

# Chapter 12

## Conservation of Large Mammals in the Face of Increasing Human Population and Urbanization in Tanzania



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**Abstract** Tanzania, like many other developing countries, has experienced rapid population growth and urbanization in the past five decades. Its population has grown from 8,000,000 in 1961 to over 50,000,000 currently, and this population is projected to double in the next two decades. This growth is also notable around the wildlife-protected areas. Using existing literature and personal experience, this chapter reviews the major aspects related to wildlife conservation in relation to human population growth and urbanization. Using examples from different parts of Tanzania, this chapter provides highlights on the trends and causes of human population growth and urbanization in areas bordering wildlife-protected areas and the effects brought about by these trends. The chapter presents the repercussions caused by these trends on the population of large mammals and other wildlife species. Recommendations are provided on how best to minimize the negative impacts that human population growth and urbanization cause on large mammals.

**Keywords** Large mammals · Human population growth · Urbanization · Wildlife protected areas · Tanzania

### 12.1 Introduction

Conservation concern over large mammals is growing globally, largely due to their ecological importance and vulnerability to extinction (Morrison et al. 2007; Di Marco et al. 2014; Craigie et al. 2010; Ripple et al. 2015; Diplock et al. 2018). Large mammals are also a big tourism draw offering opportunities for both

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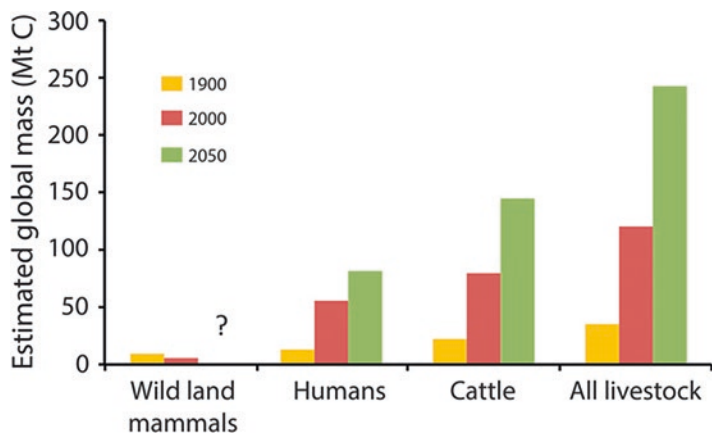
photographic tourism and trophy hunting, and consequently, contributing significantly to local and national economies (Okello and Grasty 2009; Naidoo et al. 2011; Arbieu et al. 2017; Maciejewski and Kerley 2014; Baldus and Cauldwell 2004; Lindsey et al. 2007a, b).

Despite several decades of conservation efforts, large mammals are increasingly being subjected to a risk of extinction globally. Since the 1970s, a quarter of the global populations of carnivore and ungulate species have declined toward extinction (Di Marco et al. 2014), while the populations of African large mammals are estimated to have fallen by 60%, both within and outside the protected areas (Craigie et al. 2010). In East Africa, long-term data collected in the past 50 years show a drop of large mammal populations to less than 50% (Craigie et al. 2010; Diplock et al. 2018).

The risk of extinction is well documented for individual species of large mammals including umbrella and keystone species. For instance, Africa has lost over 60% of its lion (*Panthera leo*) population (almost 100,000 animals) that survived in the past 50 years (Hance 2012). The species is currently considered extinct in Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Mali, Rwanda, and Togo (Riggio et al. 2013). The population of African elephant (*Loxodonta africana*) dropped from 3 to 5 million in the 1930s and 1940s, to 1.3 million in the 1970s (WWF 2015), and to approximately 350,000 in the early 2010s (Skinner 2014; Chase et al. 2016). The black rhino (*Diceros bicornis*) population declined to 2.4% of the 1960 population (Emslie 2012). The declining trend is also recorded for mountain gorilla (*Gorilla beringei beringei*) and Grevy's zebra (*Equus grevyi*). The population remaining for the two species is below 900 and 2000, respectively (AWF cited in Kideghesho 2016a, b).

