend on forests for their livelihood. This includes some 70 million indigenous people; NCA indigenous residents inclusive. It also states that forests are home to more than 80 per cent of all terrestrial species of animals, plants and insects.

NCA, being part of SME has a huge part to play in supporting community, conservation, protection of forests, combating desertification, halting and reversing land degradation and halting biodiversity loss. Throughout the review of MLUM, great care was observed to ensure that the goal and related issues of SDGs were translated into the vision, mission and strategies of NCA management.

4.2. Treaty for the Establishment of the EAC (Amended in 2007)

The Treaty establishing the East African Community (EAC) was signed by heads of states of the Partner countries on November 30, 1999 in Arusha, Tanzania and came into operation on July 7, 2000. The Community was formally launched on January 15, 2001. Currently with six Party States including Burundi, Kenya, Rwanda, South Sudan, Tanzania and Uganda, the broad goal of EAC is to enhance cooperation in all areas of mutual benefit of the Partner States (<http://www.africa.union.org>., visited on 13th November, 2018).

One of EAC objectives is to promote a sustainable growth and equitable development of Partner States including rational utilization of the region's natural resources and protection of the environment (<http://www.africa.union.org>., visited on 13th November, 2018). The future management of NCA bears significant contribution to the scenic and variable habitats of SME including dispersal areas for migratory wildlife species and

therefore any management consideration of NCA should take this into account to ensure its conformity with this Treaty.

4.3. Lusaka Agreement (1994)

The Lusaka Agreement is an intergovernmental cooperative enforcement of operations directed at illegal trade on wild fauna and flora taskforce with the main function of facilitating cooperation activities in and among Party States in carrying out investigations on violations of national laws pertaining to illegal trade in wild animals and vegetation. The Agreement was the brain-child of Wildlife Law Enforcement Officers from eight Eastern and Southern African countries, which met in Lusaka, Zambia in December 1992 under the auspices of Zambia's Ministry of Tourism. One year later, the development of this African initiative led to formal intergovernmental negotiations under the support of UNEP, which resulted in adopting this Agreement on 8th September, 1994. The Agreement came into force on 10th December 1996 with ratification or formal acceptance by four signatories. Later on there were six Party States to the Agreement, which are Lesotho, Kenya, Tanzania, Uganda, Zambia and the Republic of Congo (Brazzaville). Currently, the Republic of South Africa, Ethiopia and the Kingdom of Swaziland are signatories but have never ratified it.

The Agreement provides for setting up a permanent Task Force that would implement its objectives. Consequently, the Task Force was launched on 1st of June 1999 with its headquarters located in Nairobi, Kenya. The mission statement of Lusaka Agreement is to support Member States and Collaborating Partners in reducing and ultimately eliminating illegal trade in wild fauna and flora in Africa through:-

- i. Facilitation of cooperative activities in undertaking law enforcement operations;
- ii. Investigation on violations of national wildlife laws;
- iii. Dissemination and exchange of information on illegal trade activities; and,
- iv. Capacity building including promoting conservation awareness among different stakeholders.

Since NCA harbours abundant and diverse species of wild fauna in particular migratory wildlife species, any management option to be adopted by the Authority should aim at controlling potential violations of the Lusaka Agreement provisions.

4.4. Convention on International Trade in Endangered Species of Wild Flora and Fauna (1973)

Some of the wild animals that inhabit NCA belong to categories of endangered and threatened species according to the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). These animals include the African elephant, black rhino, lion, leopard, cheetah and wild dog. Among the animal groups in the lower risky category are the African buffalo and the giraffe, which is the country's symbol. Other species of mammals, amphibians, reptiles, birds and plants listed in the Convention but lack detailed account might also be present in the area. In recognition of this Convention, NCAA should set aside enough resources in terms of money and personnel

for conducting anti-poaching tasks within and in the vicinity of NCA in order to ensure that requirements contained in the CITES are complied with.

4.5. Convention on the Protection of International Cultural and Natural Heritages (1972)

This is a Convention of UNESCO, which recognizes that global cultural and natural heritages are increasingly threatened with destruction not only by traditional causes, but also by changing social and economic conditions. This recognition was made by UNESCO's General Conference that was held in Paris between 17th and 21st November in 1972. Having noted that deterioration or disappearance of any item of the cultural or natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world, Conference members agreed upon that, parts of the cultural or natural heritage of outstanding interest wherever they are should be preserved as part of the world's heritage of mankind as a whole. To that effect, Tanzania being a State Party to this Convention identified and delineated NCA as one of WHSs found in the country due to its outstanding universal values. According to Article 4 of this Convention it is the duty of a State Party to protect, preserve and transmit to future generations of the cultural and natural heritage belonging primarily to that State. This is one of the reasons that necessitated review of the current MLUM so as to identify actions that will either reduce or eliminate impacts that may threaten the outstanding universal values that made NCA to be inscribed on the list of WHSs.

4.6. Convention on Biological Diversity (1992)

Adopted at the Rio de Janeiro "Earth Summit" in June 1992, the Convention on Biological Diversity (CBD) recognizes that biological diversity is not only about plants, animals and microorganisms and their ecosystems, but it includes people and their need for food, security, medicines, fresh air, safe water, shelter and clean and healthy environment in which they live ([Http://www.cbd.int.org/cbd.](http://www.cbd.int.org/cbd/), visited on 13th November, 2018). The Convention is geared towards addressing the fragmentation, degradation and upright loss of forests and other habitats, all of which represent much larger threat to biodiversity. It aims at developing national strategies for the conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the utilization of genetic resources. Since Tanzania is a signatory to this Convention, any management approach for NCA should be dedicated to promoting sustainable development and to becoming a practical tool for translating principles of Agenda 21 into reality. This is by ensuring that the area's biological environment including flora, fauna, rare, threatened and endangered species as well as ecologically sensitive sites are sustainably conserved without compromising people's needs such as food, traditional medicines, fresh air, clean and safe water, shelter as well as security from wildlife attacks.

4.7. United Nations Framework Convention on Climate Change (1992)

Adopted in May 1992, UNFCCC sets an overall framework for intergovernmental efforts to tackle the challenges posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by emissions of gases such as carbon dioxide and carbon monoxide produced from various development projects.

Deforestation is often attributed to climate change among other factors in less developed countries including Tanzania. The fact that the lifestyle among NCA resident pastoralists is changing very fast towards modernization, any future management approach of NCA should consider control of activities that might increase emissions of gases that are known to contribute to global warming.

4.8. Convention on the Conservation of Migratory Species of Wild Animals (1979)

The Convention on the Conservation of Migratory Species of Wild Animals (abbreviated as CMS or referred to as the Bonn Convention) aims at conserving terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the auspicious of UNEP, concerned with the conservation of wildlife and habitats on a global scale. State Parties acknowledge the importance of migratory species being conserved and of Range States agreeing to take action to this end "whenever possible and appropriate", paying special attention to migratory species the conservation status of which is unfavorable and taking individually or in cooperation appropriate and necessary steps to conserve such species and their habitat. State Parties appreciate the need to take action to avoid any migratory species becoming endangered. In addition to NCA habitats supporting migratory wildlife species of SME, the area also consists of alkaline lakes that attract migratory birds, which any management model to be adopted should consider the sustainable wellbeing of migratory species both wild animals and birds.

4.9. International Plant Protection Convention (1952)

The purpose of this Convention is to secure common and effective action of preventing the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control. The implementation of the Convention has been applied mainly to crops, but it also extends to the protection of natural flora. Thus, the scope of the International Plant Protection Convention (IPPC) covers any invasive alien species that may be considered a plant pest. Since various construction materials for both residents and NCA infrastructure come from outside the Conservation Area, which in recent years has resulted into proliferation of alien plant species and increasingly causing the rangelands to deteriorate, any management approach of the area should comply with this Convention particularly by instituting close screening on construction materials before are brought in the area. Strict measures to prohibit the introduction of exotic ornamental species and cooperation with relevant stakeholders particularly the pastoralists in removing any observed exotic plant species should be initiated so as to prevent interference with existing indigenous species.

4.10. International Labor Organization Convention (1991)

The Convention provides that Governments with the participation of the people concerned shall have the responsibility for developing a co-coordinated and systematic action to protect the rights of indigenous people and to guarantee for their integrity. Article 13 of the Convention directs governments to respect cultures and spiritual values of those people and their relationship with lands or territories or both as applicable,

which they occupy or otherwise use. Land in this Convention includes the concept of territories, which covers the total environment of the area that the people concerned occupy or otherwise use. Article 15 deals with rights of indigenous people to natural resources pertaining to their lands including the right to participate in the use, management and conservation of the resources. Article 20 directs governments within the framework of national laws and regulations and in co-operation with the people concerned, to adopt special measures and ensure effective protection with regard to recruitment and conditions of employment of workers belonging to those people. Because NCA belongs to a protected area where indigenous residents are dependent mainly on livestock production economy and thus bearing close relevancy to this Convention, all important steps pertaining to how the area should be managed, must involve resident pastoralists and any management action to be considered should preserve human rights of legal indigenous people residing in NCA.

5. Strategies and Guidelines

5.1. The National Strategy for Growth and Poverty Reduction (2005)

The National Strategy for Growth and Poverty Reduction (NSGPR) is a revised version of the Poverty Reduction Strategy of 2000 which emanated from TDV of 2025. The Strategy has three main outcomes and a number of goals within each of the outcomes (Table 3). The review of MLUM of NCA has taken on board this strategy to ensure that any management approach of the area does not compromise any of the strategy's outcome and goals.

Table 3: Outcome and Goals of National Strategy for Growth and Poverty Reduction (2005)

Outcome	Goals
Growth of income and the reduction of poverty	<ul style="list-style-type: none"> • to ensure sound economic management • to promote sustainable and broad-based growth • to improve food availability and accessibility • to reduce income poverty of both men and women in urban areas • to provide reliable and affordable energy to consumers
Improved quality of life and social well-being	<ul style="list-style-type: none"> • to ensure equitable access to quality primary and secondary education for boys and girls, universal literacy among men and women, and expansion of higher, technical and vocational education • to improve the survival, health and well-being of all children and women and especially vulnerable groups • to ensure access to clean, affordable and safe water, sanitation, decent shelter and a safe and sustainable environment. This will reduce vulnerability to environmental risks • to ensure adequate social protection and the provision of basic needs and services for vulnerable people • to ensure effective systems that allow access for all people to quality and affordable public services
Good governance and accountability	<ul style="list-style-type: none"> • to ensure that structures and systems of governance as well as the rule of law are democratic, participatory, representative, accountable and inclusive • to ensure equitable allocation of public resources-with corruption effectively addressed • to put in place an effective public service framework as a foundation for service delivery improvements and poverty reduction • to ensure that the rights of poor and vulnerable groups are protected and promoted in the justice system • to reduce political and social exclusion and intolerance • to improve personal and material security, reduce crime and eliminate sexual abuse and domestic violence • to enhance and promote national cultural identities

5.2. General Management Plan (2006-2016)

NCA-GMP (2006-2016) sets NCAA's vision as self-financed WHS that provides sustainable benefits to residents and guarantees protection of natural, cultural and archaeological resources (NCAA, 2006). The GMP acknowledges that NCAA and indigenous residents have vested interest in cooperating to achieve MLUM objectives of the area. Thus, NCAA is committed to manage the conservation area according to GMP framework.

According to GMP (2006 – 2016), NCA is divided into four main management zones: i) development zone, ii) catchment forest zone, iii) external resources zone, and iv) craters' zone. The development zone has two sub zones namely Oldupai and short grass plains. The GMP provides description of zones, allowable uses and limits which guide resource management. Despite that the Wildlife Legislation requires all wildlife protected area in the country to have GMPs for guiding their management and administration, the first four GMPs, which were developed since NCA was established in 1959 until 1996 were not adequately implemented. The first four GMPs, which

contained relevant information and strategies pertaining to the management of NCA are:-

- i. The 1960 GMP that was developed by Mr. Henry Fosbrooke, first Conservator of Ngorongoro;
- ii. The second GMP was an amendment of the first one that was conducted by Egging in 1962 with one of the major emphasis put on realizing a stable environment in which human and animal inhabitants could prosper;
- iii. The third GMP, which was developed in 1966 by Dirschl, drew attention to the need for three levels of policy and objectives;
- iv. The fourth GMP was developed by Bureau of Resource Assessment and Land-Use Planning (BRALUP) of the University of Dar-es-Salaam currently known as the Institute of Resource Assessment (IRA) in 1982.

Important actions, which were recommended for implementation in the 1996-2006 GMP; the first one to be approved for implementation and recommended again in the revised 2006-2016 GMP but are not yet implemented or have been partially realized include the natural resources management actions. In this aspect recommended actions but not adequately implemented include; ensuring that the human, livestock and wildlife populations have access to quality and adequate water resources, as well as developing measures to maintain wildlife corridors and sensitive habitats. Other actions are; developing a building code to preserve the natural scenery of NCA and putting in place measures to prevent the introduction of exotic species in the area.

Actions not yet sufficiently implemented and related to community development are, ensuring improved income for NCA indigenous residents by developing a training programme in tourism-related jobs, encouraging employment by tour companies, and assisting them in tourism-related economic activities. Additional actions include developing non-traditional income generating activities other than tourism, ensuring sustainable food distribution programmes and providing reasonable level of price and special subsidies to the poor and destitute families. More actions that were proposed but not adequately implemented are, ensuring the provision of satisfactory basic services such as education, health and water supply, co-operating with indigenous residents to control permanent immigration and establishment of unplanned settlements, initiating and implementing compensation schemes for NCA families willing to resettle outside the area voluntarily. Also developing birth control strategy to control high human population growth as well as reducing the incidences of property damage and costs related to wildlife disturbance.

With regard to tourism, the proposed actions, which have not been well implemented include placing a moratorium on any additional lodges, tented camps and other permanent commercial facilities around the rim of the Ngorongoro Crater. Also reducing the number of special campsites at Ndotu and Masek lakes from 10 to five as well as rehabilitating the sites and access roads, and reducing the number of vehicles per day in the Ngorongoro Crater.

Investors in tourism industry proposed actions that can improve communication between them including organizing regular meetings to discuss management and administrative issues related to tourism promotion and holding annual meetings of all tourism companies operating in NCA. The investors proposed also publication of biannual newsletter for lodges and tour operators in order to disseminate important information and levels of stakeholders' achievements. Because the current GMP (2006 – 2016) is under review, it is expected all these actions, which were not adequately implemented will be considered and proposals presented in this review so as to adequately realize the major trio objectives of establishing NCA.

5.3. The NCA Corporate Strategic Plan (2017 - 2022)

According to the Authority's Corporate Strategic Plan (CSP) the vision of NCAA is to use her prominence as one of the 7th wonder of Africa to guarantee sustainable conservation of natural and historical resources, and human development in Ngorongoro, African continent and the world. The mission statement is to conserve the natural and historical resources and provide optimal social services to residents and staff as well as provision of high-quality services to tourists. NCAA's CSP recognizes that in order to achieve its vision and implement its mission, core values of the Authority which are, sustainability, valuing people and accountability to stakeholders shall be observed. CSP addresses i) Wildlife resources, ii) Tourism resources, iii) Revenue collection iv) Community development, and; v) Corporate governance as key objectives of managing NCA.

6. Legislation

6.1. Tanzania Natural Wealth and Resources (Permanent Sovereignty) Act No. 5 of 2017

The Act is related to all materials or substances occurring in nature such as soil, subsoil, gaseous and water resources' and flora, fauna, genetic resources, aquatic resources, micro-organisms, air space, rivers, lakes and maritime space, including the Tanzania's territorial sea and the continental shelf, living and non-living resources in the Exclusive Economic Zone which can be extracted, exploited or acquired and used for economic gain whether Processed or not. Specifically it gives directives in the following key areas:-

- i. Proclamation of permanent sovereignty: the People of the United Republic shall have permanent sovereignty over all natural wealth and resources;
- ii. Inalienability of natural wealth and resources: the natural wealth and resources shall be inalienable in any manner whatsoever and shall always remain the property of the People of the United Republic of Tanzania;

- iii. Prohibition of exploitation except for the benefit of the People': it shall be unlawful to make any arrangement or agreement for the extraction, exploitation or acquisition and use of natural wealth and resources except where the interests of the People and the United Republic are fully secured.
- iv. Guarantee of returns from natural wealth and resources: In any arrangement or agreement for extraction, exploitation or acquisition and use of natural wealth and resources, there shall be guaranteed returns into the Tanzanian economy from the earnings accrued or derived from such extraction, exploitation or acquisition and use;
- v. Participation of the People and Government requirement for beneficiation: Any authorization granted for the extraction, exploitation or acquisition and use of natural wealth and resources, arrangements shall be made or given to ensure that the Government obtains an equitable stake; and
- vi. Retention of earnings: Any arrangement or agreement for extraction, exploitation or acquisition and use of natural wealth and resources shall require that earnings from disposal or dealings be retained in the banks and financial institutions established in the United of Republic.

6.2. Environmental Management Act No. 20 of 2004

Environmental Management Act is an umbrella law on environmental management in Tanzania. The Act defines mandates for: national, regional and local level institutions; civil society; private sector; and other stakeholders; contains provisions for the establishment of environmental sections/offices at all government institutions down to the village level; and provides Vice-President's Office, Division of Environment and National Environment Management Council (NEMC) with the overall coordination and overseeing responsibilities. Further, it includes provisions for environmental planning at national, sectoral, and LGA levels; provisions for management of the key environmental challenges: land; aquatic systems including wetlands and coastal zones; pollution and waste; wildlife, forests and fisheries resources and biodiversity; and provisions for environmental analysis and record keeping, environmental information, education, research, public participation in environmental decision making. In addition, it defines key environmental planning and management tools including Environmental Impact Assessment (EIA), and Strategic Environmental Assessment (SEA); and provides for environmental quality standards, economic instruments, and meeting of international obligations; and provides directives on enforcement and compliance.

Sectoral legislation like natural resources management acts – wildlife, forest and beekeeping - must comply with the Environmental Management Act (EMA). In this case, each sector ministry shall, prepare and coordinate the implementation of sector environmental action plans at the national level, undertake analysis of environmental impacts of sectoral legislation, regulations, policies, strategies, plans, and programmes through SEA, and oversee the preparation and implementation of EIAs required for investments in the sector. To largely sustain NCA MLUM all development projects and

activities should be subjected to EIA and/or environmental audit in accordance to the area's operating GMP.

6.3. Wildlife Conservation Act No. 5 of 2009

Wildlife management in Tanzania is governed by the Wildlife Conservation Act, which allows the Government to establish PAs and outlines how these reserves shall be organized and managed. NCA is one of the PA categories in Tanzania recognized by this Act and established as a multiple land use area to reconcile the interests of natural resources conservation and human development. The future MLUM that should be adopted should ensure that any development or activity in NCA be undertaken in a manner that does not compromise the predetermined objectives for which the area was established, which are natural resources conservation, community development and tourism development.

6.4. Ngorongoro Conservation Area Act No.14 of 1975 [Cap. 284 R.E, 2002]

NCA Act aims at controlling entry into and residence within NCA, to make provision for the conservation of natural resources and development of indigenous residents living therein and other purposes connected therewith". According to section 6 of NCA Act, functions and all primary responsibility for the administration and management of NCA are vested in NCAA. NCAA functions as stated in this legislation are:-

- i. To conserve and develop the natural resources of the Conservation Area;
- ii. To safeguard and promote the interests of Maasai citizens of the United Republic engaged in cattle ranching and dairy industry within the Conservation Area;
- iii. To promote tourism within the Conservation Area and to provide and encourage the provision of facilities necessary or expedient for the promotion of tourism;
- iv. To promote and regulate the development of forestry within the Conservation Area;
- v. To promote, regulate, and facilitate transport to, from and within the Conservation Area;
- vi. To construct such roads, bridges, aerodromes, buildings and fences, to provide such water supplies and to carry out such other works and activities as the Board of Directors of the Authority may consider necessary for the purposes of development or protection of the Conservation Area;
- vii. To do all such acts and things, as in the opinion of the Board, may be necessary to uphold and support the credit of the Authority and to obtain and justify public confidence, and to avert and minimize any loss to the Authority; and

viii. To do anything and enter into any transaction which, in the opinion of the Board, is calculated to facilitate proper and efficient exercise by the Authority of its functions under this Ordinance.

A large part of NCA Act deals with the set-up and functions of the Authority, the Board, financial autonomy, accounts, auditing and reporting procedures. Also, the Act restricts entry and residence in the Conservation Area, controls residence and settlement, and prohibits cultivation. However, neither rules nor regulations have been made by NCAA as required by section 21 and 23 of the Act. Since provisions in the Act that restrict entry and residence in NCA are of paramount importance to controlling the current high human population growth rate, an attempt to revise the legislation should consider this issue very strongly.

6.5. Antiquities Act No.22 of 1979 [Cap. 333 R. E. 2002]

The Antiquities Act provides for the preservation and protection of sites and articles of paleontological, archaeological, historical or natural interest. Section 3 (1) stipulates that the Minister may declare any place to be a “monument” under this legislation. The Oldupai area was declared a monument under the predecessor of the Antiquities Act (The Monuments Preservation Ordinance) in 1937.

Section 5 (1) subject to provisions of subsection (2) of the Act states that “no person whether beneficially interested or not, shall do any of the following acts to or in relation to any monument or protected object declared as such by the Minister under section 3 or included in the list published by the Director under section 2(c) and for the time being in force or to any other place, site or structure which he knows or has reasonable cause to believe to be monument, permit any animal under his control to damage a Monument or to enter any part of a Monument fenced by or on behalf of the Director of Antiquities”. Despite this clause in the Antiquities Act, pastoral activities in NCA have become serious threat to hominid and faunal remains in the Oldupai and Laitole areas.

Since NCAA is responsible for a large area of land rich in cultural heritage resources, the Antiquities Act should under the future multiple land use management approach confer special responsibilities and roles to NCAA to manage archaeological and paleontological heritage resources contained in the land, which is entrusted by the Government to administer.

6.6. Forest Act No. 18 of 1997 [Cap. 323 R. E. 2002]

The Forest Act provides for conservation and management of forests and forest products. The main objective being the demarcation and reserving in perpetuity for the benefit of present and future Tanzanians sufficient forested land and land capable of afforestation. It also aims to protect water supplies. Forestland is administered by the Forestry Division, which has both “productive” and “protective” areas. Permits for utilisation can be issued for use of forestry products in productive reserves. However, when NCA was established in 1959, the responsibility to manage NHFR, which is a water catchment forest, was vested to NCA.