The decline of large mammals is attributed to growing anthropogenic-induced stresses on habitats and species; the main drivers being population growth and urbanization (Di Marco et al. 2014; Daskin and Pringle 2018). Human population growth and urbanization have been taking place in tandem with habitat conversion to alternative uses, such as settlements, croplands, factories, and other infrastructures (Songorwa 2004; Kideghesho et al. 2006; Hance 2012). The 60% loss of lion population in recent years is attributed to a loss of over 80% of the species' historic range (Riggio et al. 2013), and retaliatory or preemptive killing for protection of human life and livestock (Ikanda and Packer 2008; Lyamuya et al. 2014).

About 75% of the Earth's ice-free land is considered to have been altered by humans to some degree since the beginning of twenty-first century (Watson et al. 2016), and two thirds of these human-altered areas have completely lost their native vegetation (Pardini et al. 2017). In the past 10,000 years ago, large mammals, including elephants, tigers, rhinos, whales, and kangaroos, made up over 99% of the mass of all the mammals on the earth, while the proportion of humans, livestock, and pets was only below 1% (Population Media Centre 2011; Ripple et al. 2015). Currently, 96–98% of the earth's mammals are composed of humans, pets, and livestock, leaving the wild-land mammals declining to less than 5% (Fig. 12.1). Recent studies have reported a loss of about 70% and 75% of Africa's forest and savanna



**Fig. 12.1** Global change in the collective mass for wild mammals, humans, cattle, and all livestock for the years 1900–2050

ecosystems, respectively (Hance 2012). The two ecosystems constitute critical habitats for large mammals.

Correspondingly, wildlife killing, pollution, and the introduction of exotic species increase with the increasing human population (Campbell and Hofer 1995; Milner-Gulland and Bennett 2003; Metzger et al. 2010; Bitanyi et al. 2012). Many wild mammals are killed, legally or illegally, for their meat and trophies to meet an increasing demand for sustenance and commercial purposes (Riggio et al. 2012; Campbell and Hofer 1995; Milner-Gulland and Bennett 2003; Metzger et al. 2010; Bitanyi et al. 2012; Kideghesho 2016a, b; Ripple et al. 2016). On the other hand, as habitats shrink due to expansion of human activities and urban land cover, interactions or contacts between humans and wildlife increase. Subsequently, human–wildlife conflicts become evident through crop damage, livestock depredation, and wildlife-induced accidents. Occasionally, people resort to preemptive or retaliatory killing against problem or dangerous animals (Ikanda and Packer 2008).

The population growth in wildlife areas is attributed to both immigration and natural increase (Campbell and Hofer 1995; Kideghesho et al. 2006; Metzger et al. 2010). The need for agricultural and grazing land, mining resources, easy access to bushmeat and other wildlife resources, and employment opportunities are cited as the major population-pull factors to wildlife-rich areas (Campbell and Hofer 1995; Metzger et al. 2010; Bitanyi et al. 2012).

Urbanization is directly correlated to human population growth. Urban areas constitute one of the fastest growing land-use types. The increasing trend of urbanization extends to wildlife areas and, thus, poses a critical management challenge to biodiversity and large mammals, in particular (McKinney 2008; McDonald et al. 2008; Seto et al. 2012). The global urban land cover in the vicinity of protected areas is projected to triple by 2030 (McDonald et al. 2008; Güneralp and Seto 2013; Elmqvist et al. 2016).

The rate of increase in urban land cover is predicted to be the highest in Africa at 590% over the levels observed in year 2000 (Seto et al. 2012) with the urban land-cover near-protected areas increasing by almost 20 times (Elmqvist et al. 2016). Africa's urban land within the boundaries of protected areas in the year 2000 was about 500 km<sup>2</sup>. However, by 2030, urbanization within 50 km of protected areas on the continent is projected to exceed 140,000 km<sup>2</sup> (Güneralp et al. 2017). Impacts of urbanization are expected to hit the protected areas located in poor countries where institutional capacity is insufficient to adapt to new anthropogenic-induced stresses (McDonald et al. 2008).

Increasing urban land cover close to protected areas reduces effective conservation areas through the outright loss of wildlife habitats, habitat degradation, and fragmentation (McKinney 2008; Seto et al. 2012; Elmqvist et al. 2016). Other critical wildlife areas, such as wildlife corridors and dispersal areas, also suffer from urbanization (Caro et al. 2013; Jones and Davenport 2009; Jones et al. 2009; Davenport et al. 2010). The ultimate impact is extinction of native species and biodiversity loss (McDonald et al. 2008; McKinney 2008; Seto et al. 2012; Elmqvist et al. 2016; Güneralp et al. 2015).