6.7. Bee-keeping Act No. 15 of 2002 [Cap. 223 R.E. 2002]

This Act provides for the orderly conduct of beekeeping, for the improvement of products of beekeeping and for the prevention and eradication of diseases and pests among bees. It also promotes, and enhances the contribution of the beekeeping sector to the sustainable development of Tanzania and the conservation and management of her natural resources for the benefit of present and future generations as per section 3 (1) (a)-(f) . Further, the Act aims at improving biodiversity and increase employment and foreign exchange earnings through sustainable bee products-based industrial development and trade. One of the occupations, which NCA residents could engage in for the purpose of enhancing food production and income without compromising conservation importance, is bee-keeping.

6.8. Animal Welfare Act No. 19 of 2008

This Act provides for humane treatment of animals, monitoring and mitigating of animal abuse, and promoting awareness on the importance of animal welfare. It prohibits causing unnecessary or avoidable suffering in specified circumstances for specified categories of animals and prohibits transporting animals in a way that is likely to cause pain, injury or undue suffering or distress. Trekking to, or from livestock market domestic animals by NCA pastoralists will therefore be violating this Act.

6.9. Animal Diseases Act No. 17 of 2003

This Act gives provisions for control and prevention of animal diseases, monitoring production of animal products, disposal of animal carcasses and other related matters. It also provides measures for checking livestock diseases and diseases of animals other than livestock. In a manner prescribed by regulations, this Act provides for institution of quarantine of a place or area for animals other than livestock that are deemed to be potentially infected with a notifiable disease. As a measure of preventing the spread of diseases, the Act provides for establishment of barriers where by Section 9 (1) stipulates that no person shall herd or graze animals within two hundred meters of a public road unless there is a barrier between the public road and the area of herding or grazing.

6.10. Livestock Identification, Registration and Traceability Act No. 12 of 2010

This Act provides for the establishment of the National Livestock Identification, Registration and Traceability System for purposes of controlling animal diseases and livestock theft, enhancing food safety assurance; to regulate movement of livestock, improve livestock products and production of animal genetic resources and to promote access to livestock market.

6.11. Tourism Act No. 29 of 2008

In response to objectives contained in the 1961 “Arusha Manifesto”, the Government of Tanzania has formulated, improved and is implementing wildlife conservation Regulations due to the fact that the country’s tourism is largely wildlife-based so that

existing tourist attractions are sustainably protected for the benefit of the present and future generations. Currently, funding for community development, livestock development, social services and grain supplements for NCA resident pastoralists is largely dependent on tourism income. Despite, that NCAA envisages to increasing self-production of pastoral food and household income from the sale of surplus milk and meat, the future MLUM will be sustained if humans and livestock populations will be maintained within the limits of acceptable use so as to avoid impairment of the area's rangelands, water resource and tourism attractions of which NCAA is largely dependent for its revenue.

6.12. Local Government (District Authorities) Act No.7 of 1982 [CAP. 287 R.E. 2002]

The Local Government (District Authorities) Act creates district-based local government authorities in Tanzania. The Act provides for among others, the establishment, composition, functions and legislative powers of the district and township councils and village authorities. Section 22 (1) establishes a village as the corporate entity of a registered village with all mandates and functions including planning and coordinating activities, rendering assistance and advice to villagers engaged in agriculture, forestry, horticultural, industries or any other activity, and to encourage village residents to undertake and participate in communal enterprises. At the district level, there is a District Council composed of members among others those elected from each ward. District Councils, through appropriate District Committees, supervise the implementation of all plans for economic, commercial, industrial and social development in their areas.

Section 118 of this Act provides for the protection and management of the environment on the part of the District Council. Under this Section, District Councils are required to take necessary measures to control soil erosion and desertification, to regulate the use of poisonous and noxious plants, drugs or poison, regulate and control the number of livestock, maintain forests, manage wildlife, ensure public health, provide effective solid and liquid waste management, and protect open space and parks. Since NCA is one of the three divisions that fall under the jurisdiction of NDC, the extent to which NCAA is integrated into LGA and procedures for the establishment of villages and wards in NCA should be analyzed under the future MLUM of the Conservation Area.

6.13. Land Act, No. 4 of 1999 [Cap. 113 R.E.2002]

The Land Act categorizes land into different forms including public land, village land, and reserved land. NCA is one of the categories that belong to reserved land and established to reconcile the interests of natural resources conservation and development. Livestock production is one of the land uses that are allowed in NCA as part of compatible activities for pastoralists' economic development and food production. So long as NCA falls under the reserved land according to this Act, the ambiguity of having villages in the area should be re-examined. Improvement of livestock production, which is one of the fundamental principles of utilizing NCA land profitably and anticipated to offer optimal benefits to the community without compromising the principles of sustainable natural resources conservation, should be given priority because the activity does not deviate from the provisions of the Land Act 4 of 1999.

6.14. Village Land Act, No. 5 of 1999 [Cap. 114 R.E. 2002]

The Village Land Act is arguably amongst the laws that most directly impact the well-being of most Tanzanians. The Act advocates for the major parts of administration of land in the country to be decentralized to villages and guarantees firm administrative set up to protect small-holder security of tenure. Fundamentally, the Act vests all village land in the Village Authority. The fact that NCA falls under the reserved land category and because some villages in NCA possess only registration numbers without physical boundaries demarcation, while others have no registration at all, implies that under the current MLUM, villagers in the area have no right of land ownership, a situation that needs specific assessment if the future management of NCA will have to be administered without critical conflicts.

6.15. Land Use Planning Act No. 6 of 2007

Basically, the Land Use Planning Act requires land uses to be organized in a planned fashion, with certain approvals from respective government authorities. Among other issues, the Act requires all land in the country to be used for the benefit of people referred to as “beneficial use”; meaning the use of land that is conducive to public health, welfare and safety. Section 45(1) specifies that any approved plan shall apply to the area or zone to which it relates whether or not it is embodied in a local government authority by law. It stipulates further that every person, agency or relevant planning authority shall comply with the requirements of the approved plan. Section 47 spells out that any landholder or occupier of land shall take all steps necessary to ensure voluntary compliance with aspects of an approved plan that are relevant to activities carried out on the land one holds or occupies.

In order to lessen land use conflicts which are currently prevailing in NCA the future MLUM should delineate the area into zones where socio-economic activities including schools, health facilities, livestock infrastructure and other social facilities shall be allowed and living other zones exclusively for natural resources conservation and controlled livestock grazing. Once NCA in collaboration with resident pastoralists and NDC have developed the main proposed management zones, every person, agency or relevant planning authority shall be obliged to comply with the requirements of the approved zoning plan.

6.16. Water Resources Management Act No. 11 of 2009

The Water Resources Management Act was enacted to control and protect all water resources in the country. This legislation defines water as all water flowing over the surface of the land or contained or flowing in, or from a spring or stream or natural lake, swamp or in, or beneath a watercourse. The Act puts in place a regime of water rights to govern access to water use. Pollution control norms are also embodied in water rights. This law requires water utilization permit by various users to be granted by relevant authorities. Because NCA is currently facing acute shortage of water resource both in terms of quantity and quality, comprehensive survey should be undertaken to determine criteria for implementing the proposed zoning scheme under the future MLUM.

6.17. Water Supply and Sanitation Act No. 5 of 2019

An Act to provide for Sustainable Management and adequate operation and transparent regulation of water supply and sanitation services; establishment of water supply and sanitation authorities; rural water agency, National Water Fund and Community based water supply organizations; and provide for appointment of service providers. Section 4(1) promotes and ensures the right of every person in Tanzania to have access to efficient, effective and sustainable water supply and sanitation services for all purposes by taking into account the fundamental principles as stipulated under paragraphs (a) – (j) of subsection (1). Section 4 (2) provides that all persons exercising powers under this Act or under any written law having a bearing on provision of supply and sanitation services shall strive to promote and have regard to the National Water Policy, 2002, in respect of Urban Supply and Sanitation and Rural Water Supply.

6.18. Employment and Labour Relations Act No. 6 of 2004

Employment and Labour Relations Act makes provisions for core labour rights, establishes basic employment standards, gives a framework for collective bargaining and provides for the prevention and settlement of disputes, and for related matters. The Act applies to all employees including those in the public service of the Government of Tanzania in the Mainland but does not apply to members, whether temporary or permanent in service of the Tanzania People's Defence Force, the Police Force, the Prison Service and the National Service. Principal objectives of the Employment and Labour Relation Act are:-

- i. To promote economic development through efficient productivity and social justice;
- ii. To provide the legal framework for effective and fair employment relations and minimum standards regarding conditions of work;
- iii. To provide a framework for voluntary collective bargaining;
- iv. To regulate the resort to industrial action as a means to resolve disputes;
- v. To provide a framework for resolution of disputes by mediation, arbitration and adjunction;
- vi. To give effect to the provision of the constitution of the United Republic of Tanzania of 1977, in so far as they apply to employment and labour relations and conditions of work; and
- vii. Generally, to give effect to the core conventions of the International Labour Organization as well as other ratified conventions.

Section 5 of this Act prohibits child labour of under 14-year olds and restricts labour of 14-18-year olds to light work, which is not harmful to the child health or development or prevent the child's school attendance. It also allows for participation in vocational orientation or training programmes that are approved by the concerned Authority. The same section prohibits labour to less than 18-year olds in mines, factories, ships or any other worksites including non-formal settings or agriculture, where conditions can be considered hazardous for the child. Sub-section 7(1) provides for employers to ensure the promotion of equal opportunities and elimination of discrimination in employment practices. All NCA residents who are capable of working should be considered for

formal employment whenever opportunities arise and when individuals have requisite qualifications. While those who will not be having required qualifications in formal services should be encouraged to engage themselves in livestock keeping and other compatible income generating activities either within or outside in order to make them self-sufficient instead of waiting for hand outs and other free social services from NCAA and aid agencies.

6.19. National Public Health Act No. 1 of 2009

The National Public Health Act provides for the promotion, preservation and maintenance of public health with a view to ensuring the offering of comprehensive, functional and sustainable public health services to the general public and to provide for other related matters. Since there is potential for health risk that may arise from remains of drugs, vaccines, acaricides and accumulation of animal feces and other compatible income generating activities either within or outside, the future MLUM should consider the control and speedy treatment of both traditional and emerging human and zoonotic diseases.

6.20. The Education Act No. 25 of 1978 [Cap. 353 R.E. 2002]

The Education Act aims at providing for the development of the system of education. Section 4 (1) stipulates that the Minister shall, subject to the provisions of this Act, be responsible for promotion of education of the people of Tanzania and the progressive development of institutions devoted to that purpose, The Act provides further for securing effective execution by local authorities, under the Minister's guidance, control and direction, of the national policy for providing a varied, comprehensive and nationally beneficial educational service in their respective jurisdictions.

21. Grazing-land and Animal feed resources Act No. 13 of 2010

The Act provides for the development and management which shall safeguard and develop grazing-lands. It also provides for management of communal and strategic grazing-land. Section 16 (1) provides for grazing-lands that shall be demarcated or delineated in accordance with the provisions of the Village Land Act and the Land Use Planning Act. Section 16 (2) imposes the Village Council to grant the right of way for stock-driving for purposes of providing access to water, dipping, marketing facilities and other services which are not within the grazing-land. The Village Council is empowered by the Act to set aside part of the communal village land to be a strategic grazing-land in accordance with the provisions of the land use planning Act.

Section 19 (1) imposes power to local government authorities to prepare grazing- land inventory trend condition and land use planning for sustainable grazing- land productivity. Section 37 of the Act, empowers the local government authority to make by-laws for soil conservation, prevention of adverse effects to soil and soil erosion in a grazing- land, rehabilitation, protection or improvement of the grazing land.

To conclude this Chapter, the Team of Experts perceived that, existing policy and legal frameworks outlined herein above, makes it complex to manage NCA due to the fact that while some policies and laws complement each other, others are either overlapping

or conflicting. In view of that, minimum threshold for sectoral policies and legal integration in NCA should be a pre-requisite to achieving the stated objectives. Yet, factual evaluations of harmonized policies, laws, regulations and procedures have to be done with a number of assessing mechanisms in place. Accordingly, all Ministerial Departments and Agencies (MDAs) have an individual and collective responsibility to oversee that harmonization of sectoral policies is implemented. Moreover, as sectoral policies of tourism, conservation, industrialization infrastructure, climate, transport and communication, energy, natural resources, community development and others are constantly being formulated – policies, regulations and procedures require an integration component to optimize benefits from the area.

7. Institutional Framework

The management of NCA is under different ministries and management authorities based on mandates related to community development (people and social services), land use issues, natural resources and environment, livestock, water, energy and infrastructure. The lead ministries are MNRT, Vice President's Office (Environment), President's Office – Regional Administration and Local Government (PO-RALG) and Livestock and Fisheries Development. Also there are other sector ministries and authorities that have a stake in the management of NCA. As a multiple land use area, NCA that occupies 59 percent of Ngorongoro District is managed by NCAA. Details on relevant institutions with different responsibilities in NCA are provided below.

i. The Ministry of Natural Resources and Tourism

The mandate of MNRT is to ensure sustainable conservation of natural and cultural resources, and development of tourism in collaboration with national and international stakeholders. The mandate involves policy formulation; formulation and review of laws and regulations; monitoring and evaluation; regulation and control; development of tourism sector; and capacity and institutional building. The functions of MNRT are implemented at three levels: i) MNRT itself whereas directorates of wildlife, forestry and beekeeping, tourism and antiquities are overall responsible for coordination, monitoring, reporting and evaluation of the implementation at sector level; ii) Institutions mandated to manage different categories of PAs by laws - NCAA manages NCA; TANAPA manages national parks; Tanzania Wildlife Management Authority (TAWA) manages GRs, GCAs, WMAs and Open Areas; and Tanzania Forest Service Agency (TFS) manages national forest reserves (natural and plantations), bee reserves and forest and bee resources on general lands; Tanzania Wildlife Research Institute (TAWIRI) undertakes, co-ordinates and supervises wildlife research; and iii) other sector ministries and authorities.

ii. Ngorongoro Conservation Area Authority

The NCAA manages NCA under NCA Act No. 14 of 1975 (CAP 284, R.E. 2002). The objective of the Authority is to conserve and develop natural resources, promote tourism, and safeguard and promote interests of resident pastoralists in the Conservation Area. According to the setup, NCAA is under the Conservator who is

assisted by two Deputy Conservators: i) Conservation, Community Development and Tourism; and ii) Corporate Services. The Conservator is also the secretary to the Board of Directors that reports to MNRT on performance of the functions and management of affairs of NCAA. The management structure has been designed to ensure efficient and effective management by avoiding bureaucracy.

Administratively, NCA is under Ngorongoro Division in Ngorongoro District with 11 wards and 25 villages that follow administrative structure similar to other villages of Tanzania. Councilors from 11 wards of NCA are part of NDC and participate in all meetings that deliberate issues related to development of the district including NCA. As such, NCAA collaborates with NDC in addressing issues related to community development.

Further, NPC was established in 1994 as a mechanism of engaging indigenous residents in the planning and management of NCA. NPC is responsible for active participation of indigenous residents in decision making, food security, and provision of basic social services such as education, health, water, and livestock development. NPC is composed of Ngorongoro Division Councilors, village government chair persons, and representatives from different community social groups such as women, youths, and traditional leaders. Government leadership in Ngorongoro Division most often advocates development activities to enhance socio-economic development in a multiple land use area. Therefore, the objectives of natural and cultural resources management may conflict with community development objectives, and at the expense of the former.

iii. Other Ministries and Authorities

Other key ministries and authorities with responsibilities in NCA include:-

- a. **President's Office Regional Administration and Local Government (PO-RALG):** Has a role to coordinate and supervise regional development management and administration. The ministry coordinates rural and urban development management policy and strategies; coordinates Regional Secretariats activities and builds their capacity in institutional development strategies for integrated socioeconomic development and financial development of LGAs. Also, the Ministry coordinates and supervises development planning and sectoral interventions on donor supported programmes at district and other local levels; The Ministry also issues ministerial guidelines to Regional Secretariats and LGAs; and strengthens the channel of communication and information flow between the national and sub-national levels.

- b. **Vice President's Office (Union Affairs and Environment):** Has a mandate to provide overall policy guidance, coordination, expertise and services for sustainable environmental management and development. Specifically, the functions of VPO (Environment) include to: coordinate issues relating to articulation and implementation of the National Environmental Policy and the Environmental

Management Act 2004; develop, coordinate and assess the implementation of strategies and plans to address crossing cutting challenges related to environmental management and promote the integration of environment in other sector development frameworks. Other functions include; Advising the government on legislative and other measures for the management of the environment and/or the implementation of relevant international agreements in the field of environment; preparing and disseminating reports on the State of Environment; and coordinating the implementation of the green growth and climate resilient development agenda.

- c. **Ministry of Home Affairs:** Ministry of home affairs has a mission to "save lives and properties, facilitate and control movement of aliens and non-aliens, assist refugees, and rehabilitate convicts through implementation of relevant laws and regulations." The police force, prisons service, immigration service, fire and rescue force, refugees' service, and community service are departments of the Ministry.

- d. **Ministry of Lands, Housing and Settlement Development:** Has been mandated to administer land and human settlement". It provides various land related services to individuals and institutions in the country, and provides advice to government and the public on matters pertaining to human settlements development.

- e. **Ministry of Livestock and Fisheries Development:** Has been mandated of overall management and development of livestock, and Fisheries resources for sustainable achievement of the Millennium Development Goals, NSGRP, improved livelihoods, particularly those communities, which are dependent on livestock for food safety and security without compromising animal welfare and environment conservation. Other responsibility of the Ministry is to build and support the technical and professional capacity of local government authorities and private sector in order to develop, manage and regulate the livestock and fisheries resources sustainably.

- f. **Ministry of Water:** The Ministry of Water is the government ministry principally responsible for water supply and management of water resources in Tanzania. Its mandate is to ensure that water resources are developed and managed sustainably in collaboration with all stakeholders. It also facilitates participatory improvement and management of water resources so as to enhance sustainable productivity, food security, poverty reduction and achieve national economic development.

g. National Environment Management Council

NEMC is under the Vice President's Office (Union Affairs and Environment) and has the main role to provide advice on all matters pertaining to environmental conservation and management. The Council is responsible for consultation, collaboration and partnership arrangements with other entities concerned with environmental matters, and for facilitating and promoting measures necessary to help achieve an important quality of lives for Tanzanians. In terms of legal and institutional frameworks in connection to NCA, NEMC has a key role to play toward natural resources with respect to coordinating the conduction of EIA and environmental audits.

h. Tanzania Rural and Urban Roads Agency (TARURA):

The aim of TARURA is to provide sustainable and cost effective maintenance and development of Rural and Urban Roads Network to support the social economic development of Tanzania. Specific objectives of TARURA include advising PO-RALG on matters relating to rural and urban roads, developing and maintaining rural and urban roads, and demarcating and protecting road reserves. In NCA, TARURA is responsible for maintaining road networks that link district headquarters, villages and social services infrastructures.

iv. Other NCA stakeholders include but not limited to;

- a. Indigenous residents (Maasai, Datoga and Hadzabe) as well as neighbouring communities;
- b. Civil Societies (Community Based Organizations and Non-Governmental Organizations);
- c. Private Sector; and
- d. Development Partners.

CHAPTER FIVE

KEY FINDINGS AND DISCUSSION

1. Preamble

Based on the background information and key components of MLUM, this Chapter presents and discusses main findings. The findings and discussions are categorized into conservation of natural and cultural resources, community development including livestock sector and tourism development. In addition, the Chapter summarizes important trends, achievements and lessons learnt. Before discussing these aspects, summary of current challenges facing NCA, which lead to land use conflicts, incompatibility and ultimately to unsustainable conditions of both the ecosystem and people's livelihoods is summarized in an analytical framework (Figure 4).

The framework illustrates that humans and livestock populations are increasing, but the latter at a relatively slower pace causing a decreased livestock per capita. On one hand, negative implications of low livestock per capita on pastoral economy and food security force people to diversify their livelihood options. Some of the options pursued, for example, crop production and poaching are ecologically destructive and unsustainable, thus threatening the sustainability of the model. Unpredictable climatic conditions, diseases, predation and rangeland quality influence livestock number per unit area. For instance, dry periods will lead to rangelands deterioration and create an ideal condition for diseases transmission, which may lead to human wildlife conflicts due to compressed grazing land. This has negative implications on the health of livestock, a situation, which lessens the value of animals for the market. On the other hand, frequent droughts, diseases and rangeland degradation along with government policies and laws, political interventions, attitudes and change of lifestyles have implications on wildlife numbers and distribution as well as choice on alternative livelihood strategies, which may ultimately, threaten the sustainability of NCA as a MLUM.

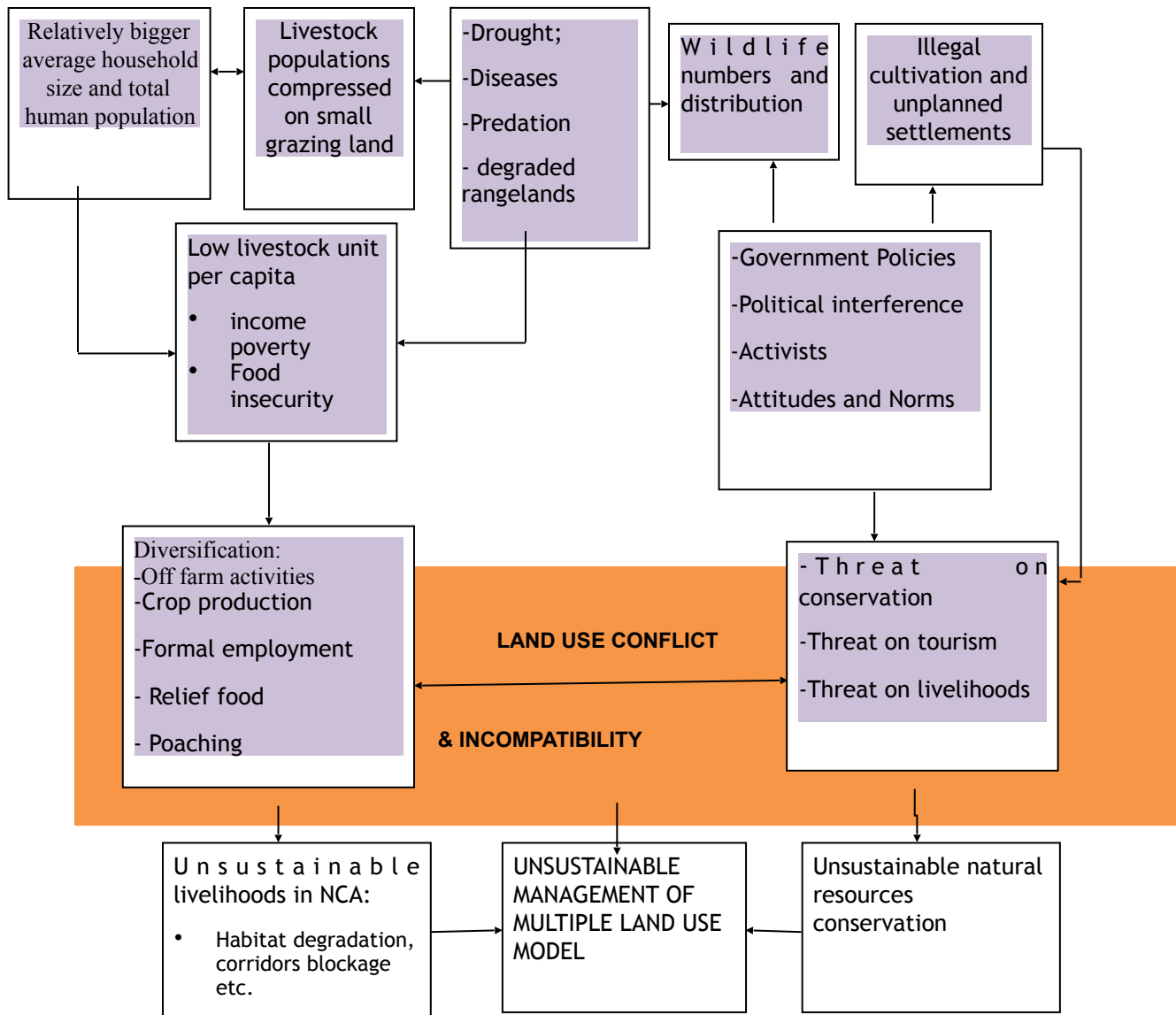


Figure 4: Analytical framework of the current situation in NCA

5.2 Conservation of Natural Resources

Conservation of natural resources involves precipitation hydrology, land use, land cover change, wildlife population trends, land use conflicts and cultural heritage.

5.2 1 Precipitation and Hydrology

In NCA, rainfall is highly variable within and between seasons and years, and is determined by large-scale tropical weather patterns, and modified by local topography. As local topography is so pronounced, there are great variations of rainfall patterns within NCA. The rainfall is associated with the inter-tropical convergence zone (ITCZ) of the trade winds of the northern and southern hemispheres. This causes areas close to the equator to have two distinct peaks in the rainy season.

Generally, NCA is currently going through a series of drought with almost complete failure of the short-rains (NCAA, 2006). Simulation of the inter-annual rainfall data between 2006 and 2100 from NCAA Headquarters rain station revealed that rainfall in NCA will continue to depict a sustained quasi-cyclic oscillation pattern (Ogutu *et al.*, 2019). The plains are poorly supplied with springs and permanent water sources because the peaks of the Crater Highlands intercept the easterly moisture laden winds and force them to drop most of the rain on the eastern side compared to the north-western part of the region, which lies in rain-shadow area (Aikman and Cobb, 1997). For instance, between 1963 and 2017, the only long-term station (on the Ngorongoro Crater rim at NCAA headquarters shows an annual average of 870.5mm. The spatial rainfall variability is depicted by annual rainfall data from NCAA HQ and Ndotu rain stations (Figures 5 and 6). The latter station received an annual average of less than 500mm between 1985 and 2017,

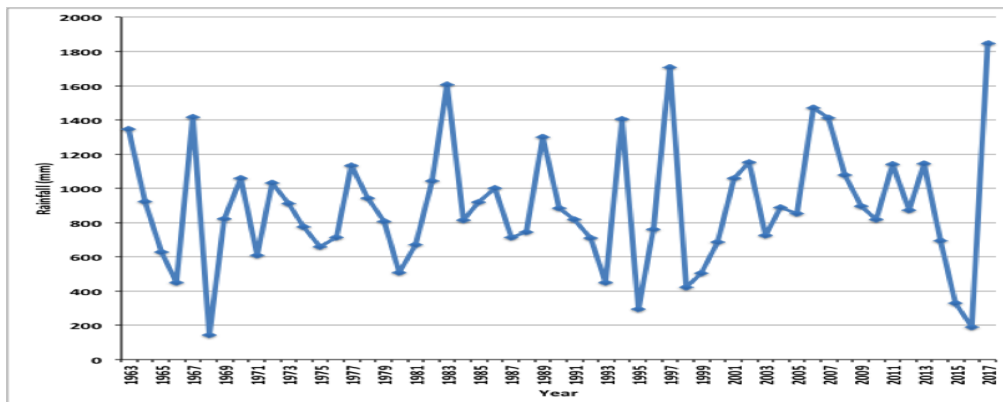


Figure 5: Rainfall trends (mm) between 1963 and 2017 at NCAA Headquarter

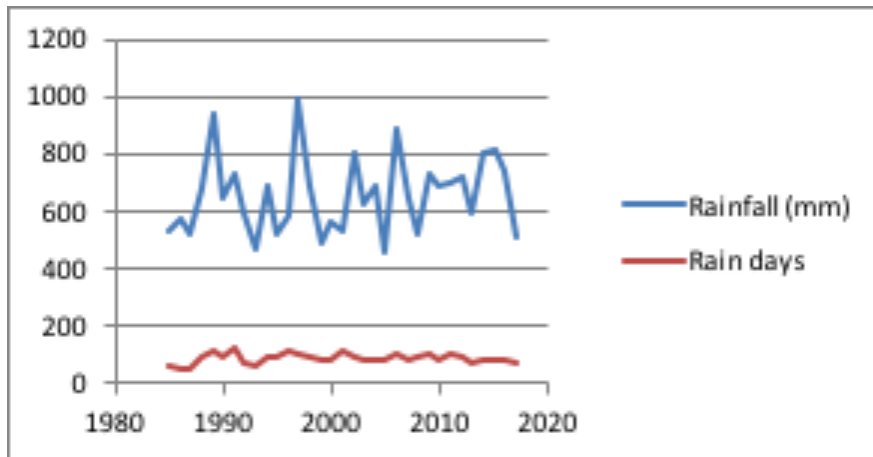


Figure 6: Rainfall trend (mm) between 1985 and 2017 at Ndutu Lodge

Rocks underlying the north-western region are the ancient crystalline, which are largely devoid of cracks and cavities to enable them hold large quantities of water as compared to the eastern side where many cracks and holes known as vesicles are present and therefore allow rain water to seep relatively easier into those rocks (Aikman and Cobb, 1997). Underground water in many parts of the lowlands is saline with fluoride concentration estimated to be as high as 20mg/liter, which is extremely beyond consumption limits for both livestock and humans, which is 4mg/litre (Aikman and Cobb, 1997).

The scattered pattern of settlements in NCA contributes to the deprivation of many people in the area from accessing enough and quality water for domestic and livestock uses and other social services. Figure 7 and 8 show type as well as coverage of water sources and areas with potential water sources in NCA respectively.

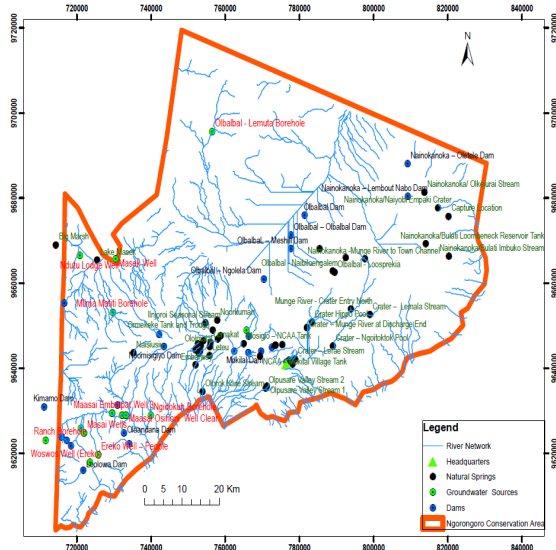


Figure 7: Type and coverage of water sources in NCA

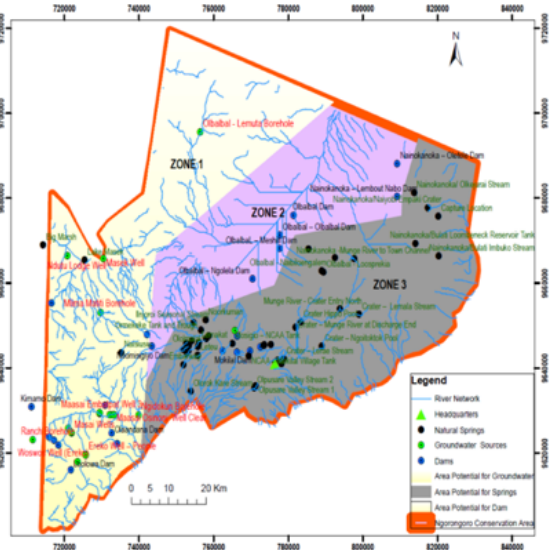


Figure 8: water source potentials in NCA

5.2.2 Land Use and Land Cover

Analyses of vegetation cover changes in NCA using remote sensing images (Landsat MSS 1975, Landsat MSS 1991 and Landsat MSS 2000) between 1975 and 2000 indicated major changes during a period of 25 years where forests increased by about 49.0% from 93,128.6ha to 138,437ha, woodland by 1,190% from 11,066ha to 142,735.7ha bushland by 43.0% from 28,048.5ha to 40,012ha and highland grassland by 34.0% from 25,438.8ha to 34,187.1ha (Niboye 2010; Table 4). Swelling in highland tussock grass was accompanied by an increase in invasive plant species and unpalatable grass species both indigenous and exotic (Niboye, 2010; Clarke *et al.*, 2011) (Plate 3A&B). Conversely, shrubland decreased by 29.1% from 165,290.2ha to 118,971.6ha and low and mid grassland by 37.0% from 449,875.1ha in 1975 to 283,307.1ha in 2000 (Niboye 2010; Table 4). These changes were associated with natural vegetation succession as well as anthropogenic activities including livestock overgrazing, land clearing for cultivation, cutting of trees for commercial and domestic uses as well as damages of forests and woodlands by elephants.

Table 4: Land cover changes (1975 to 2000)

Land cover type	Area Cover (ha) 1975	% cover 1975	Area Cover (ha) 1991	% cover 1991	Area Cover (ha) 2000	% cover 2000
Forest	93,128.6	11.6	141,940.6	17.7	138,437.0	17.2
Montane heath	24,235.4	3.0	24,235.4	3.0	24,235.5	3.0
Woodland	11,066.2	1.4	143,417.5	17.9	142,735.7	17.8
Shrubland	165,290.2	20.6	117,737.2	14.7	118,971.6	14.8
Bushland	28,048.5	3.5	40,012.2	5.0	40,012.0	5.0
Grassland	449,875.1	56.0	282,977.0	35.2	283,307.1	35.3
Highland Grassland	25,438.8	3.2	32,453.2	4.4	34,187.1	4.3
Cultivated area	108.9	0.01	16,909.1	2.1	17,695.9	2.2
Bare ground	31.2	0.004	807.7	0.1	1,021.7	0.13
Wetland	3,865.0	0.5			44.0	0.01
Water body	3,000.0	0.4	3001.0	0.4	2,408.5	17.8
Total	802,898.6	99.9	802,898.4	100.0	803,056.5	100.0

Source: Niboye, 2010



Plate 3: Buffalo grass (*Eleusine jaegeri*) in highlands (A) and *Bidens schimperi* in the Crater (B)

Further, the analysis indicated an increase in bare soil mostly in areas which were previously covered by grassland vegetation especially in Embulbul depression, Olbalbal and Ndotu plains. The increase might be attributed to a shift from keeping cattle to small stocks especially sheep which are more concentrated in these areas and mole rats

trampling. An increase of about 16,150% from 108.9ha to 17,587ha of cultivated area was inevitable following a lift on ban of cultivation in NCA, which existed for a period of 21 years from 1992 to 2013.

Recent analysis of Landsat images which covered a period of 10 years between 2008 and 2018 (Landsat MSS 2008 and Landsat MSS 2018) revealed that in 2008 shrubland, woodland and grassland covered 1,030 km² (12.47%), 1,884 km² (22.81%) and 4,020 km² (48.65%) respectively (Mwita & Kija, 2019). The land use and land cover (LULC) types with least coverage were water and bare land, which covered 28.5 km² (0.34%) and 154.56 km² (1.87%) respectively. However, by 2018, shrubland had increased to 1,578 km² (19.10%), woodland decreased to 1,629km² (19.72%) and grassland decreased to 3,774 km² (45.67%). In general, in the span of 10 years, shrubland increased by 53.2% while woodland decreased by 13.53% and grassland decreased by 6.11%. Details of other LULC types for the year 2008 and 2018 (area coverage and proportions) are shown in Table 5 and Figure 9.

Table 5: Proportions of land use and land cover change (2008 and 2018)

Land cover	2008		2018		Change (%)
	Area (Km ²)	Proportion (%)	Area (Km ²)	Proportion (%)	
Bare land	154.56	1.87	108.95	1.32	-0.06
Water	28.50	0.34	35.35	0.43	0.01
Grassland	4019.94	48.65	3773.81	45.67	-0.30
Shrubland	1030.34	12.47	1578.10	19.10	0.66
Woodland	1884.44	22.81	1629.10	19.72	-0.31
Forest	376.33	4.55	131.20	1.59	-0.30
Non palatable	768.54	9.30	1006.50	12.18	0.29

Results indicate that, there have been notable changes in land use and land cover over time across NCA. For instance, NHFR has experienced massive decrease in the forest cover; the 2018 satellite image shows an increase in shrubs and decrease in woodland mostly in areas surrounding Kapenjiro, Irkeekpus and Bulati villages and this is most probably due to livestock grazing and cutting down of trees for construction of temporary bomas.

Between 2008 and 2018, only water, shrubland and non-palatable grasses registered positive changes, while other classes of land cover had negative change. Increase in non-palatable species indicates a deteriorating habitat, implying reduced available wildlife habitat and reduced forage availability for herbivore species both wildlife and livestock. Spatially, changes are distributed over the whole NCA landscape (Figure 10).

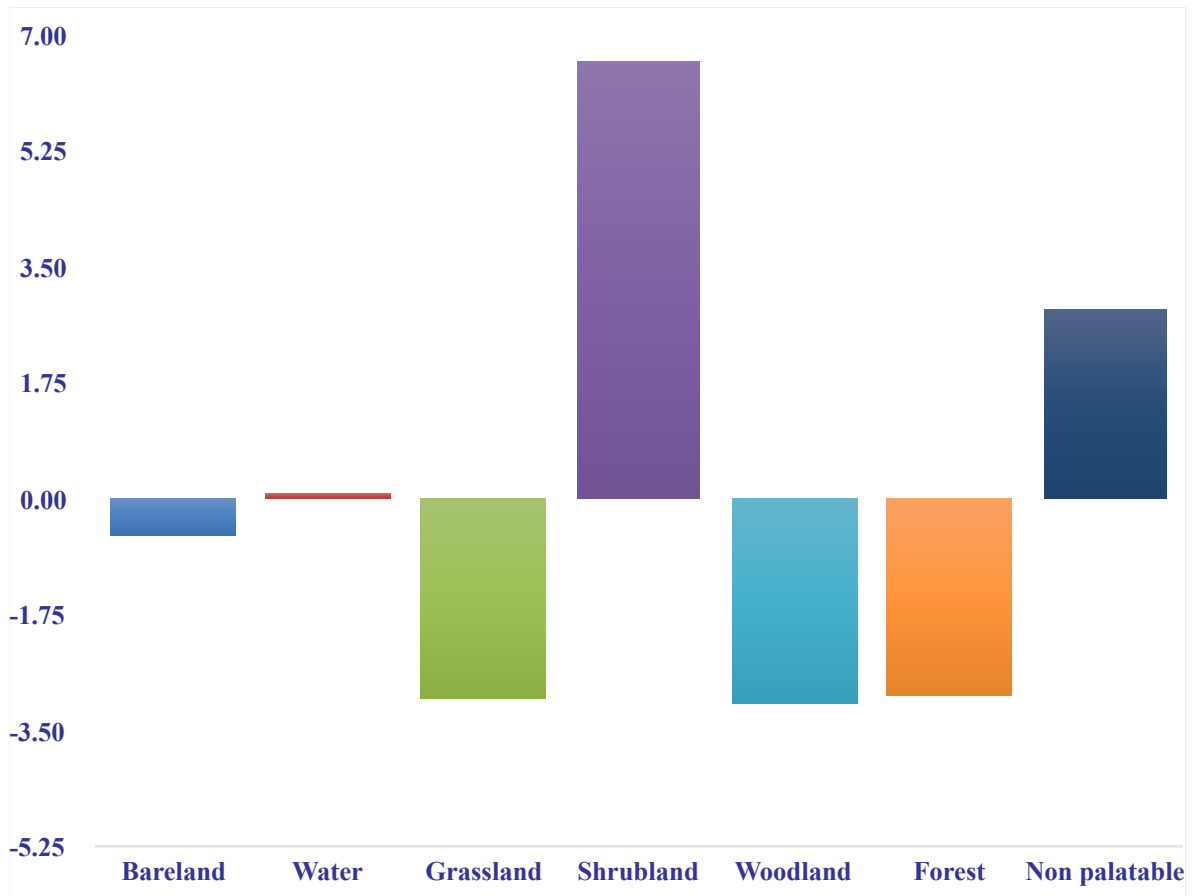


Figure 9: Changes in land use and land cover in NCA from 2008-2018

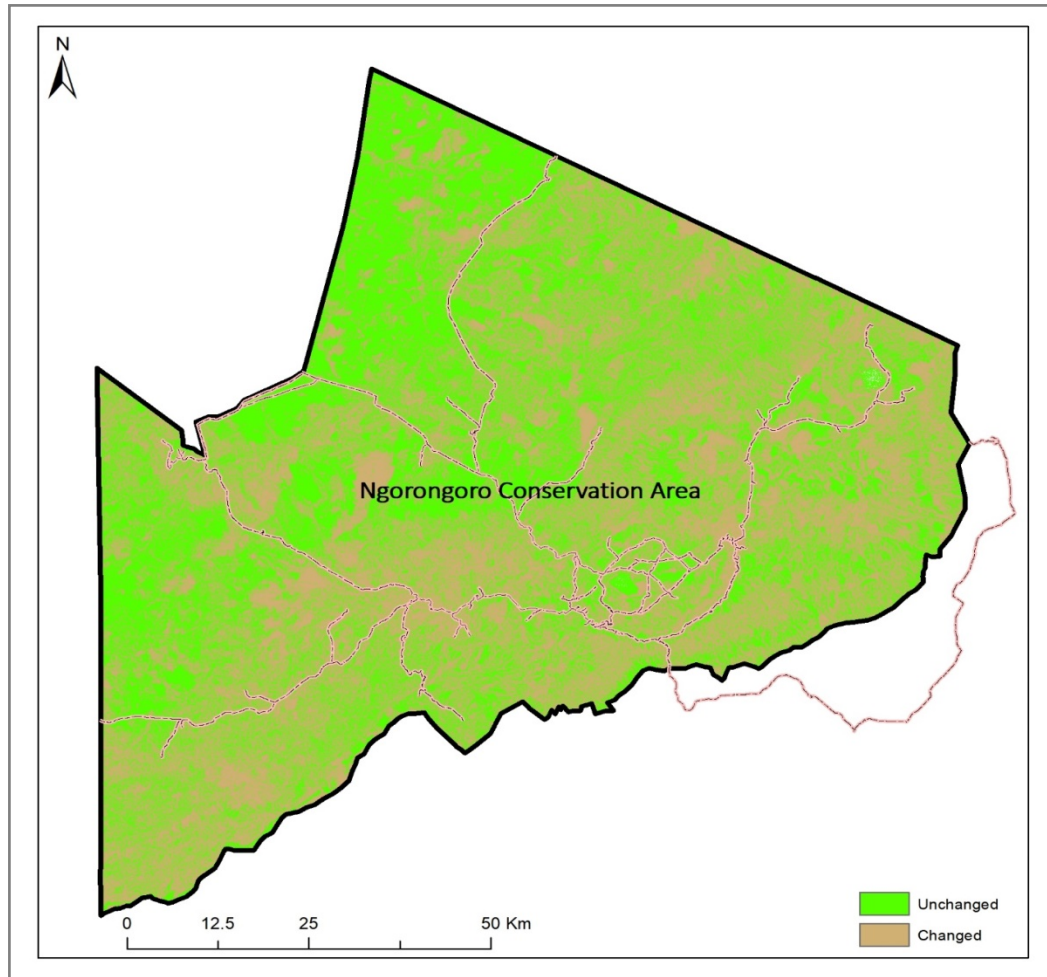


Figure 10: Distribution of land use and land cover across the NCA landscape

Based on land cover of NCA (Figures 11 and 12, about 53% of rangeland is in excellent condition followed by good condition (~11%), fair condition (~26%) and poor condition (~10%). The fair and poor conditions threaten sustainable conservation therefore immediate interventions are required to rescue the situation.