Scientific predictions indicate that by 2030, impacts of urbanization on habitats will affect over 25% of vertebrate species classified by IUCN as endangered or critically endangered (Güneralp and Seto 2013). The species under threat include 139 amphibian species, 41 mammalian species, and 25 bird species (Seto et al. 2012). Africa and Europe have the highest proportions of species facing a risk from urbanization at 30% and 33%, respectively. McDonald et al. (2014) estimate about 80% loss of vertebrate species in all global ecoregions to every 10% expansion of urban land cover. Tanzania's wildlife species, including large mammals, are equally facing uncertain future due to stresses induced by human population growth and rapid urbanization.

This chapter recognizes the importance of Tanzania in terms of biodiversity hotspots and diversity of large mammals, along with efforts in place to protect these assets. Drawing examples from different parts of Tanzania, the drivers and impacts of human population growth and urbanization on the conservation of large mammals are reviewed. Figure 12.2 provides a scope of the review and discussion of these drivers and impacts.

## 12.2 Tanzania: Large Mammals and Conservation Efforts

Tanzania, having 6 of the 25 globally known biodiversity hotspots, is home to about 20% of Africa's large mammals (URT 2014). The mammals and other wildlife groups have elevated the country as a globally popular tourism destination. Consumptive and nonconsumptive forms of tourism are, by large, supported by wildlife, particularly large mammals, including elephants, rhinos, lions, leopards, and buffaloes. In the 2016 and 2017 financial years, the tourism sector accounted for 17.5% of the GDP and 25% of foreign exchange, ranking second after agriculture

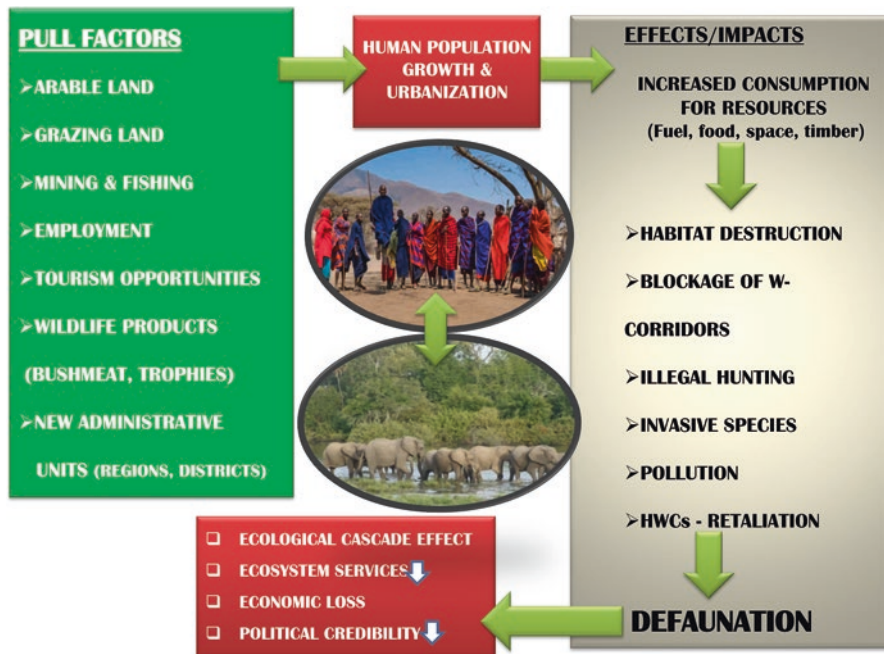


Fig. 12.2 The pull-factors and effects of human population growth and urbanization

Table 12.1 Coverage of wildlife-protected areas under different categories

PA category	No. of PAs	Land area (km <sup>2</sup> )	% of land area
1. National parks	16	57,167.50	6.05
2. Ngorongoro Conservation Area	1	8292.00	0.88
3. Game reserves	28	114,782.97	12.15
4. Game controlled areas	44	58,565.02	6.12
5. Ramsar sites	4	48,670.00	5.2
6. Wildlife management areas	38	29,518.40	3.00

Sources: URT (2018a)

(WWF 2015). The earnings from tourist hunting between 2011 and 2016 amounted to approximately US\$ 145 billion (URT 2018a).