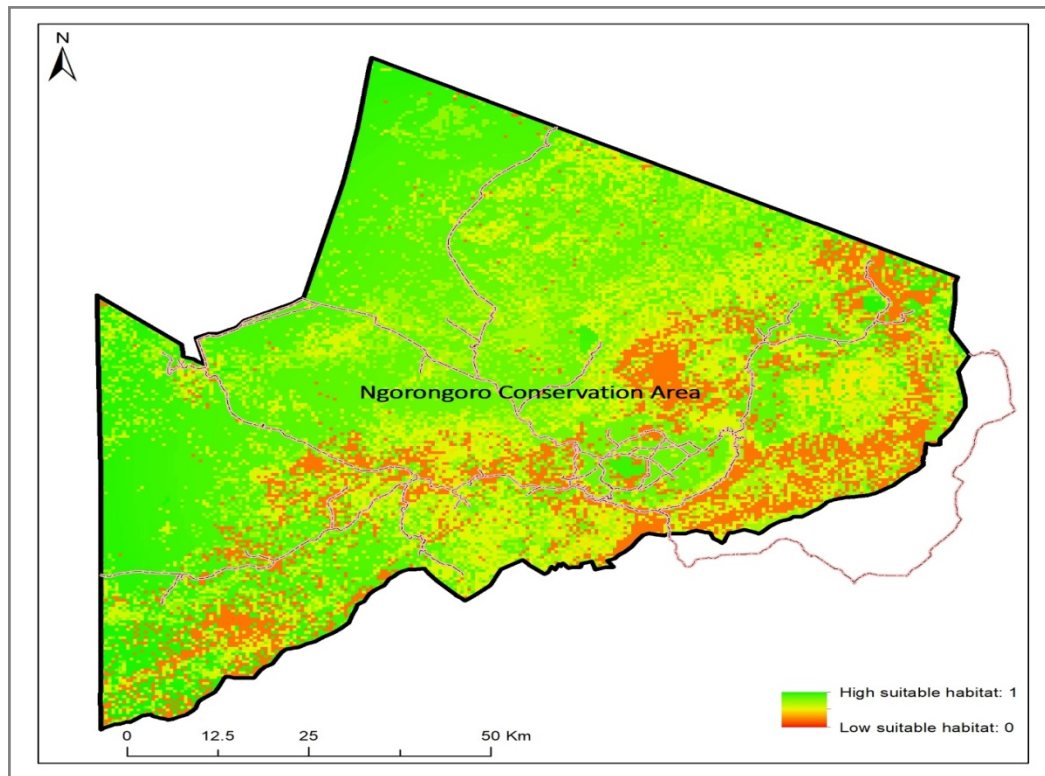


Figure 11: Proportion of high and low suitable habitats across NCA landscape in 2018

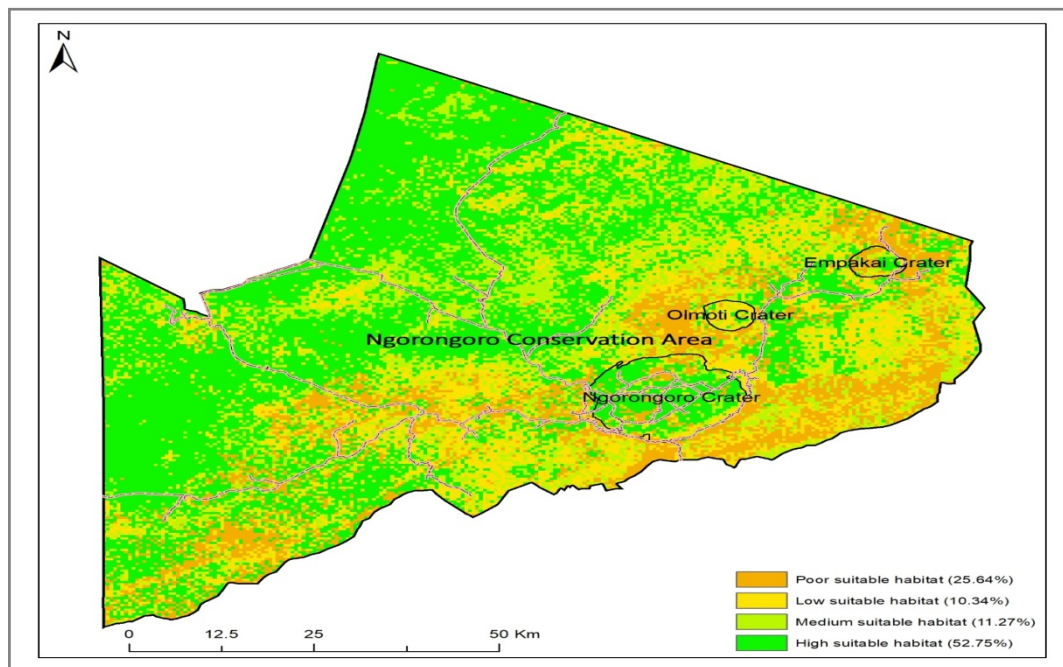


Figure 12: Habitat suitability across NCA landscape in 2018

Prediction of rangeland condition was performed using SAVANNA Model on three scenarios to determine the relative better one to adopt. Seven vegetation functional groups were categorized including palatable grasses, palatable forbs, unpalatable herbs, palatable and unpalatable shrubs, evergreen forests and deciduous woods (Boone et al. 2002). Eleven animal species were classified under three functional groups (wild migratory ungulates, wild resident ungulates and livestock). Migratory ungulates included wildebeest, zebra, grazing antelopes; Thomson’s gazelle. Resident herbivores comprised of zebra, grazing antelopes, wildebeest, browsing antelopes, African buffalo and elephant. Livestock group composed of cattle, goat and sheep.

In scenario one it was assumed that optimal stocking capacity of the area will remain 250,925 LHUs as was estimated in 1994 (Boone *et. al.*, 2002), livestock allowed to increase unabated at the 2017 growth rate, large herbivore numbers and distribution remain the same as they were in 1994 and total NCA land area remains 810,000ha as was determined in 2006. Simulation revealed that beyond year 2022, forbs will dominate in the rangelands, followed by shrubs both of them replacing palatable grasses (Figure 13). This suggests that many grazer populations including livestock will continue to decline.

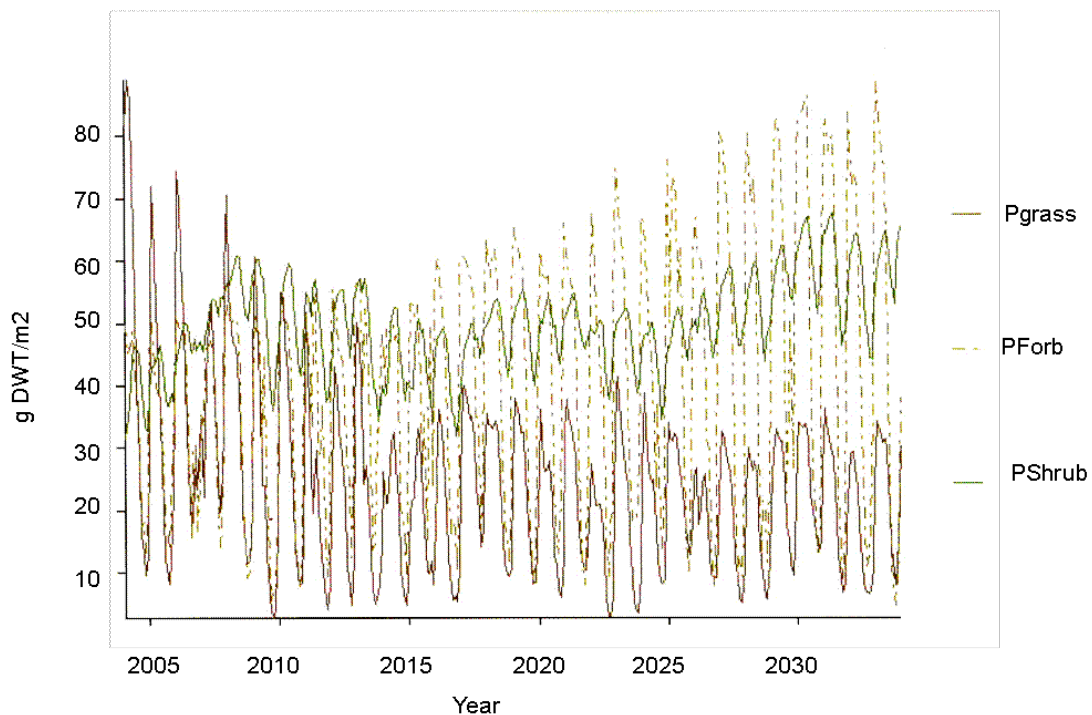


Figure 13: Anticipated standing plant biomass in scenario one

With scenario two where it is assumed that about 430,414ha will be annexed to the current NCA area to make it 1,240,414ha, optimal stocking capacity of the area increased to over 250,925 LHUs than was estimated in 1994 (Boone *et. al.*, 2002), populations of wild herbivores increased to 141,075 LHUs. thus, exceeding 121,742 LHUs that was estimated in 1994. In this scenario it was however assumed that some people will be encouraged to voluntarily settle outside NCA leaving about 20,000 people of which others to be resettled on less settled peripheral areas to be annexed to NCA. Simulation revealed that, shrubs and forbs continue to decline progressively giving way for grasses to recover up to around by 2028 when re-invasion of forbs and herbs are detected. This vegetation mixture will favour all herbivore species including grazers, browsers and mixed feeders (Figure 14).

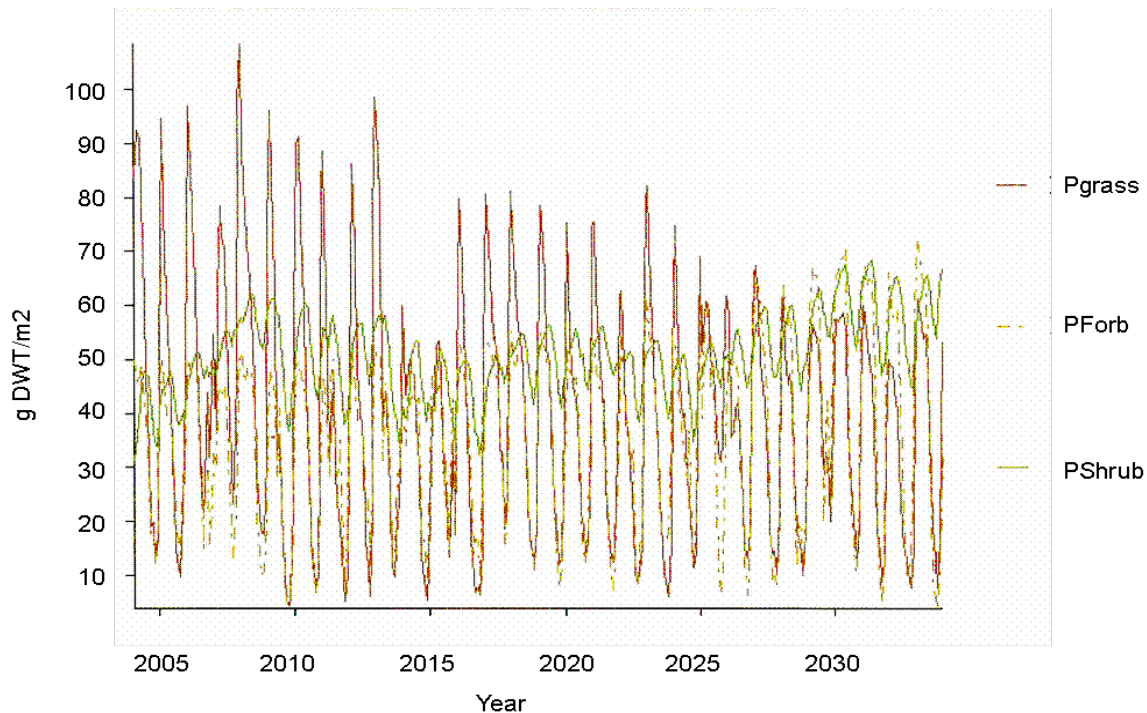


Figure 14: Anticipated standing plant biomass in scenario two

In scenario three is assumed that MLUM is abolished and NCA is changed into a different conservation category where human habitation and livestock keeping is not allowed but allowing the current 810,000ha to be utilized exclusive by wildlife and habitat conservation. Because with this scenario, wild herbivore populations, composition and distribution will be ecologically regulated, grassland vegetation category will continue to dominate the rangelands at least up to 2032 when some forbs will vividly emerge, but this will be a normal plant succession process. Throughout the simulation period until up to around 2038, herb vegetation category in the rangelands will be insignificant. This means with wildlife only in NCA rangelands will continue to improve progressively for the next 20 years (Figure 15).

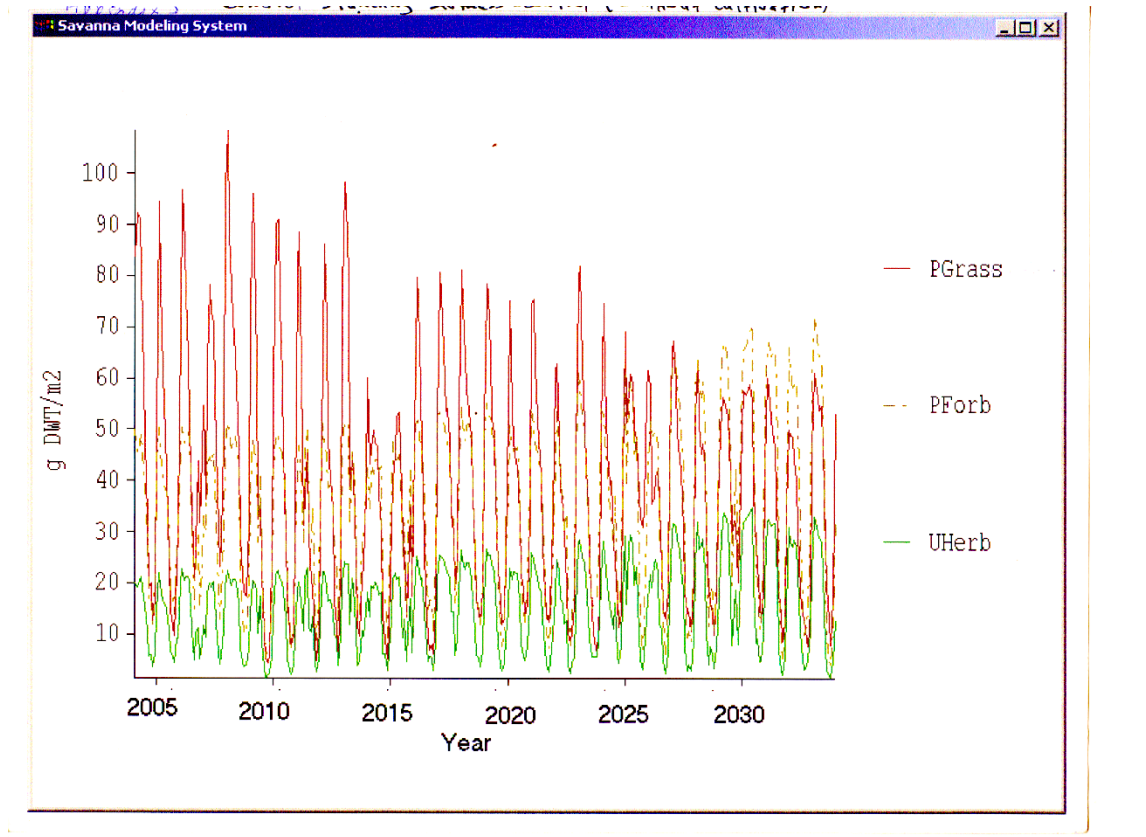


Figure 15: Anticipated standing plant biomass in scenario three

In conclusion, vegetation change simulations under three different scenarios, indicated that while status quo i. e. leaving NCA to continue be managed as it is now will negatively impact the rangelands. While wild herbivores in particular small-sized animals will continue to be displaced by livestock, by 2032 the area will have no capacity to accommodate more domestic herbivores thus their populations will also start decline. Conversely, both expanding NCA area to give space for traditional transhumance mode of livestock production but, relocating some people and their livestock outside the area or changing NCA into a different conservation category where habitation and livestock keeping will not be allowed, rangelands be impacted positively by initially allowing grasses to increase on the expense of forbs and shrubs and reach a point where composition of grasses, forbs and shrubs will stabilize favouring all herbivore species i.e. grazers, browsers and mixed feeders.

5.2.3 Human settlements

There is an increase in construction of improved houses with corrugated-iron sheets. Most of these improved houses do not blend with the environment and changes the scenic view of NCA. The situation is caused by absence of guideline to ongoing constructions. Hence, it is necessary to design and use building code to guide

settlement development in areas earmarked for settlements within NCA. Plates 4A and 4B show Kimba business center as well as a primary school, a dispensary and settlements in Kayapus and Misigiyo villages respectively.



Plate 4: Kimba business centre in Kayepus village (A) (unregistered) and residential and business centre in Misigiyo village (B) (registered).

5.2.4 Wildlife Populations Trends

5.2.4.1 Drivers of Wildlife Population Trends

Primary drivers of changes in herbivore populations are vegetation change and diseases, which are directly linked to precipitation. Long-term data analysis on rainfall from the meteorological station at NCAA headquarters for a period of between 1963 and 2012 revealed that the projected ungulate population dynamics in the Ngorongoro crater emulate upheld oscillations in the predictable rainfall patterns (Ogutu *et al.*, 2019). This means that rainfall influences significantly herbivore abundance in NCA. The oscillations are associated with recurrent severe droughts that cause food scarcity and hence nutritional stress for large herbivores. High rainfall supports above-average production of plant biomass, which may be of low quality due to the dilution of plant nutrients. Large-sized herbivores dependent on bulk, low-quality forage should prosper under the wet and cooler conditions whereas small-sized ones requiring high-quality forage should thrive under relatively low rainfall and warmer conditions (Ogutu *et al.*, 2019).

Data collected in Ngorongoro Crater for the period of 53 years from 1964 to 2017 show a general decrease in wildebeest and plain zebra populations and its replacement by buffalo as the dominant herbivore in terms of biomass. The wildebeest indicates a decreasing trend from an average of 8,179 to 5,526 while zebras decreased from 2,900 to 2,655 and buffaloes are increasing in number and corresponding biomass (Figures 16 & 17). The decrease in wildebeest population size was quite high (32%) compared to that of zebras which was about 8%.

The buffalo and warthogs (*Phacochoerus aethiopicus*) are relatively recent colonizers of the crater grassland. Wild dogs were present in the 1960s but now occur very ephemerally. Small numbers of elephants use the crater floor and cheetah appear to be intermittent visitors.

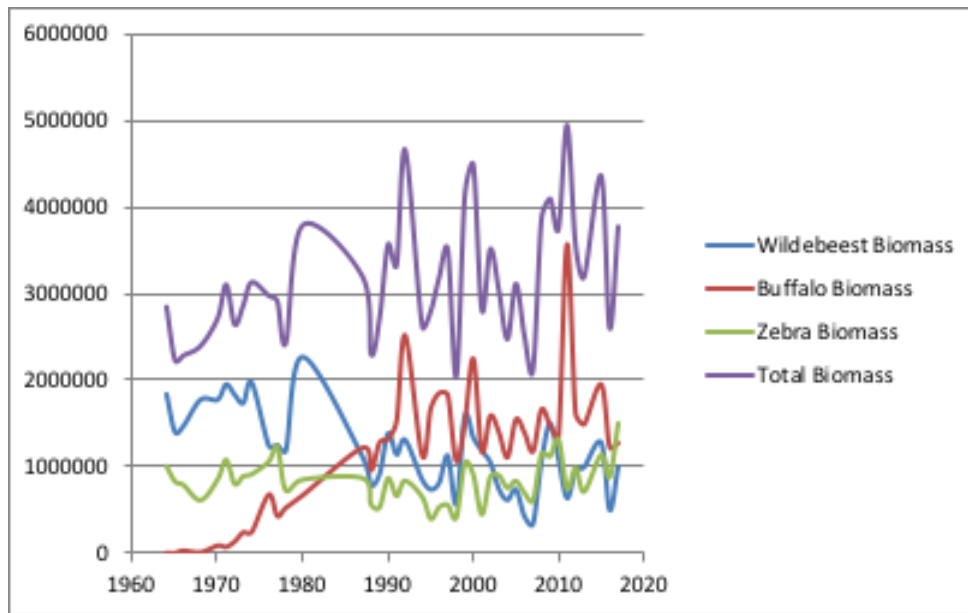


Figure 16: Main species biomass and total biomass from 1960s to 2017

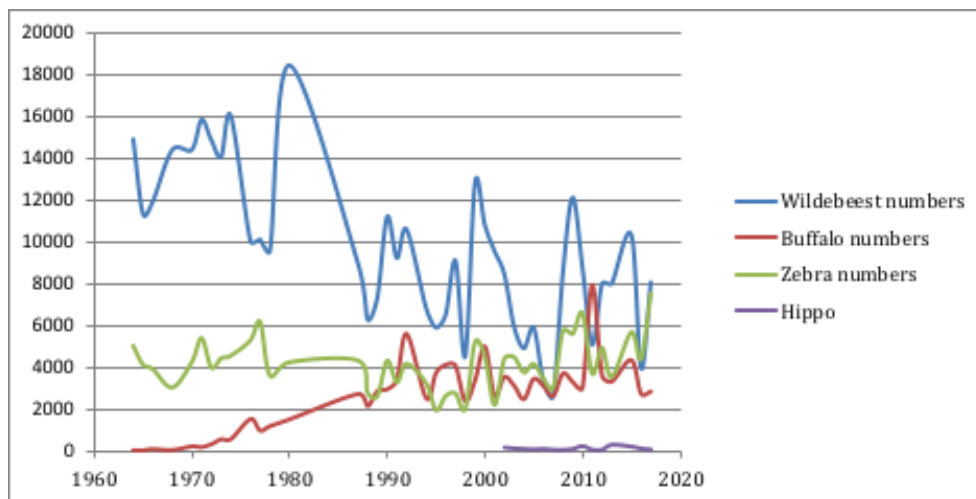


Figure 17: Population changes in four herbivore species

Other factors that may regulate wildlife population such as poaching and diseases also need consideration when designing any future MLUM. The significant decline in black rhino population in NCA since early 1970s through 1980s was mainly attributed to poaching. Before 1960s black rhinos in Serengeti plains were about 700, in Oldupai there were 60 rhinos, and in Ngorongoro Crater there were more than 100 individuals (Mascarenhas, 1993, Fyumagwa & Nyahongo, 2010). By 1980s, poaching for trophy decimated rhino population to two and 12 individuals for Serengeti and Ngorongoro Crater respectively. With regard to diseases, from 1880s to 1980s rinderpest (a Morbillivirus similar to canine distemper virus) was a major cause of mortality for buffalo,

wildebeest and eland in the Serengeti ecosystem including the Crater Highlands and there was a serious outbreak affecting yearling buffalo adjacent to the Ngorongoro Crater in 1961 (Machange, 1997). Inoculation campaigns of cattle against rinderpest supported the buffalo population to more than double and wildebeest population more than triple in SME from the numbers that were recorded in 1960s. Fortunately, rinderpest virus was eradicated and Tanzania declared free from the virus in 2005. However, over time other wildlife diseases have been emerging. For example, *Babesiosis* caused by *Babesia bicornis* parasite, which killed five black rhinos in the Ngorongoro crater in January 2001 was an emerging disease in NCA (Morkel, 2001; Nijhof *et al.*, 2003) and frequent outbreaks of anthrax in other herbivore species.

5.2.4.2 Stocking rate and limits of acceptable use

In 1994, total LHUs in NCA were estimated to be 488,886 in wet season and 122,110 during dry season. Out of this total, domestic herbivores accounted for 20% (97,033) during wet season and 80% (97,033) during dry season (Boone *et al.*, 2002). According to the 2017 livestock and wildlife counts in the Ngorongoro Crater, LHUs were estimated to be 602,544 in wet season and 235,477 during dry period where livestock accounted for 35% and 90% respectively. This analysis indicates that livestock populations in NCA were increasingly displacing wild herbivores. Further, whereas cattle accounted for 86% of the total domestic LHUs in 1994, its contribution declined to 80% in 2017 (Table 6). The above analysis shows that while the rate of livestock populations' increase in NCA was relatively higher than that of wildlife, small stock and particularly sheep was increasingly replacing cattle, which was probably a strategy to cope with deteriorating rangelands' condition, increased water scarcity, disease epidemics and effect of climate change.

The fact that the total LHUs for both wildlife and livestock during wet season in 1994 (488, 886) and 2017 (602,544) was above the estimated limit of LHUs (250,925) stocking rate of NCA in 1994 (Boone *et al.*, 2002) and that of 2017 dry season (235,477) was approaching threshold, is an indication that NCA capacity to support any additional herbivores both wild and domestic was no longer feasible. However, this conclusion does not take into consideration of some negative aspects, which may have lowered further the area's carrying capacity that was estimated to be 250,925 LHUs in 1994 (Boone *et al.*, 2002). These aspects are, persistent deterioration of the rangelands, increasing water scarcity, prolonged drought, some years having relatively fewer rain-days and prevention of co-utilization of the plains by wildebeests and cattle between February and April due avoidance of the latter from contracting *Malignant Catarrh Fever* (MCF) disease, which is transmitted by the former.

Table 6: Population estimates for large herbivore in NCA in 1994 and 2017

Functional Group	Body Mass (Kg/Animal)	1994 (Source: Boone 2002)			2017 (Sources: * NBS 2017; **NCAA ^{WS} , 2017 *** NCAA ^{DS} 2017;**** Boone et.al.2002)		
		Number	LHUs (WS)	LHUs (DS)	Number	LHUs (WS)	LHUs (DS)
Cattle	180	115,468	83,137	83,137	238,826*	171,955	171,955
Goats and Sheep	18	193,000	13,896	13,986	570, 633*	41,086	41,086
Migratory Wildebeest	123	625,000	307,500	0	625,000****	307,500	0
Migratory Zebra	200	62,959	50,567	0	62,959****	50,567	0
Migratory grazing antelopes	15	150,000	9,000	0	150,000****	9,000	0
Resident Wildebeest	123	9,000	4,428	4,428	9,575**	4,710	4,710
Resident Zebra	200	7,087	5,670	5,670	4,027**	3,258	3,258
Resident Grazing Antelopes	30	13,600	1,632	1,632	13,600****	1,632	1,632
Buffalo	450	3,150	5,670	5,670	2836****	5,105	5,105
Browsing Antelopes	40	2,654	425	425	2,654****	425	425
Elephant	1,725	300	2,070	2,070	300****	2,070	2,070
Rhinoceros	816	15	49	49	59****	193	193
Giraffe	750	1,666	4,998	4,998	1,666****	4,998	4,998
Warthog	45	250	45	45	250****	45	45
TOTAL	--	--	488,886	122,110		602,544	235,477

Note: One Large Herbivore Unit (LHU) = 250Kg; WS = Wet season; DS = Dry season

**** Boone et al, 2002 (Assumption that populations have remained as were in 1994

5.2.4.3 Archaeological, paleontological and cultural heritages

Management and conservation of archaeological and paleontological resources in the NCA has been harmonized after transfer of jurisdictions from the Division of Antiquities (DOA) to NCAA. This harmonization has resolved misunderstandings and inefficient management of these resources; hence NCAA has invested substantially in improving the exhibits for archeological and paleontological resources and is already generating a lot of revenue.

On the other hand, despite the richness in cultural resources in NCA and visitors' great interest in traditional way of life, the knowledge and culture of the Hadzabe and Datoga who are also indigenous residents of the area have received little attention. Similarly, while management of Maasai cultural bomas, where history and cultural values are communicated commercially over provision of authentic experience, uncontrolled presentation particularly by youths who display dances along roads is eroding norms and customs. Also, some individuals in particular youngsters are displaying themselves for photography in a way that is disrespectful of the culture, and hoard incomes rather than sharing, as tradition dictates.

5.2.4.4 Achievements and Lessons Learnt

- i. Improved infrastructure and social amenities particularly roads, schools, health facilities
- ii. Introduction of geo-park in NCA as additional tourist attraction
- iii. Diversified tourist activities
- iv. Sustaining cultural heritage resources.
- v. Improved education and awareness on natural resources and environment;
- vi. Ecological variations due to leeward and seaward influences in terms of rainfall availability motivate land availability for different purposes, hence more concentrations in the highlands;
- vii. Few infrastructures to support conservation, community and tourism development inside and outside NCA;

5.2.4.5 Challenges

- i. Uncontrolled establishment of cultural Bomas and tourism facilities;
- ii. Unsustainable use of natural resources within and outside NCA;
- iii. Overgrazing, land degradation and invasive species;
- iv. Local extinction of some species (gerenuk and oryx);
- v. Diseases transmission among livestock, wildlife and humans;
- vi. Increased pressure on fragile resources: traffic congestion in the Crater and Camps on ecologically sensitive areas;
- vii. Human-wildlife conflicts: livestock depredation and human attacks;
- viii. Conservation and human development conflicts;

- ix. Encroachment reduced the size of NCA from 8,292 km² in 1959 to 8,100km² by 2006; and
- x. Inadequate infrastructure to support conservation of natural and cultural resources.

5.3 Community Development

5.3.1 Human and livestock population trends

In 1960 immediately after NCA was established human population was about 8,000 people (Kijazi *et. al.*, 1997; Macbe, 1997). The 2017 Population and Livestock Census in NCA revealed that there were 93,136 people (Figure 18), of which 48,025 or 51.6% were females (NBS, 2017). The NCA is characterized by a young age structure, with 49.48% of the total population being below 15 years of age (NBS, 2017).

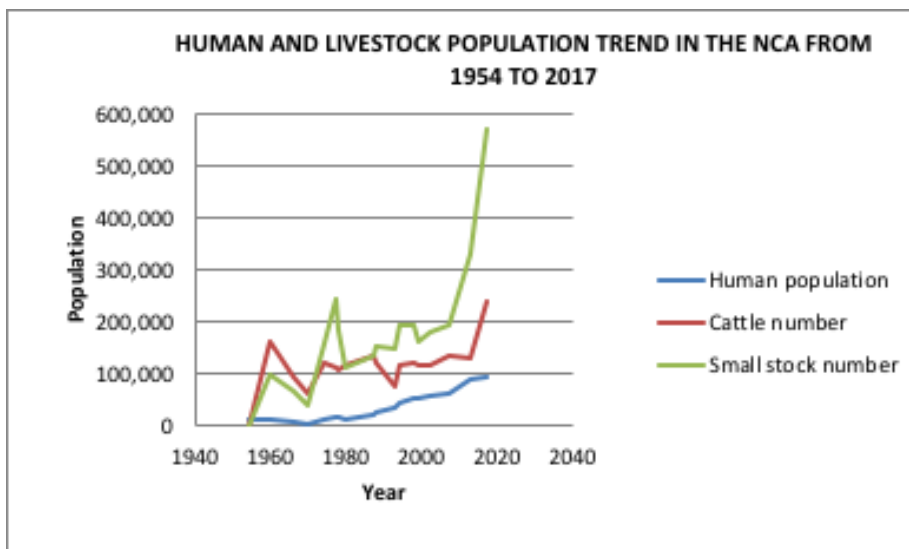


Figure 18: Human and livestock population trend (A) in the NCA from 1954 to 2017

Immediately after the establishment of NCA in 1960 the number of cattle increased steadily with some decline in bad years from 161,034 and reached 238,826 in 2017, and small stocks increased steadily with some decline in bad years from 100,689 and reached 570,633 by 2017 (Kijazi *et al.*, 1997; NBS, 2017). Further to that, other livestock types, which NCA households kept in 2017, were 22,104 donkeys, 6,497 chicken, 225 pigs, 48 camels, 6,220 dogs and 1,036 cats (NBS, 2017).

Based on minimum livestock per capita of 8.0 TLUs (Macbe, 1997), which influence utilization of available land of about 8,292km², Grandin *et al.* (1988), estimated the optimal number of people that could be accommodated in NCA to be about 25,000. Live weight of cattle weighing 250kg is equated to one TLU, thus Maasai zebu cattle which on average weighs 180kg is equal to 0.72 TLU. Corarrubia *et al.* (2012) report that in many agro-pastoral communities in African countries, 80% of livestock is normally owned by 20% of the community members. However, this is contrary to the situation in

NCA where 80% of the total livestock is owned by only 3% of the community members (URT 2013). Ideally, in pastoral community under MLUM, the percentage of community members who own livestock should be much higher than what was observed in NCA.

From the observed discrepancy in livestock ownership, the level of wealth has been deteriorating with time among indigenous pastoralists in NCA (Tables 7 & 8). On average, poor households have increased from 58% in 1994 to 75.1% in 2013 (Naomi and Carol 1997; URT 2013).

Table 7: Wealth classification in NCA in 1994

S/N	% Households	Wealth classification	TLU/ Household
1	21%	Destitute	<2.1
2	16%	Very poor	2- 5
3	21%	Poor	5- 10
4	Average poor 58%		
5	20%	Middle	10- 20
6	22%	Wealthy	>20
7	100%		

Source: Naomi and Carol (1997); Ereto I Project document

Table 8: Wealth classification in NCA in 2013

S/N	% Households	Wealth classification	TLU/ Household
1	22.5%	Destitute	0- 2
2	29.9%	Very poor	3- 4
3	22.7%	Poor	5- 6
4	Average poor 75.1%		
5	14.7%	Middle	7- 20
6	10.2%	Wealthy	>20
7	100%		

Source: URT (2013)

5.3.2 Tropical Livestock Unit

TLU is a measure used to compare the number and density of livestock grazers so as to assess the overall effect on grazing land of different types or of mixture of animals, expressed either as a total for the whole field or as units per land area. On average 8.0 TLUs is a minimum number for a person who solely depends on pastoralism to maintain

sustenance. According to the International Livestock Research Institute (ILRI), one TLU equal 250kg cattle and equal 10 small stocks. The relative slow growth rate of livestock populations than that of people means that TLUs per person have decreased steadily from 11.6 in 1960 to 2.3 in 2017 (Table 9). The decline below the minimum number for sustenance implies that livestock economy can no longer sustain the food base and be a dependable occupation for NCA pastoralists. This is the reason why NCA resident pastoralists are progressively becoming in dire need of grain supplement either by own production, subsidized by NCAA or free supply from aid organizations. This is among other factors that compel pastoralists to resort to other livelihoods strategies including illegal cultivation, which in the long run may become detrimental to sustainability of resident community's livelihoods, the ecosystem and tourism industry.

Table 9: Number of Topical Livestock Units in the NCA in 2017

No.	Type of livestock	Number of livestock in 2017	TLUs in 2017
1	Cattle	238,826	171,955
3	Goats	226,260	16,291
4	Sheep	344,373	24,795
5	Donkeys	22,104	15,915
	Total	831,563	228, 955
5	Per capita TLU in 2017 (excluding donkeys)		2.3

Source: NBS, 2017. Note: One Cattle=10 small stocks= One TLU

In the recent human and livestock census (NBS 2017), it was established that out of 20,890 total households of NCA, 4,596 (22%) households had no livestock suggesting that they have lost qualification to live in NCA as pastoralists pursuant to NCA Act 284 (R.E. 2002).

Because WHO estimates an average minimum intake for a person to be 400gm of grains (cereals) and 100gm of legumes per day, the 70% deficit of pastoral food (2.3 in 2017 against minimum requirement of 8.0 TLUs per capita) should be supplemented by grains and legumes. Out of the total 93,136 human population in NCA, 70% pastoral food deficit should be equivalent to 65,195 people of the total population, which face food scarcity crisis in NCA. Because the average required flour from maize was 26,078kg, equivalent to about 435 bags per day (100kg of maize will yield 60kg of flour), required grain supplement to cover one year in 2017 was 9,518,470kg of flour (158,641 bags). In order to fulfill grain requirements and at an average price of 50,000.00 shillings per 100kg bag of maize, NCAA was supposed to spend about will 7.94 billion shillings to purchase grains in 2017. In addition, NCAA needed to purchase 6.52 tons of legumes per day, which is equivalent to 2,380 tons of legumes per year.

Statistical prediction in a scenario where it was assumed that optimal stocking capacity of the area will remain 250,925 LHUs as was estimated in 1994 (Boone *et. al.*, 2002). livestock allowed to increase unabated at the 2017 growth rate, large herbivore numbers

and distribution remain the same as they were in 1994 and total NCA land area remains 810,000ha as was determined in 2006, total LHUs accounted for by domestic herbivores were 228,955 (including donkeys). This means that the remaining 21,970 should have been accounted for wild herbivores. However, this was not the case because wild herbivores contributed 389,503 and 22,436 to total LHUs in wet and dry seasons respectively implying that the dry season carrying capacity for NCA (the worst weather condition) was exceeded by 366 LHUs, which could have been the reason for massive livestock deaths during that year.

At an average of 3.5% annual growth rate, human population will reach 200,000 people by 2038. Assuming total TLUs will remain 228, 955 as it was in 2017, TLUs/per capita will drop to 1.0. This means that the community in NCA will need supplementary food from other sources of about 87%. This situation might force households in NCA to spend more money on food purchase and thus cut down expenses on other social and development needs.

Analysis revealed further that, even if wild herbivores were removed and left for human settlement and pastoralism alone at an average annual growth rate of 3.5% for humans as well as livestock, TLUs will grow up to 1,150,000 by 2032 and thereafter start to decline due to rangeland degradation and deterioration and reach 800,000 by 2038 (Figure 19). Because human population will have increased over two-fold to about 200,000 people by 2038, TLUs per capita will be 4.0 (50% of the minimal requirement for household sustenance). This will necessitate the community to complement pastoral economy by 50% from alternative sources despite that revenue from tourism will be meager due to absence of wild animals, which is a major attraction of tourists.

Because total TLUs will have surpassed the area’s stocking capacity in 2025 livestock populations will be unstable and suitability of rangelands will be depleted by invasions of forbs and herbs thus favouring small stocks, which are more destructive.

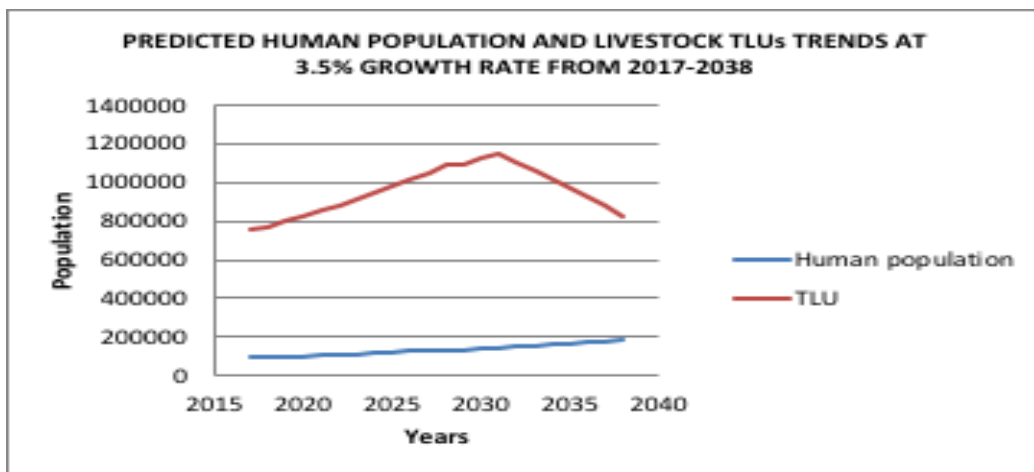


Figure 19: Predicted human population and TLU trends: Calculated from NBS (2017) base data.

In a scenario where it is assumed that about 430,414ha will be annexed to the current NCA area to make it 1,240,414ha, optimal stocking capacity (carrying capacity) of the area will increase and reach 375,363 LHUs above 250,925 LHUs that was estimated in 1994 (Boone *et. al.*, 2002). Because human population will be maintained at 34,632 (20,000 in NCA & 14,632 in Gilal meirugoi) people annually by encouraging some people to voluntarily settle outside NCA and others resettled on peripheral areas to be annexed, pastoral food requirements will be derived from a total of 189,264 TLUs (29,264 TLU from Gilai), which will require 302,822.4ha in order to guarantee health animals with market value. TLUs per capita will be 8.0, which is a minimum for sustenance, therefore, unless in bad years, no supplementary food will be required. Wild herbivores' populations will increase and contribute about 186,099 LHUs to total LHUs (domestic and wild herbivores), which will be above 121,742 LHUs that was estimated in 1994.

With a scenario, which assumes that MLUM is abolished and NCA changed into a different conservation category by resettling all people and livestock outside the area and allowing the current 810,000ha to be utilized exclusively by wildlife as well as more focus put on habitat conservation, NCA will lose its uniqueness of being the only protected area in Tanzania and probably globally where management model allow wildlife-human coexistence. Ultimately NCA may lose 6.0% of tourists who in 2008 said that their interest of visiting NCA was induced by this type of management approach. However, this loss and its associated income may be compensated by high conservation value of the area where there will be minimal interference with the nature.

5.3.3 Status of rangelands

Analysis on rangeland utilization by both wildlife and livestock gives a general indication that NCA habitats are undergoing rapid changes, suggesting that livestock productivity is increasingly threatened. Physical and natural resources' analysis has shown that pastoralists in NCA have traditionally utilized the rangelands under communal property regime and practised transhumance mode of livestock keeping based on seasonality of resource abundance. Shrinkage of grazing land, which is caused by diverse factors, has confined cattle into smaller grazing areas. High grazing pressure in NCA has induced retrogressive ecological changes, which reduces primary productivity of rangelands. The constricted grazing land has disrupted traditional pastoral land use system that also maintained the landscapes, which the tourism industry depends on. As a result, livestock diseases and the ultimate failure in productivity are partly associated with restriction of livestock in smaller areas.

The fact that NCA rangeland has already deteriorated due to invasion of both exotic and indigenous plants, water scarcity and recurring dry spells and it also supports wild herbivores implies that the area is already overstocked (Plate 4). Further, livestock composition in NCA has changed favoring keeping more small stocks from 6.0% in 1960 to 19.0% in 2017 of total TLUs. Sheep, which its feeding habit is more destructive

to the rangelands accounted for 56% of the total 41,086 TLUs that was accounted for by small stock in 2017.



Plate 4: (A) shows bare ground resulting from overgrazing in the NCA; (B) shows spread of pioneer weeds (invasive species) on degraded land after onset of rains and (C) shows movement of cattle during the dry season.

Research has shown that drought causes mortality of an average of between 30% and 50% of livestock in years of severe dry spells in NCA (Machange, 1997). In 2017 about 77,889 cattle, 78,490 sheep and 72,881 goats, which accounted for 32%, 23% and 32% of livestock populations respectively that existed in NCA died and the mortalities were associated with drought (Conservator of NCA, 2018), see also Plate 5 A and B, and Table 10.

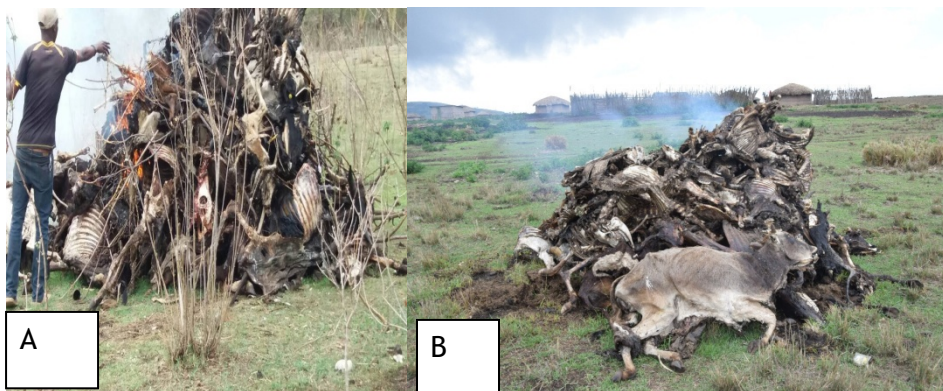


Plate 5: Burning of cattle carcasses that died from starvation at the end of November 2017

Table 10: Livestock mortality in the NCA at the end of November 2017

S/N	Livestock	Total population	Livestock died	% mortality
1	Cattle	243,069	77,889	32.04
2	Sheep	344,373	78,490	22.8
3	Goats	226,260	72,881	32.2

Source: NCAA's Community Development Department (December 2017)

5.3.4 Veterinary Services

Common livestock diseases in NCA, which claim high number of livestock include East Coast Fever (ECF), Malignant Catarrhal Fever in cattle, Anthrax and Contagious Bovine Pleuropneumonia (CBPP) for cattle and *Peste des Petit Ruminants* (PPR) and *Coenurosis (Ormilo)* for small stock (sheep and goats) and Contagious Caprine Pleuropneumonia (CCPP) specifically for goats. Rabies has been a serious problem for human, livestock and wildlife because of inadequate domestic dogs and cats' vaccination. Majority of resident pastoralists associated poor quality condition of livestock with poor veterinary services, deterioration of rangelands particularly invasion of both exotic and indigenous plant species. Inadequate innovative breeding practices such as natural mating using improved bulls and artificial insemination is another constraint.

In addition, pastoralists associated poor condition of livestock with water scarcity, insufficient mineral lick points, and restrictions on utilizing core livestock grazing areas such as the craters and NHFR, (NBS, 2017). According to the Animal Diseases Act No. 17 of 2003, NCA is construed to be an infected area. This means that if livestock movement was to seriously be instituted based on the Act of 2003, animals from the area may not easily be moved outside to markets without putting into action 21-day quarantine. Indigenous pastoralists in NCA are very knowledgeable with livestock diseases with some minor differences among individuals except for the newly introduced one PPR (Figure 20).