Recognizing the importance of wildlife in Tanzania’s economy, the country has devoted over 30% of its land area for protection of wildlife. The areas under protection fall under different categories, namely, national parks, Ngorongoro Conservation Area, game reserves, game controlled areas, Ramsar sites nature reserves, and wildlife management areas (Table 12.1).

However, efforts that are being invested to conserve wildlife populations are often compromised by numerous challenges. There are documented declines of wildlife populations in many ecosystems of Tanzania due to illegal hunting, habitat loss, and wildlife diseases (Masanja 2014; Kideghesho 2016a, b; Mtui et al. 2017). Research-based literature indicates a clear linkage between human population growth and the level of these threats (Campbell and Hofer 1995; Songorwa 2004; Milner-Gulland and Bennett 2003; Metzger et al. 2010; Bitanyi et al. 2012).

### 12.3 Human Population Growth and Urbanization Trends

Tanzania has high rates of human population growth and rapid urbanization. The population has quadrupled from 12,313,469 in 1967 to 55,890,747 in 2019 (NBS 2020). The urban population has increased at approximately twice the rate of population growth or about 3% p.a., raising urbanization from approximately 6.3% in 1967 to over 33.8% in 2017 (World Bank 2019; Table 12.2).

Human population growth close to wildlife areas is mainly linked to human migration. Migration from one geographical locality to another is often employed as a strategy to respond to shocks, sustain livelihoods, and adapt to environmental changes (Walsh 2007; Kikula 1996; Rusengula 2014). Besides ecological benefits, Tanzanian ecosystems offer a variety of livelihood opportunities through good agricultural land, mineral resources, wildlife and forest products, arable and grazing lands, and space for settlements. The Tanzanian ecosystems are, therefore, major recipients of the human population from different parts of Tanzania.

### 12.4 Drivers of Human Population Growth and Urbanization

Drivers of human population growth and urbanization in the vicinity of wildlife-protected areas have political, economic, and social dimensions. Some of the factors include availability of natural resources (e.g., wildlife, fish, and minerals), suitable

**Table 12.2** Human population growth and urbanization trends in Tanzania (1967–2017)

Year	Total population	Urban population	Percent urban	Urban growth rate
1967	12,313,469	786,567	6.4	
1978	17,512,610	2,412,902	13.8	10.2
1988	23,095,878	4,247,727	18.4	5.7
2002	34,569,232	7,943,561	23.1	4.5
2012	44,928,923	13,305,004	29.6	5.2
2017	52,554,628	17,605,800	33.1	5.3

land for agriculture and livestock grazing, employment and other economic opportunities created by tourism, and formation of new administrative units. These factors are briefly discussed below.

### ***12.4.1 Availability of Wildlife Resources***

The Tanzania ecosystems attract people wishing to capitalize on the potentials offered by wildlife resources. Investment in wildlife-based tourism provides employment opportunities in hotels, tour companies, hunting industry, and self-employment through selling of souvenirs, investing in shops, bars, and other enterprises. Besides employment opportunities, wildlife products other such as bushmeat and trophies attract people to the areas. A case in point is Serengeti National Park where bushmeat is linked to population increase and increased settlements close to park boundaries (Bitanyi et al. 2012; Kideghesho et al. 2007).

### ***12.4.2 Demand for Arable and Grazing Lands***

Suitable land for agriculture, water, and grazing is one of the important factors attracting human populations to protected areas. Population growth, urbanization, and land conversion to different uses in many parts of the country have rendered the available land scarce and, therefore, these parts can no longer support people's livelihoods. This situation forces people to migrate and settle in new areas that can support their livelihood strategies.

The migration to wildlife-rich areas in search of pastures, arable land, and water is more notable among the major pastoral/agro-pastoral communities such as Sukuma, Maasai, Barbaig, Kurya, and Taturu (Tenga et al. 2008; Mwambene et al. 2014; Mtui et al. 2017; Rusengula 2014). For example, the Sukuma moved to Lake Rukwa Basin from the Lake Zone in 1967 and later to Usangu and Morogoro plains in 1972 (Mwambene et al. 2014). In the 2000s, after eviction from Ihefu Wetland (Usangu), they moved to Rufiji (Rusengula 2014), Lindi, and Ruvuma (Mwambene et al. 2014). The Maasai and Barbaig from northern Tanzania moved to Morogoro and Usangu plains before independence (Mwambene et al. 2014; Walsh 2007). Currently, the Sukuma and Maasai tribes are dominant in Kilombero Valley practicing agriculture and livestock keeping (Kabuye 2015). In the late 1990s, pastoralists from northern Tanzania settled in the open area south of the Katavi National Park while grazing cattle illegally inside the Park (Mtui et al. 2017).