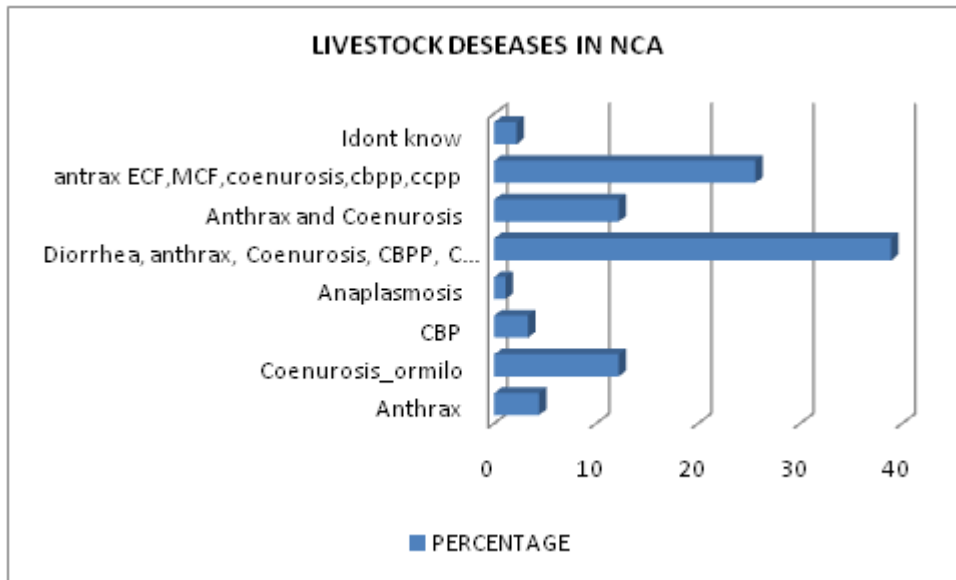


Figure 20: Livestock diseases of great economic importance (Source NCAA 2018)

Despite NCAA providing livestock services to the community including but not limited to improved bulls, artificial insemination and free vaccination, overall majority of the community members (69.3%) felt that livestock services are generally poor and only 13.5% perceived livestock services to be good (Figure 21).

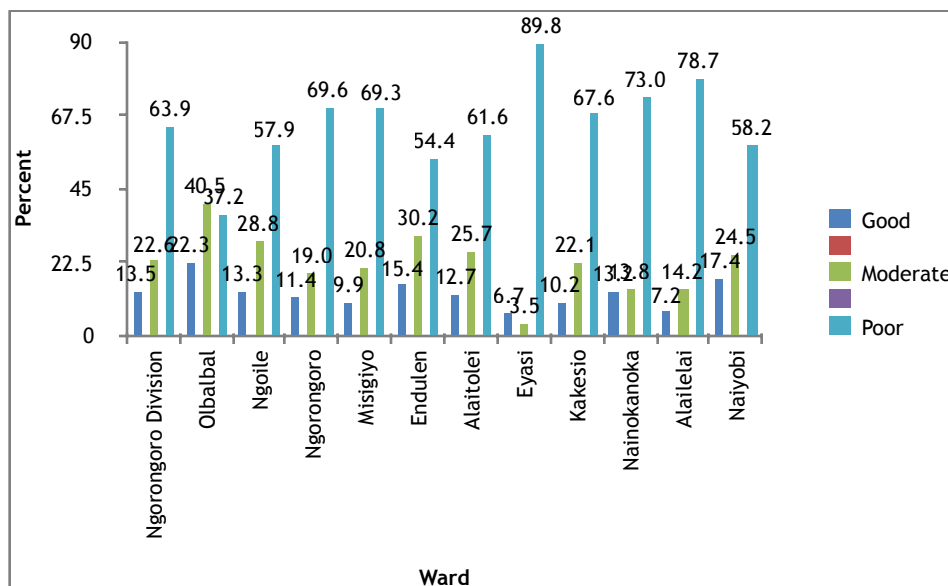


Figure 21: Community perception on livestock services in NCA

5.3.5 Poverty levels

Comparison of the well-being between the resident pastoralist in NCA and those of LGCA that used several measures such as livestock to human ratios, acreage

cultivated before a ban was reinstated and nutritional status indicated that those who resided in LGCA were better-off (Galvin *et al.*, 2002, 2015; Smith 2000; Smith 1999). About 50.0% of all households in NCA experienced food shortage at different times in 2017 (NBS, 2017).

5.3.6 Alternative livelihood strategies

NCA consists of households, which are located in very remote and difficult environment and majority of them are poor with estimated household size of 4.5 (NBS, 2017). The household livelihoods rely on livestock keeping and subsidized grain supplements from NCAA. Those without livestock and do not engage in other income generating activities like beekeeping, small businesses are destitute and account for 62.2% of all households in the NCA. Only 5.0% of all households in the area had at least one member partly engaged in tourism activities in 2017 (NBS, 2017). Although beekeeping was not readily mentioned as one of the alternative occupations among NCA pastoralists (Runyoro, 2007; NBS, 2017), it is currently undertaken by some members of the community particularly those residing in Ngoile, Nainokanoka and Meshili villages with support from NCAA and other stakeholders (Plate 7).



Plate 7: Women beekeeping group in NCA

5.3.7 Social Services

5.3.7.1 Education

Although some villages had two or three primary schools, the majority of the villages owned one and others had no school at all. There are 21 government and three (3) private preprimary schools, 22 governments and one (1) private primary school and two (2) governments and one (1) private secondary school in all 25 villages. Many schools had insufficient teachers and teaching materials. Many pupils are walking long distance and, in an environment, where wild animals are wide spread. Difficulty to easily access education in NCA was one of the reasons that accounted for relatively high dropouts compared to other districts in Arusha region. In 2013, illiteracy level in NCA was 69.1% (PMO-RALG, 2013), however, by 2017 illiteracy level of the population of age five and above had dropped to 64.2% (NBS, 2017). The literacy rate for males was 44.4%

compared to females' 27.8%. This means that 72.2% of females were illiterate in 2017 (NBS, 2017). Plate 8 shows Sendui and Kakesio Primary schools respectively.

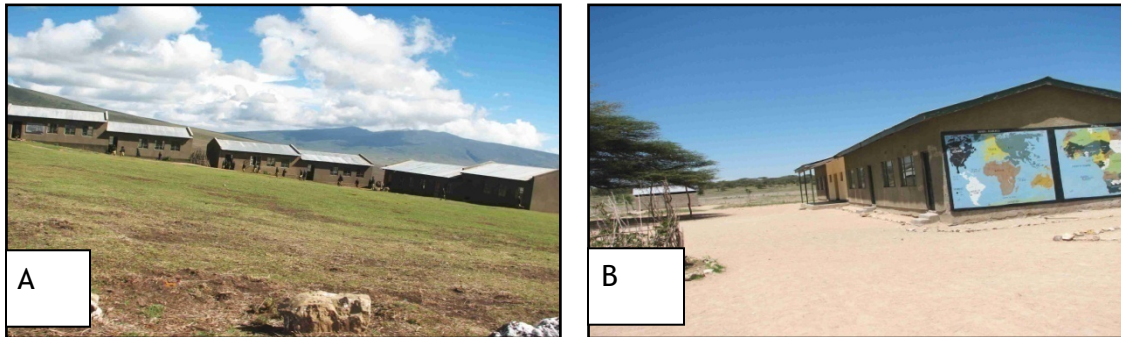


Plate 8: Sendui (A) and Kakesio (B) Primary Schools in NCA

NCAA through NPC from 1995 to 2018 has provided bursaries to 6,083 students at different levels from primary to universities. For university students all of them were undergraduates except one male student who was sponsored for Master degree (Table 11).

Table 11: Students bursaries by NCAA through NPC from 1995 to 2018

Education level	Females	Males	Sub total
Primary	15	35	50
Secondary	2,072	3,159	5,231
VETA	32	36	68
Colleges	135	232	367
Universities	69	298	367
Total	2,323	3,759	6,083

5.3.7.2 Health

The risk of contracting infectious diseases in NCA is mostly attributed to many settlements being located in isolated and remote areas where water is scarce and health facilities are not available. Communities in NCA have the highest risk of contracting infectious diseases including anthrax, diarrhea/dysentery, cholera, respiratory diseases, Sexually Transmitted Infections and HIV/AIDS as well as hydatid disease because of multiple factors including feeding habit, inadequate clean water, inadequate and use of latrines, and polygamy. People are compelled to walk long distance to access health facilities where most of them experience insufficient availability of essential medicines and insufficient health personnel (NBS, 2017). During

community consultations, it was often reported that some people experience animal attacks while going to seek medical services.



Plate 9:

Figure 22: Endulen hospital, the only hospital in NCA

5.3.7.3

Water sources

In 2017, households, which accessed water from improved sources accounted for about 52.0% of all the households. The distribution of water sources is mainly close to the highland (Figure 23). However, communities that accessed piped/ tape water out of the main improved water sources was 36.0% of the total households. Further, 22.1% of households use unprotected spring as their main source of drinking water followed by surface water including rivers and small seasonal dams (NBS, 2017).

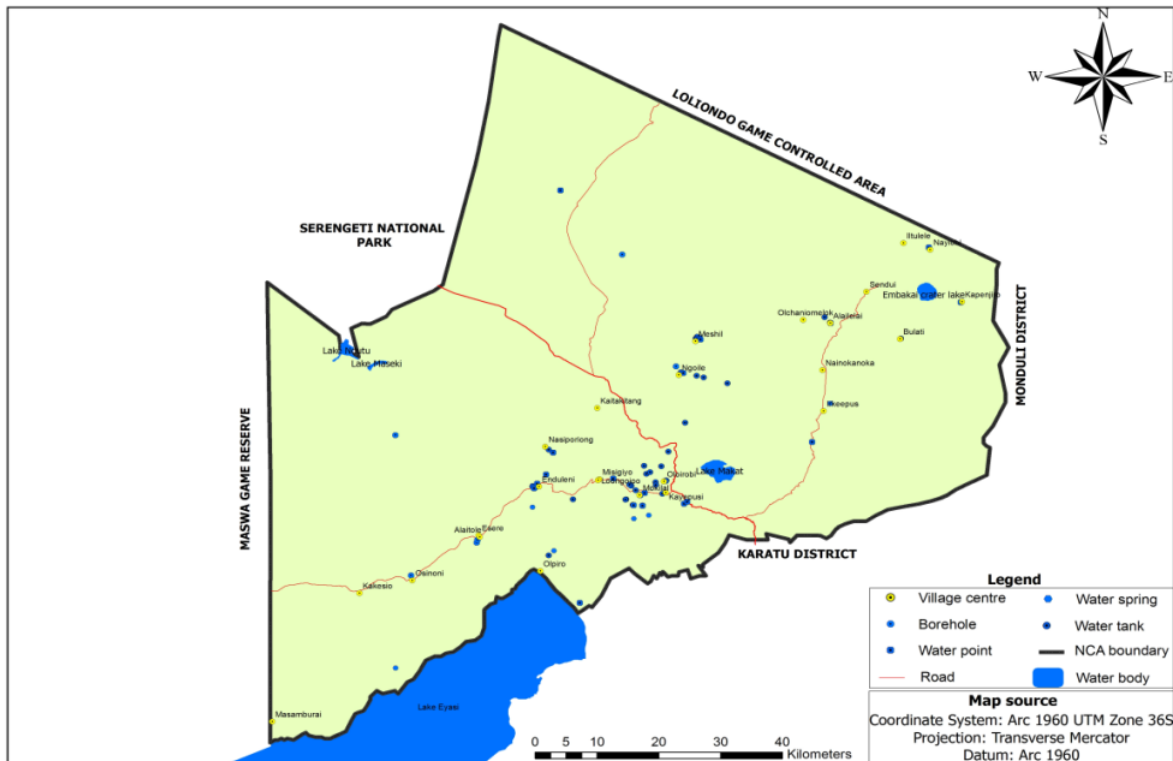


Figure 23: Distribution of water services in the NCA as per draft GMP report 2018

5.3.7.4 Communications

Almost all roads in NCA that form a network of approximately 500 kilometres and 800 kilometres of tracks serving different functions including administration, anti-poaching, tourism activities and delivering of community social services were in poor condition during this assessment. Only two airstrips located at NCA Headquarters and Ndutu were operating. Cellular phones are in use as there are 11 communication towers located at high points, including four on the Ngorongoro Crater rim, Oldean hill, at Nainokanoka, Endulen, Nasipaoriong', Mokilal, Kayepus and Meshili villages, but not available in some parts of the area as witnessed by the Team of Experts when visited all the 25 villages in January and February 2019.

5.3.7.5 Energy for domestic use

Firewood is the main source of energy for cooking in NCA, which is used by 95.0% of all households in the area (Plate 10). For lighting purpose, 55.0% are using torches/rechargeable lamps as their main source of light and 31.2% use firewood (NBS, 2017). This state implies that there is potential for depletion of natural forests in NCA.



Plate 10: Maasai women in NCA with bundle of firewood

5.3.8 Achievements and Lessons Learnt

- i. Initiating and implementing a number of development projects for communities and supporting social services (health, education, and water supply) and providing hand-outs to communities. For example, from 2014 to 2017, NCAA spent 11.1 billion shillings for community development projects;
- ii. Through NPC education program, NCAA has sponsored 6,083 students at different levels between 1995 and 2018;
- iii. A total of 25 primary schools and two secondary schools have been built and their operation supported;
- iv. Provision of veterinary services to pastoral community;
- v. Implementing school feeding program to enhance attendance in schools;
- vi. Facilitate establishment of 12 primary cooperative societies in order to enhance food security and livestock production;
- vii. Construction of 28 dams and bore holes for water supply for people and livestock;
- viii. Support communities to health services;
- ix. Facilitate development of food security strategy to address food insecurity; and
- x. Provision of livestock extension and veterinary services to communities;

5.3.9 Challenges

- i. High human and livestock populations but population of the latter has been relatively lower resulting into decline in livestock per capita;
- ii. Food insecurity (pastoral food deficiency of 70%);
- iii. Change of life style among indigenous residents and demand for development opportunities;
- iv. Human-wildlife conflicts: livestock depredation and human attacks;
- v. Conservation and human development conflicts;
- vi. Unstructured and non-legal binding of NPC;

- vii. Inadequate infrastructure for livestock development, veterinary services and market for livestock and their products;
- viii. Limited livelihood alternatives to livestock keeping;
- ix. High illiteracy rate (64%) compared to other divisions in the district and among districts in Arusha Region;
- x. Severe water scarcity for humans and livestock both in quantity and quality;
- xi. Disease outbreaks in human, livestock and wildlife including zoonoses;
- xii. Lack of land ownership for resident pastoralists for private use;
- xiii. Boundary conflicts and clarity with neighboring divisions and districts;
- xiv. Rangelands deterioration, including increased invasive species and weeds;
- xv. Existence of crop production in some villages' particularly eastern zone such as Irmelili, Kapenjiro, Naiyobi, and Nguruman, which is against NCA Act;
- xvi. Uncontrolled expansion of cultural Bomas and other tourism facilities;
- xvii. Destruction of natural resources and environment – Habitats (Boundaries between NCA and Karatu, community areas within and outside NCA);
- xviii. Unsustainable use of natural resources within and outside NCA;
- xix. Expansion of community development activities (primary and secondary schools, health centres, and livestock development structures) motivates movement of people from other different places to NCA;
- xx. Inadequate infrastructures to support community development inside and outside NCA.
- xxi. Emergence of several modernized settlements, which later on are registered as sub-villages, villages and wards. However, these settlements are against Ngorongoro Conservation Act; and
- xxii. Spatial distribution of indigenous people in NCA.

During consultative meetings and focus group discussions pastoral communities suggested the following:-

- i. Permission to build decent permanent houses according to building code that should be developed;
- ii. Maintaining MLUM with more benefits generated from tourism revenue;
- iii. Land ownership with title deeds;
- iv. Allowed to grow crops to ensure food security;
- v. More social services in terms of water, health facilities, schools and electricity;
- vi. More grazing land including access to restricted management zones,
- vii. Reclaim encroached and excised area of NCA (192km²);
- viii. Involvement in all issues which affect community livelihoods; and
- ix. Compensation for livestock depredation and human attacks.

5.4 Tourism Development

NCAA has made achievements in terms of increasing number of tourists and revenue, availability of tourism facilities, diversification of tourism products over the past years.

5.4.1 Increase in tourists and revenue

Tourist numbers both non-residents and residents have continued to increase remarkably over the past five decades as shown in Figure 24. Tourism revenue in NCA has also been increasing over the years. For example, for a period of 19 years between 1999/2000 and 2017/2018 revenue trend showed a consistent and continuous increase except for the 2008/2009 and 2014/2015 financial years (Figure 25) when the global economic recession and Ebola threat decreased the number of foreign tourists respectively. Consequently, NCAA's contribution to Government consolidated fund has increased in recent years. For example, in 2017/2018, NCAA contribution to the government consolidated fund was TZ 22,355,000,000/= compared to TZS 13,000,000,000/- in 2016/2017. Situation of the above achievement is a result of NCA having retained its status as the popular tourism destination in Tanzania

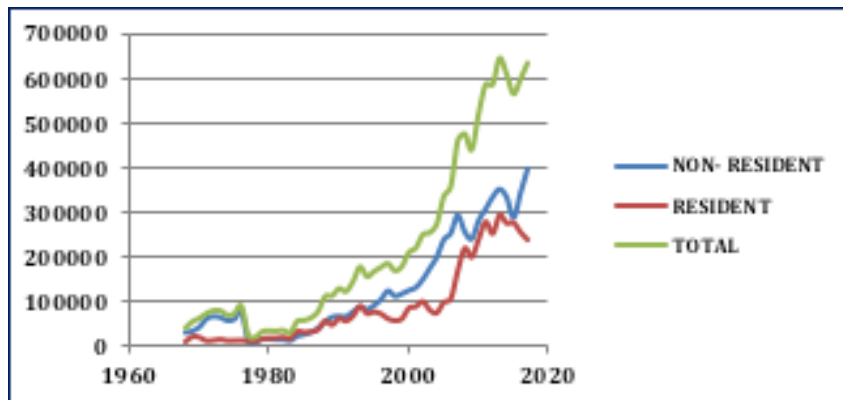


Figure 24: Tourist trends in NCA from 1960s to 2018

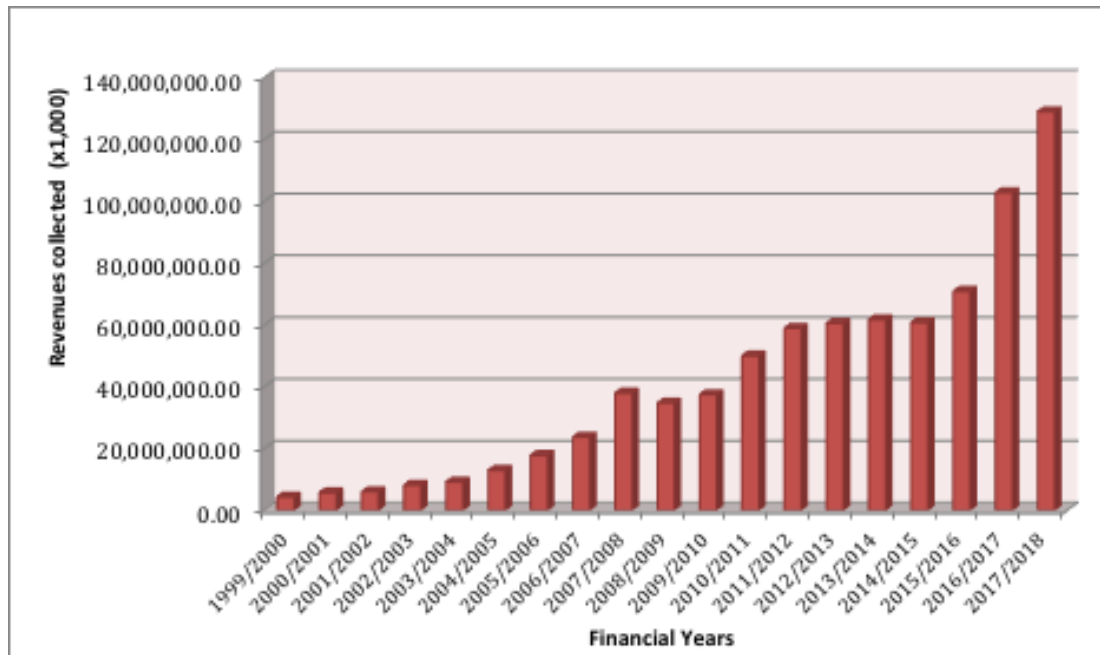


Figure 25: NCAA's revenue trends since 1999/2000 to 2017/2018

5.4.2 Increase in tourism facilities

Development of tourism facilities to cope up with increasing number of tourists have been ongoing. The Conservation Area has a total of 58 tourist accommodation facilities with capacity of over 620 beds. Number of lodges has increased from three (Ndutu, Wildlife and Rhino lodges) in 1960s to six in 2018. As for permanent tented camps there was none in 1960s and the number has increased to 12 in 2018. Similarly, the number of campsites has increased from nine in 1980s to 48 camp sites in 2018.

5.4.3 Diversification of tourism products

Tourism products have been increasing in recent years from the well-known products such as the Ngorongoro, Olmoti and Empakaai craters; shifting sand, Oldupai Gorge Museum and Laetoli footprints to products including walking safaris, horse riding, hot air balloon flying and geo tourism.

5.4.4 Community Based Tourism

Communities engage in different tourism-based activities as part of livelihood strategy (selling of souvenirs, entertainment of tourists including traditional dances, tour guiding and translation as well as provision of security services). There are also cultural bomas that provide the community, especially women with an opportunity to sell traditional goods (Plate 11). Currently, there are 14 cultural bomas, which are managed by residents from Meshili, Ngoile, Oloirobi, Kayepus, Nasipaoriong', Kaitakiteng, Loongoijoo, Misigiyo, Alchaniamelok, Nainokanoka and Irkeekpus villages.



Plate 11: One of the Maasai tourist cultural boma in the NCA

5.4.5 Tourists travel motivation

In 2017/2018, out of the total 1,327,143 tourists recorded in Tanzania, 644,155 visited NCA. A survey conducted in 2008 revealed that five topmost attractions influenced decisions of tourists to visit NCA prior to arranging for travel. These attractions were variety and wildlife abundance, which accounted for 30.0% of all the respondents (n=2,907), the Ngorongoro Crater (19.0%), the landscape and scenery (9.0%), presence of black rhino (8.0%) and about 7.0% mentioned annual wildlife migration (Runyoro, 2009). These findings tallied well with those of Nyahongo *et al.* (2005). Although it is often asserted that if human-wildlife co-existence was to be abandoned, NCA would attract relatively fewer visitors than today, during the same study, human-wildlife co-existence and the area being renown as the origin of humankind ranked sixth as reasons for arranging visitation, and each accounted for 6.0% of all the respondents (Runyoro, 2009).

According to these studies, the five attractions, which tourists enjoyed most after visiting the area were, wildlife abundance, that accounted for 44.0% (n=2,907), the Ngorongoro Crater (14.0%), landscape and scenery (11.0%), wildlife-human co-existence (5.0%) and wildlife migration (5.0%). On the other hand, when asked to list things they disliked after their visits, majority (49.95%) mentioned poor road condition, tourists and vehicle congestion in the Ngorongoro Crater (20.0%), poor tourist facilities in campsites (12.0%), sub-standard accommodation facilities and services (6.0%) and poor reception and customer care, which accounted for 3.0% of all the responses (Runyoro, 2009).

NCAA Corporate Strategic Plan (CSP) mentioned five things tourist disliked in the following order: livestock in NCA, poor distribution of human settlements and buildings that do not blend with the environment, delay at the main gates, poor road condition and inadequate interpretation services (CSP, 2017). The attractions, which tourists recognized prior to visiting NCA and those, which they liked after their visit, were all naturally occurring. Those, which they disliked were administrative, which could be addressed by NCAA without making change in the policy. In view of above, if good land use planning could be realized and populations for both people and livestock controlled, the presence of resident pastoralists in NCA may continue to add value as one of the tourist attractions.

5.4.6 Achievements and Lessons Learnt

5.4.7 Challenges

Despite the successes recorded on increase in tourists, increases in tourism facilities and diversification of tourism products and its corresponding revenue, there area is facing the following tourism challenges. These include:

5.4.7.1 Vehicle trends and congestion:

The number of vehicles entering the Ngorongoro Crater, which has been increasing remarkably creates congestion of tourists and vehicles at few visitor attractions thus reducing visitor enjoyment and satisfaction. The congestion also causes significant adverse visual and environmental impacts in the Crater by contaminating forage close to roads with vehicle emissions and dust that reduces its palatability. It further interferes with wildlife activity patterns particularly feeding, resting and mating. During the past five years vehicles entering the Ngorongoro Crater increased from 45,090 in 2014 to 73,514 in 2018 (Figure 25), which ranged from 70 in April to about 350 vehicles per day in August 2018 (Plate12).



Plate 12: Vehicle congestion at Ngoitokitok picnic site (A) and visitors watching wildlife in the Crater (B)

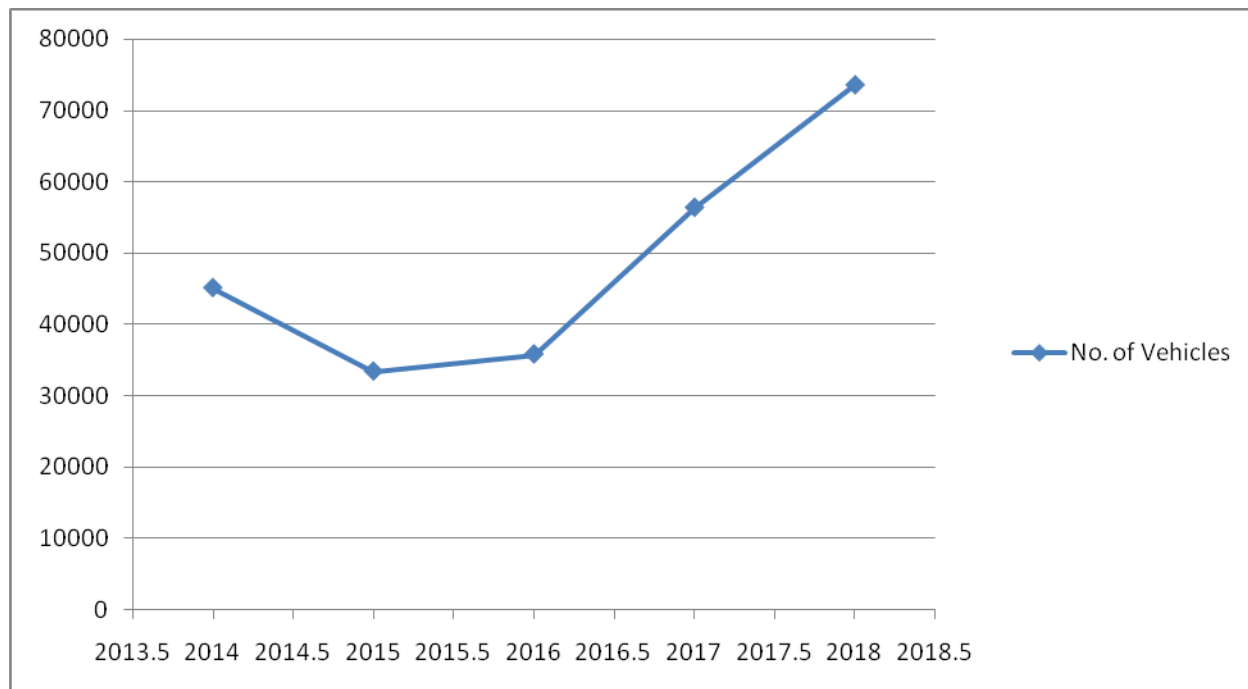


Figure 25: Number of vehicles that entered the Crater in year 2017 and 2018

5.4.7.2 Inadequate infrastructure

While there are diverse tourism products, tourism development is challenged by inadequate road network (Table 12 and Figure 26), airstrips (Table 13) and accommodation facilities. Absence of improved tourism infrastructure and facilities is likely to have negative impacts on environment and may have negative effect on visitor's experience.

Table 12: Classes of Roads in NCA

Class	Road Section	Distance in Kilometers
Class I	Lodoare to Serengeti Boundary (Golini)	86
	Oldupai Museum access	5
Class II	Ngorongoro to Kakesio	76
	View Point to Empakaai Crater (Forsbrooke Road)	78
	Crater main roads (including ascent and descent)	83
Class II Upgrades	Empakaai to Kapenjiro	7
	Empakaai to Naiyobi	11
	Endulen to Olpiro	9
Class III	Crater tracks	100
	Olbalbal from Main Road	20
	Ndutu from Main Road	25
	All other tracks and walking trails including a track to Loliondo	800
	Total	1300

Table 13: List of Airstrips in NCA

Airstrip	Status	Position (x; y)
Endulen	Not paved on black cotton soil and ridge. Dry weather only. 700 m	35.2631; -3.1943
Ndutu	Paved with gravel. 1 200 m	34.979; -3.013
Ngorongoro	Paved with gravel on edge of Ngorongoro crater. Unusable June to Sept owing to fog. 1100 m	35.474; -3.2213
Kapenjiro	Not paved on slope. Currently used by flying doctors	35.503; - 2.978
Oldupai	Not operating for a long time due to high wildlife population	

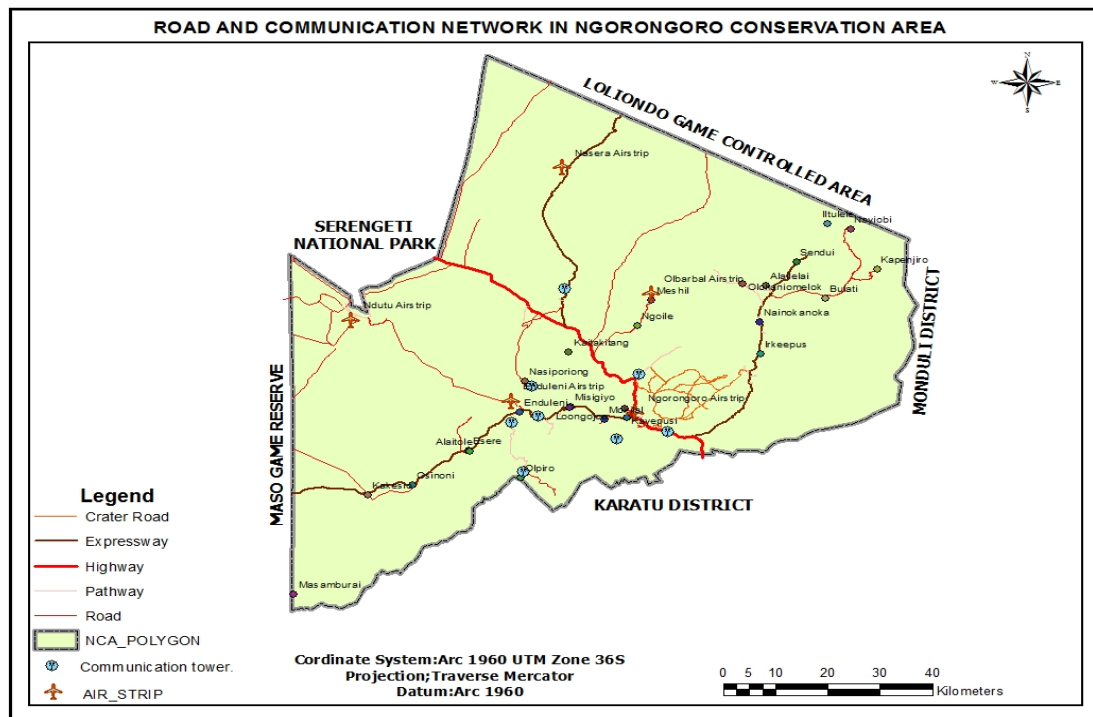


Figure 26: Roads and Communication Networks in NCA

5.4.7.3 Over- dependence on foreign tourists:

Trends in foreign and domestic tourists for the past 12 years show that the former outnumber the latter. Likewise, in terms of revenue foreign tourists contribute more revenue than domestic tourism. This means that in the face of economic and other social crisis in tourists' source countries, revenue to NCA will shake and may lead to failure to implement its mandate of conservation, community development and tourism development.

5.4.7.4 Uncontrolled expansion of cultural bomas

Uncontrolled expansion of cultural Bomas frustrates community based tourism and benefit sharing arrangement. The main challenges being:-

- a) Inadequate coverage and exploitation of cultural resources. For example, the knowledge and culture of the Hadzabe and Datoga tribes are not fully developed and utilized;
- b) Inadequate designing, management and coordination of cultural bomas cause limited representation of history and culture of indigenous residents.
- c) Uncontrolled presentation of history and culture particularly by youth erodes norms and customs;
- d) Inadequate participation and benefit sharing arrangement from tourism; and
- e) Uncontrolled tourists sometimes offend residents by either getting wrong impression or disregarding cultural norms.

5.5 Financing the Components of the Model

5.5.1 Income accrued from tourism

Tourism revenue in NCA has been increasing over the years in line with increasing number of tourists and facilities. In 2017/2018, for instance NCA was the only protected area, which generated more income per unit area than any other protected area in East Africa. NCAA's income and distribution of funds to the components of the model include community development; conservation of the natural and cultural heritage resources; and tourism development.

5.5.2 Expenditure

Over the past five financial years (2013/2014 -2017/2018), there has been an increase in revenue generation. However, the proportion of disbursement of funds to support community development, conservation of natural and cultural resources and tourism development has been declining from 12.6%, 6.8% and 11.0% in financial year 2013/2014 to 4.8% 2.5% and 4.2% in financial year 2017/2018 respectively (Table 14, 15, and 16)). Likewise, the proportion of funds to support declined from 6.8% to 2.5% during the period (Table 15). Also, allocation of funds to support declined from 11.0% to 4.2% (Table 16).

Table 14: Expenses for Community Development for five financial years

YEAR	TOTAL INCOME	TOTAL EXPENSES	% EXPENSE OF TOTAL REVENUE
2013/2014	60,499,703,374	7,641,205,303	12.6
2014/2015	58,591,378,664	5,202,699,514	8.9
2015/2016	69,658,661,000	4,073,299,000	5.8
2016/2017	102,678,667,000	4,855,441,000	4.7
2017/2018	128,927,004,000	6,136,810,000	4.8

Source: CAG reports for 2016, 2017 and 2018

Table 15: Expenses on Conservation of Natural and Cultural Heritage Resources

YEAR	TOTAL INCOME	TOTAL EXPENSES	% EXPENSE OF TOTAL REVENUE
2013/2014	60,499,703,374	4,131,966,523	6.8
2014/2015	58,591,378,664	4,214,923,000	7.2
2015/2016	69,658,661,000	4,991,941,000	7.2
2016/2017	102,678,667,000	2,035,946,000	2.0
2017/2018	128,927,004,000	3,242,190,000	2.5

Source: CAG reports for 2016, 2017 and 2018

Table 16: Expenses for Tourism Development for five years

YEAR	TOTAL INCOME	TOTAL EXPENSES	% EXPENSE OF TOTAL REVENUE
2013/2014	60,499,703,374	6,630,607,871	11.0
2014/2015	58,591,378,664	4,012,709,977	6.8
2015/2016	69,658,661,000	2,850,592,000	4.1
2016/2017	102,678,667,000	4,480,211,000	4.4
2017/2018	128,927,004,000	5,405,215,000	4.2

Source: CAG reports for 2016, 2017 and 2018

Cumulatively, there has been a decline in total expenditure on the components of the multiple land use model for the past five years (2013/2014 to 2017/2018) from 30.4% to 11.5% respectively (Table 17). The Team of Experts noted that, as NCAA's tourism revenue increases the proportion of expenditure on conservation, community and tourism development decreases. This implies that high proportion of revenue accrued from tourism in NCA is spent for infrastructure and other administrative issues to support the three components of the model and contributions to the government.

Table 17: Total Expenses on Community, conservation and Tourism development

YEAR	TOTAL INCOME	TOTAL COMMUNITY, TOURISM & CONSERVATION EXPENSES	% EXPENSE OF TOTAL REVENUE
2013/2014	60,499,703,374	18,403,779,697	30.4
2014/2015	58,591,378,664	13,430,332,491	22.9
2015/2016	69,658,661,000	11,915,832,000	17.1
2016/2017	102,678,667,000	11,371,598,000	11.1
2017/2018	128,927,004,000	14,784,215,000	11.5

Source: CAG reports for 2016, 2017 and 2018

Assuming 50% of tourist entering NCA will exist through Kleins-Mto wa Mbu road after tarmacking the ongoing development of that route, NCAA will lose about 25% of visitors' entry as at least half of the visitors who used to travel through NCA after visiting SENAPA may opt to use a new route where there is new tourist attractions. In addition, at least another 25% income may be lost if severe decline in wildlife will occur. Annexation of the proposed areas in Loliondo, Lake Natron and Mto wa Mbu GCAs that will embrace a tarmac road, which is under construction will take care of this shortcoming and at the same time increase stay days in NCA as more tourist attractions will also be contained in the proposed area for annexation. Because the current sources of revenue will be retained and new source established the budget proportion from tourism income to support the three major components of MLUM might increase.

CHAPTER SIX CONCLUSION AND FUTURE MANAGEMENT OPTIONS

1. Conclusion

The analysis and discussion has revealed that NCA is an important component of SME. The conservation area harbours natural and cultural resources that provide ecosystem services to humans and biodiversity in general. The area contains water catchment forests, refugee sites of endangered species such as black rhinos, breeding and refuelling sites of a diversity of bird species and calving grounds for wildebeest. Also, is home to indigenous residents (Masai, Datoga and Hadzabe) and their livestock, it contains important cultural heritage sites, contributes to foreign exchange generation, economic growth and livelihoods improvements. Thus, despite the challenges observed in addressing the three components of MLUM, it is worth maintaining the area since the conservation benefits outweigh the cost of losing it.

During consultations, stakeholders acknowledged that NCA is experiencing ecological problems to balance conservation of natural and cultural resources, community development and tourism development. Representatives from 25 villages of NCA and members of NPC proposed that a “Status Quo” i.e. allowing people to continue with their activities under indigenous knowledge application and strict enforcement of actions provided in GMP should be the future option for managing the multiple land use area. Other stakeholders’ groups suggested four different options including; (i) maintain status quo (ii) Annexing some areas on the periphery of NCA to resettle humans and livestock; (iii) Demarcating NCA into two distinctive zones - one for humans and livestock and the other for natural resources conservation; (iv) Reducing humans and livestock to maintain limits of acceptable use; and (v) Disregarding MLUM and relocate people and livestock outside NCA (Table 18).

If the proposed scenario of status quo was to be adopted and assuming that total TLUs would remain at 228,955 as it was in 2017, the TLUs per capita will drop to 1.0 by 2038. This means that supplementary food to pastoral community in NCA will increase to about 87%, which is far worse than the current situation of 70%. Even if the area was left solely for livestock and an average annual human population growth rate remains at 3.5%, the population will increase over two-fold to about 200,000 people by 2038. TLUs will grow up to 1,150,000 by 2032, but thereafter start to decline and reach 800,000 TLUs by 2038 due to rangelands degradation and deterioration. If the wish of the Government is to have perpetual NCA, the indigenous pastoralists and their representative organ (NPC), the option of status quo will not be feasible to sustain co-existence of people, livestock and wildlife.

The Team of Experts merged suggestions 2, 3 and 4 above and formed one option of maintaining MLUM with adjustments (Appendix 1). Under this option it is suggested that some areas from Loliondo, Longido (Lake Natron) and Monduli (Mto wa Mbu GCAs) be annexed to the current NCA. Relocation of immigrants outside the area and voluntary **resettlement of indigenous residents be conducted to maintain only 34,632 (20,000 in**

NCA & 14,632 in Gilai meirugoi) people with livestock totaling 189,264TLUs (29,264 TLU from Gilai) in the new proposed NCA. Analysis revealed that with this option, LHUs accounted for by wild herbivores will increase from 121,742 that was estimated in 1994 (Boone *et. al*, 2002) to approximately 186,099TLUs because by assuming that all other variables will remain constant, the optimal carrying capacity for both wild and domestic herbivores will expand from 250,925LHUs that was estimated in 1994 (Boone, *et. al.*, 2002) to 375,363LHUs. In order to maintain livestock composition of the 1960, small stock population should be maintained at about 153,800 and cattle at around 248,410 animals accounting for 6% and 94% of total 189,264TLUs respectively. An estimated human population of 20,000 people in NCA (about 5,000 households) and their livestock will continue to reside in the new proposed NCA with strict control according to the four suggested zones and one sub-zone. In the annexed area of Lake Natron, about 14,632 people will be accommodated at Gilai Meirugoi ward (about 3,000 households), some households will also be included from Engaresero and Pinyinyi villages after annexation from Ngorongoro district. TLUs per capita will, therefore, be 8.0 for the entire period up to 2038, implying that all food requirements will come from livestock. Nonetheless, because some locations within the proposed settlement and development zone can support small-scale crop production, with this option it is possible for future NCA residents to produce agricultural food particularly legumes and vegetables to complement pastoral diet.

Predictions of the option that suggests abolishing the model indicated that resettling all people and livestock outside NCA and leave the area exclusive for wildlife and habitat conservation would be costly, availability of land to accommodate about 100,000 people may be a challenging endeavour and the exercise may face antagonism from those identified for relocation and the hosting community, particularly in areas of culture differences as was experienced with 159 families that were resettled at Jema Village, Salei Division in Ngorongoro District between 2007 and 2010.

Table 18: Stakeholders opinions and views on NCA model (Appendix 1)

S/N	Stakeholders' names	Key Comments	proposed options
1	TFS, WD, CAWM-Mweka, NCAA-Board, TATO, HAT, TTGA, TTB, National Museum, UDSM, WWF-TCO, TWPF, Ngorongoro-DC, Ngorongoro-CMT, Lodges, FZS, SUA, NGOs, NCAA, NPC, Meatu-CMT, MGR, NCA (VEOs, WEOs, VCs), Political Leaders (NDC)	Very high human and livestock population; poor roads; revisit governance issues; GMP & CSP are not followed; MLUM is the selling point for NCA; Invasive plant species is wide spread; Reduce number of small stock; social services e.g. schools be outside NCA; Educate all children in NCA	Retain MLUM but reduce number of people and livestock to acceptable minimum.
2	TAWIRI-HQ, SWRC, National Museum, UNESCO Commission, TANAPA, TAOA, TWPF, TFS, WD, NM-AIST, SUA, TCT, Longido-CMT, Monduli-CMT, Karatu-CMT	Very high human and livestock population, extensive habitat destruction has caused invasive alien & pioneer plant species; Spoon feeding is affecting communities psychologically; Retain cultural bomas; Majority of Maasai families have dual settlements; Resettlement of Maasai in NCA will not be a new event in Tanzania.	Abandon MLUM by relocating people to establish Ngorongoro Nature Reserve. Retain historical bomas for cultural tourism.
3	FZS, TAWA, indigenous residents in NCA, NCAA staff	High human and livestock population; Restriction to cultivate is affecting food security; NCAA is causing poverty; invasive plant species is wide spread; Improve roads; Reclaim original boundary of NCA from Eyasi, Ndutu, Karatu & Sale division; Allow maasai to build decent houses; Involve community in decision making.	Zoning the NCA and de-gazette some areas for people to grow crops and the rest be for conservation and tourism
4	Indigenous residents in NCA, TTGA	There is no serious problem except that NCAA is restricting livestock access to three craters, NHFR and Ndutu marsh	Maintain the status quo
5	SUA, TAWIRI, CAWM-Mweka, TANAPA, Ngorongoro CMT, TAWA	The area is small to accommodate high human and livestock population	Annex some areas like Loliondo GCA.

2. Future Management Options

Based on key findings, analysis of current situation and prediction of the future under different options the Team of Experts believe that two options can be adopted to guarantee sustainable conservation of NCA. However option one, which is to maintain multiple land use model with some adjustments has more advantages economically, socially, culturally, politically and internally than the one that advocates for changing NCA to other protected area category. Environmentally and ecologically both options have more or less similar merits at least within the next twenty years up to 2038. In view of the above, key considerations; strengths and weaknesses of both options are presented as follows:

2.1. Key conditions for maintaining multiple land use model with some adjustments

Alter existing boundary of NCA: The proposal aims to include Loliondo GCA (1,500 km²) in Ngorongoro district (Appendix 11), part of Lake Natron GCA in Longido district and a site that contains Engaruka ruins and part of Upper Kitete-Selela wildlife corridor in Mto wa Mbu GCA in Monduli district. To enhance the ecosystem function, there should be a mechanism to protect NCA– Upper Kitete- Selela – Manyara Ranch wildlife corridor to connect SME with Lake Natron – Manyara – Tarangire ecosystem (Figure 27). Located in Monduli District are Engaruka historical site, which also contains an important catchment forest that is being degraded by overgrazing causing and resulting into gully erosion and Oldonyo Lengai; one of the remaining active volcano mountains in the country. Also, Lake Natron is the only breeding site of lesser flamingo in Eastern Africa, contains hot springs and hominid footprints and its shores are important rangeland for rare species like the Oryx. The aim of the proposed annexation is to maintain conservation of core areas, tourism and community development (Appendix 2, 3 &4).

According to Wildlife Conservation Act No. 5 of 2009, settlements and human activities are not allowed in GCAs; therefore, the proposed alteration will legalize existing settlements and human activities in Lake Natron GCA as well as part of Mto wa Mbu and avoid resettlement inconveniences to residents in those areas. Also, the proposition aims to enable settlement and development to communities as opposed to current situation in GCAs. In terms of conservation, altering of boundaries will enhance gene flow from different wildlife populations between ecosystems. Further, the boundary alteration will increase tourism products under the management of NCAA, which will ultimately increase stay-days and the resulting revenue from tourism. The boundary alteration will increase the size of NCA for about 50% from the current size of 8,100km² to 12,404 km², which is an increase of about 4,304km² (Table 19).

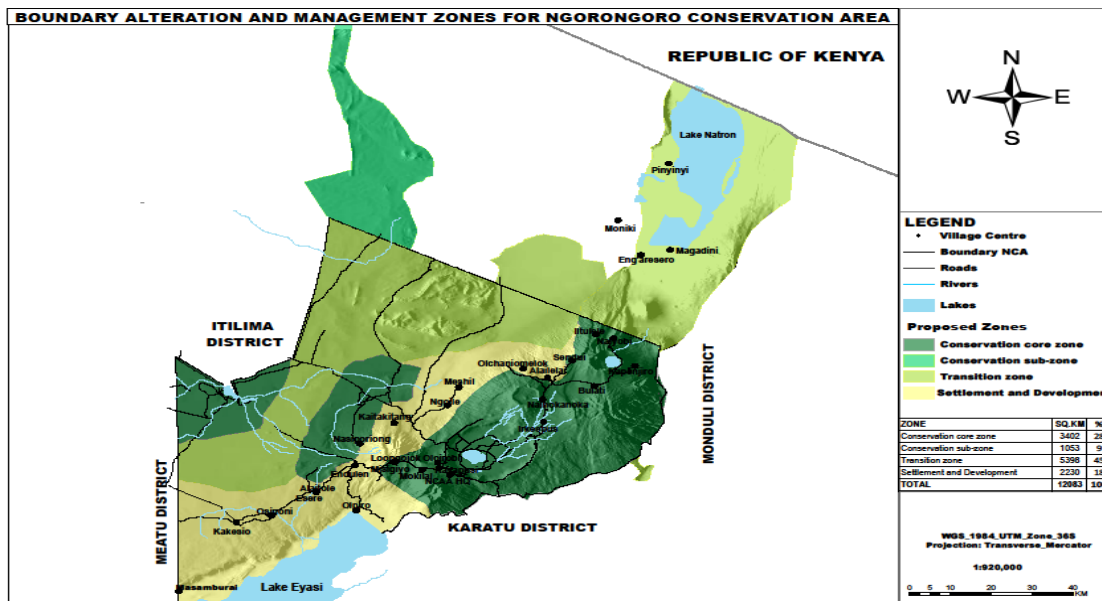


Figure 27: Proposed boundary alteration and management zones

The boundary alteration will increase the size of NCA from the current size of 8,100km² to 12,404 km², which is an increase of about 4,304 km² (53.14%) (Table 20).

Table 19: The new size of NCA after boundary alteration

Proposed management zones	Area (Km ²)	Percentage
Conservation core zone	3,326	26.8
Conservation sub-zone	1,053	8.5
Settlement and Development	2,629	21.2
Transition zone	5,398	43.5
Total	12,404	100

- i. Reduce human and livestock population based on scientific recommendations (Boone et al., 1994; UNESCO 2009), and the Grazing Lands and Animal Feeds Resources Act No. 13 of 2010. This recommendation involves;
 - a. **Non-indigenous residents:** Based on the requirement of NCA Act, this group of people should be asked to return to their original homelands. There are three categories of non-indigenous residents including those who moved in NCA to conduct crop production when a ban on cultivation was relaxed in 1992 and subsequent years, those who were compensated and moved out of the area in 1975 when crop

production was prohibited and their descendants but decided to come back and those who were civil servants and religious workers and their descendants who decided to remain in NCA after retirement (Appendices 1, 3 & 4).

b. Resettlement of indigenous residents: Since this group is legally residing in NCA, negotiations shall be conducted between the Government and those interested to move out of NCA on an attractive incentive package to enable them move into areas of their choice. Negotiations shall be participatory and include concerned families, NCAA, experts and traditional leaders. There shall be time to implement this recommendation (Appendices 1-4).

Construction of a modern school outside or in settlement zone on the periphery of NCA:

Modern secondary schools shall be established outside or in the settlement zone where pupils shall be prepared and make them realize development opportunities available outside NCA to encourage them to resettle after their studies.

d. Resettlement scheme: The scheme shall be handled in three levels – i) resettlement within NCA should be strictly for indigenous residents, ii) resettlement in altered boundaries, and iii) voluntary resettlement whereby compensated indigenous residents will move to other places of their choices (Appendix 5); and

e. **Development of social services infrastructure:** Social service infrastructure shall be established in proposed zones designated for settlement and community development. These will include schools, health facilities, water supply facilities, livestock health centers and religious facilities. Notwithstanding this proposal, establishment of social infrastructure and settlement in the development zone shall be conducted according to the Land Use Planning Act No. 6 of 2007. Section 45(1) specifies that any approved plan shall apply to the area or zone to which it relates whether or not it is embodied in a local government authority by law. It stipulates further that every person, agency or relevant planning authority shall comply with the requirements of the approved plan (Appendix 5).

f.

iii. Strengthening institutional collaboration: to improve capacities of different Management Authorities and institutions and other collaborating organizations to effectively manage natural resources, community and tourism development in NCA and neighboring areas. Specifically, there should be a consideration to establish collaboration between Tanzania and Kenyan institutions to address natural resources management, human livelihoods and livestock development issues in SME. Maasai is a cross border tribe; hence, the challenges experienced in NCA are likely to exist in areas adjacent to Maasai Mara National Reserve.

iv. Review the existing Ngorongoro Conservation Area Act to:-

- a) Embody GMP into NCA Act to recognize natural and cultural resources conservation zone (no-go-zone), transitional zone (regulated use zone – i.e. grazing only and no settlement), and community development zone (settlement, crop production, grazing, and other regulated uses).
 - b) Restructure and embody NPC into NCA Act to guide establishment, appointment of members, functions, and the link between NCAA and NDC (Appendix 6).
 - c) Strengthen legal compliance and enforcement;
-
- i. Enhance natural resources and environmental education and awareness to indigenous residents;
 - j. Introduce adult education to indigenous residents to reduce illiteracy level;
 - k. Regulate tourism development by encouraging construction of hotels and lodges outside NCA, development of tourism products to diversify tourism activities inside NCA (including activities that involve communities);
 - l. Introduce rangeland rehabilitation programme; and
 - m. Enhance participatory management in conservation, community development and tourism.

2.1.1. Strengths

- i. Existence of political will to address challenges facing NCA;
- ii. Assurance of maintaining co-existence of conservation, tourism and community development in NCA;
- iii. The existing NCA Act, Cap. 284 and GMP embrace multiple land use model;
- iv. Revised NCA Act will resolve conflicting policies and laws;
- v. Retain its national and international recognition and designation;
- vi. Avoid community unrest from the fear of unknown with regard to government decision on their existence in NCA;
- vii. Minimize human-wildlife conflicts;

- viii. Improved revenue generation through diversification of tourism products;
- ix. Improved social services and livelihoods;
- x. Possibilities to acquire land for voluntary relocation, removal of immigrants, and establish special resettlement scheme. For example, replicating Jema resettlement scheme with improvements;
- xi. Improve human settlement and livestock grazing in designated community development zones;
- xii. Existing NCA capacity to execute conservation, tourism and community development activities;
- xiii. Enhanced community participation in conservation and tourism development;
- xiv. To retain about 25% of tourist entry fee that NCA may lose from returning visitors when construction of the Kleins-Mto wa Mbu Road that traverses Loliondo and Lake Natron GCAs by encompassing part of the road stretch in the proposed portion for annexation to NCA;
- xv. If the two proposed options are ignored in favour of maintaining the status quo or leaving NCA to indigenous pastoralists the government will lose 50% of expected revenue by 2038; and
- xvi. Maintaining 50% of expected revenue from tourism that NCA may otherwise lose when all wildlife will have been extirpated before 2038 by maintaining the status quo or leaving NCA exclusively for habitation and livestock keeping. In a 2008 study about 50% mentioned that they visited NCA to see wildlife variety and abundance, wildlife migration, rhinos in their natural habitat and pristine environment.

2.1.2. Weaknesses

- i. If not controlled, increased human population will affect conservation, tourism and humans;
- ii. If not controlled in terms of numbers per household, increased livestock will affect conservation of natural resources and environment;
- iii. If not appropriately handled, resettlement may not be desirable to some pastoralists, politicians and CSOs; and
- iv. If not controlled, conflict of interest among NCAA staff and other non-residents will affect execution of NCAA obligations.

2.2. Key conditions for Changing NCA to other protected area category

- i. The area can be designated as a National Park, or Game Reserve. The category of national park permits photographic tourism, game viewing and research, while the category of GRs permits photographic tourism, tourist hunting and research. Both categories prohibit human settlement and development such as livestock grazing and crop production. As such designating NCA into either of the two will mean abolishing MLUM and relocating people to other places;
- ii. Redefine the management of NCA based on the conservation category that will be adopted; and
- iii. Review the existing NCA Act to reflect other protected area category.

2.2.1. Strengths

- i. Existence of political will in addressing challenges facing NCA;
- ii. Increased protection status in favour of conservation and tourism;
- iii. Removed communities will diversify socio-economic activities outside NCA. For example, livestock, crop production and other Income Generating Activities;
- iv. Minimize human-wildlife conflicts to neighboring communities;
- v. Improved quality of social services and livelihoods in resettled areas;
- vi. Improved human settlement and livestock grazing in resettled areas;
- vii. Maintain ecological integrity and biodiversity;
- viii. Possibilities to acquire land for voluntary relocation, removal of immigrants, and establish special resettlement scheme (i.e. replicating Jema Resettlement scheme with some improvements); and
- ix. Existing experience of relocating people (e.g. Ujamaa villages 1974, naturalization of Somali-Zigua at Chogo village in Handeni, and resettlement project by NCAA in Jema village).
- x. Maintaining 50% of expected revenue from tourism that NCA may otherwise lose when all wildlife will have been extirpated before 2038 by maintaining the status quo or leaving NCA exclusively for habitation and livestock keeping. In a 2008 study about 50% mentioned that they visited NCA to see wildlife variety and abundance, wildlife migration, rhinos in their natural habitat and pristine environment.

2.2.2. Weaknesses

- i. Total removal of people from NCA may not be supported by some pastoralists, politicians and CSOs;
- ii. Ignore co-existence of conservation, tourism and community development in NCA;
- iii. Loss of international recognition as a multiple land use area;
- iv. Discourage community participation in conservation and tourism development; and
- v. Antagonism between families to be resettled and hosting community may arise and more profoundly if the two communities are of different ethnic groups that differ in their culture and mode of production.

3. Strategies for the Future

Based on the proposed management options, the following short, medium and long term actions are proposed: -

3.1. Short term actions (2020 – 2023)

- i. Implement natural resources and environmental education and awareness creation programmes;
- ii. Enhance NCA and sectoral capacities and coordination: There is need to adhere to the objectives of NCA through enhancement of NCA, districts, local communities and other stakeholders' capacities to effectively manage and benefit from the ecosystem. The following areas need considerations:-
 - a. Strengthening staff including those from sector ministries, NCAA and Ngorongoro LGA on capabilities for management and field operations especially extension services;
 - b. Improving communication and information delivery among stakeholders;
 - c. Developing monitoring and evaluation frameworks;
 - d. Improving mechanisms to engage and benefit indigenous residents; and
 - e. Enhancement of training and awareness creation on policies and legislation, regulations and guidelines related to MLUM to indigenous residents.

- iii. Review Ngorongoro Conservation Area Act to adequately address relevant issues related to conservation, tourism development and community development, institutional collaboration and mandates and strategies to deal with previous and current challenges facing NCA;
- iv. Enhance law enforcement by developing regulations to operationalize NCA;
- v. Revise the current GMP in accordance to approved adjusted MLUM and reviewed Act;
- vi. Restructure NPC and its mandate (Appendix 6);
- vii. Negotiate and facilitate interested NCA residents to settle outside the area;
- viii. Enhance participatory management to engage indigenous residents and neighboring communities in planning, decision making and monitoring;
 - a. Develop and implement community-based conservation (CBC) framework in collaboration with other conservation institutions and stakeholders (e.g. TANAPA, private sector and NGOs) through:-
 - b. Establishing natural resources and environment management institutions/committees in neighboring villages;
 - c. Introducing and supervise various CBC scheme including WMA, Community Based Tourism and other benefit sharing mechanisms; and
 - d. Promote sustainable use of natural and cultural resources.
- vii. Introduce adult education to indigenous residents to reduce illiteracy level in collaboration with the respective Ministry and Local Government Authorities;
- viii. Regulate tourism development and activities in accordance to GMP.

3.2. Medium term actions (2020 – 2025)

- i. Implement education and awareness creation programmes particularly on family planning and entrepreneurship;

- ii. Alter existing boundary of NCA to include Loliondo GCA (1,500 km²) and part of Lake Natron GCA (2,804.14km²), Engaruka historical site as well as Upper Kitete-Selela wildlife corridor in Mto wa Mbu GCA to increase land size for conservation, tourism and community development (Figure 27);
- iii. Comply with GMP requirements;
- iv. Relocate people and livestock to designated areas based on acceptable limits and the requirement of GMP by respective management zones;
- v. Continue with negotiation, encouragement and facilitation of interested NCA residents to settle outside the area;
- vi. Develop social services in community development zones according to GMP;
- vii. Enhancing capacity and coordination to effectively manage NCA; and
- viii. Implement participatory management programmes especially in community development zones and communities neighboring NCA.

3.3. Long term actions (2020- 2029)

- i. Continue to implement education and awareness creation programmes on all issues that promote sustainability of adjusted MLUM;
- ii. Continue to develop social services infrastructure in community development zones according to GMP;
- iii. Continue with negotiation, encouragement and facilitation of interested NCA residents to settle outside the area;
- iv. Establish and operationalize institutional collaboration between NCAA and other collaborating authorities and institutions in Tanzania and Kenya;
- v. Strengthen border security to regulate movement of people, livestock between Tanzania and Kenya.
- vi. Strengthen communication among institutions and other stakeholders particularly indigenous residents;
- vii. Implement participatory management programmes; and
- viii. Promote good governance practices through:-
 - a. Transparency and accountability,
 - b. Access to information,

- c. Rule of law,
- d. Bureaucratic efficiency, and
- e. Avoiding conflict of interest among staff, non-residents and other participating stakeholders. .

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ANNEXES

Annex 1

PROPOSED MANAGEMENT ZONES, IMPORTANCE AND USES

N o.	Area	Management zone	Ecological/ Economic Importance	Uses	Remarks
1	Northern Highland Forest Reserve (NHFR) <ul style="list-style-type: none"> • Ngorongoro crater • Olmoti crater Empakai Crater 	Core conservation zone	<ul style="list-style-type: none"> • Conservation • Wildlife refuge • Water catchment • 	<ul style="list-style-type: none"> • Tourism development • Research and training • Conservation 	<ul style="list-style-type: none"> • Restricted to communities • Protection of endangered and threatened species esp. rhinos and elephants and plants
2	Oldupai Gorge and Laetoli footprints	Core conservation zone	<ul style="list-style-type: none"> • Major cultural, historical and archaeological sites • Geopark • Conservation 	<ul style="list-style-type: none"> • Research and training • Tourism development • Conservation 	<ul style="list-style-type: none"> • Restricted to communities
3	Lake Ndutu/ Masek Basin	Core conservation zone	<ul style="list-style-type: none"> • Conservation • Water catchment • Marshes and feeding area for water birds 	<ul style="list-style-type: none"> • Tourism development • Research and training • Conservation 	<ul style="list-style-type: none"> • Restricted to communities
4	Engaruka historical site	Core conservation zone	<ul style="list-style-type: none"> • Cultural, historical (ruins) and archaeological site • Geopark • Water catchment 	<ul style="list-style-type: none"> • Tourism development • Research and training • Conservation 	<ul style="list-style-type: none"> • Restricted to communities

N o.	Area	Management zone	Ecological/ Economic Importance	Uses	Remarks
5	Selela village forest reserve area	Core Conservation zone	<ul style="list-style-type: none"> • Conservation • Water catchment • Wildlife corridor especially elephants 	<ul style="list-style-type: none"> • Tourism development • Research and training • Conservation 	<ul style="list-style-type: none"> • No settlement • No grazing • No crop production • Protection of migratory route, esp. elephants from NCA to Manyara and Tarangire NP is crucial. • Reducing human-wildlife conflicts.
6	Lake Natron and its escapement and basin (Gilai meirugoi ward)	<ul style="list-style-type: none"> • Transition zone. • Settlement and development (Magadini, Londulo & Meirugoi villages) 	<ul style="list-style-type: none"> • Water catchment • Cultural, historical and archaeological sites • Geopark • Flamingo breeding sites • Habitat for rare wildlife species – e.g. Oryx • Oldonyo Lengai active volcanic mountain • Conservation • Hot springs • Water falls • Foot prints 	<ul style="list-style-type: none"> • Research and training • Tourism development • Conservation • Livestock grazing • Settlement 	<ul style="list-style-type: none"> • limited settlement • seasonal grazing • controlled crop production • Protection of L. Natron against siltation • Protection of Flamingo breeding sites

N o.	Area	Management zone	Ecological/ Economic Importance	Uses	Remarks
7	Loliondo GCA (1,038 km ²)	Core conservation sub zone	<ul style="list-style-type: none"> • Water catchment • Buffer zone to SENAPA and NCA • Breeding and dispersal area • Wildlife migration route • Conservation 	<ul style="list-style-type: none"> • Tourist development • Research and training • Conservation 	<ul style="list-style-type: none"> • No settlement • No grazing • No crop production • Tourism activities – e.g. trophy hunting
8	Loliondo GCA (462 km ²)	Transition zone	<ul style="list-style-type: none"> • Wildlife migration • Conservation • Tourism 	<ul style="list-style-type: none"> • Livestock grazing • Conservation • tourism 	<ul style="list-style-type: none"> • Reducing human-wildlife conflicts
9	Oldonyo Gol & west of Kakesio	Transitional zone	<ul style="list-style-type: none"> • Buffer zone • Maasai pastoralists • Datoga • Hadzabe 	<ul style="list-style-type: none"> • Seasonal livestock grazing • Conservation 	<ul style="list-style-type: none"> • No settlements • No crop production • Limited uses – e.g. seasonal grazing
1	Eastern part of Endulen, Osinoni, Kakesio and Eyasi	Community development zone	<ul style="list-style-type: none"> • Datoga agro-pastoralists • Hadzabe hunter-gatherers • Maasai pastoralists 	<ul style="list-style-type: none"> • Settlement/ registered villages • Livestock grazing • Establish pasture development programme • Crop production • Community based tourism 	<ul style="list-style-type: none"> • Human population growth and infrastructure development controlled within limits of acceptable use.

Annex 2:

PROPOSED RESETTLEMENT PLAN

No.	Current Settlements and ward		Proposed villages and wards		Remarks
	Ward	Villages/ settlements	Ward	Villages	
1	Kakesio	<ul style="list-style-type: none"> • Kakesio, • Osinoni, 	Kakesio	<ul style="list-style-type: none"> • Kakesio, • Osinoni, 	
2	Eyasi	<ul style="list-style-type: none"> • Olpiro, • Masamburai 	Eyasi	<ul style="list-style-type: none"> • Olpiro, • Masamburai 	Consideration for minority group and physical barrier was the reason to make a separate ward
3	Alaetoli	<ul style="list-style-type: none"> • Esere, • Laetoli 	None	<ul style="list-style-type: none"> • None 	Alaetoli ward is abolished
4	Endulen	<ul style="list-style-type: none"> • Endulen, • Nasipaoriong', 	Endulen	<ul style="list-style-type: none"> • Endulen, • Nasipaoriong', • Esere, 	Esere village is annexed to Endulen
5	Ngorongoro	<ul style="list-style-type: none"> • Oloirobi, • Kayepus, • Mokilal 	Settlements/ or No settlements	Mokilal	Oloirobi and Kayepus villages are abolished
6	Misigiyo	<ul style="list-style-type: none"> • Misigiyo, • Loongoijoo, • Kaitekiteng 	None	Misigiyo	Misigiyo, Kaitekiteng and Loongoijoo are abolished
7	Ngoile	<ul style="list-style-type: none"> • Ngoile 	Olbalbal	<ul style="list-style-type: none"> • Ngoile, • Meshili, • 	Ngoile ward is abolished
8	Meshili	<ul style="list-style-type: none"> • Meshili 	None	<ul style="list-style-type: none"> • None 	Meshili ward is abolished
	Alaelilai	<ul style="list-style-type: none"> • Alaelilai, • Sendui, • Alchaneome lock 	Alaelilai	<ul style="list-style-type: none"> • Alaelilai • Alchaneome lock • Bulati 	Bulati village is annexed to Alaelilai and Sendui is abolished

9	Nainokanoka	<ul style="list-style-type: none"> • Nainokanoka, • Erkeekpus, • Bulati 	None	<ul style="list-style-type: none"> • None 	Nainokanoka Erkeekpus are abolished
10	Naiyobi	<ul style="list-style-type: none"> • Ittulele, • Naiyobi, • Kapenjiro 	None	None	Naiyobi ward and its villages is abolished because of risk of active volcano of Lengai
11	None	None	Gilai meirugoi	<ul style="list-style-type: none"> • Magadini • Meirugoi • Londoluo 	Ward is annexed from Longido district