### 12.4.3 Mining Opportunities

Along with hosting a variety of wildlife species, some areas are equally rich in mineral deposits. Some of these deposits are found in protected areas, wildlife corridors, and dispersal areas. Mineral deposits are found in or close to national parks (e.g., Serengeti, Katavi, and Lake Manyara) and game reserves (e.g., Kigosi, Muhesi, and Moyowosi). The presence of mineral deposits causes an influx of artisanal miners, especially young people, from different parts of Tanzania who perceive this as an opportunity to exit poverty.

### 12.4.4 Formation of New Administrative Units

Reclassification of new urban areas, mainly due to formation of new administrative units is not uncommon practice in Tanzania. The number of administrative regions in Tanzania mainland has grown from 17 in 1967 to 26 in 2016, an increase of 53%; districts increased from 85 to 185, equivalent to 118% (Table 12.3). In 2003, Manyara Region was created out of a portion of Arusha Region, followed by four more regions in 2012, namely, Geita, Katavi, Njombe, and Simiyu. Songwe Region was created from the western part of Mbeya Region in 2016. New administrative regions are formed in tandem with lower administrative units (districts, divisions, wards, and villages).

Formations of new administrative units attract populations to fill the newly created administrative and operational posts in the areas. Besides civil servants and their families, the new units also attract people wishing to take advantage of emerging economic opportunities and social services, such as business ventures, informal employment, water, and better health facilities. For instance, until 1974, Maasai land formed one administrative unit – the Maasai District. In 1967, the District had a population of 106,892 (Omri-Pack 1998). Out of this District, five new districts (Monduli, Ngorongoro, Kiteto, Simanjiro, and Longido) were established, and as of the 2012 population census, they had a total population of 1,002,875 (Table 12.4).

All districts above are endowed with wildlife resources, but they are also subjected to human pressure through poaching, habitat destruction, and blockage of

**Table 12.3** Trends of administrative units in Tanzania (1967–2018)

Year	No. of regions	No. of districts	No. of urban areas
1967	17	85	32
1978	20	95	110
1988	20	(?)	c. 170
2002	20	129	(?)
2012	25	159	c. 600
2018	26	185	(?)

Sources: URT (1967, 1988, 2002, 2012)



**Table 12.4** Population of selected districts bordering Tanzanian important wildlife areas in 1967 and 2012

Former district	Human population 1967	New districts	Human population 2012	% increase (1967–2012)
Maasailand	106,892 (Omri-Pack 1998)	Ngorongoro	199,879	853.8
		Monduli	182,275	
		Simanjiro	209,420	
		Kiteto	286,741	
		Longido	141,244	
Serengeti	158,984	Serengeti	282,080	267.6
		Bunda	250,050	
Ulanga	100,700	Ulanga	169,853	192.3
		Malinyi	128,460	
Biharamulo	73,301	Biharamulo	323,486	839.4
		Chato	365,127	
Magu	243,822	Magu	299,759	106.44
		Busega	203,597	

Source: [www.citypopulation.de](http://www.citypopulation.de)

migratory corridors. Some game controlled areas have lost their conservation value following increasing settlements and transformation into urban centers (e.g., the Headquarter of Kiteto and Hai Districts). However, the ecological impacts caused by formation of new administrative units (i.e., regions, districts, divisions, wards, and villages) have received minimal attention in scientific research.

## 12.5 Negative Impacts of Human Population Growth and Urbanization on Large Mammals

### 12.5.1 Loss or Weakening of Conservation Status to Some Protected Areas

With increased population, wildlife habitats and corridors are transformed into settlements, infrastructures, and croplands. Furthermore, demand for fuelwood, building material, furniture, and wildlife products (e.g., bush meat) increases (Kideghesho 2015). Some lands, previously gazetted as protected areas due to high diversity and concentration of large mammals, have remained as “parks in paper” since they are currently dominated by settlements and other infrastructures with virtually no wildlife species. Examples are Sanya-Lalatema, Mwadui Diamond and Mto wa Mbu Game Controlled Areas.

In Ngorongoro Conservation Area, the fate of Multiple Land Use Model, adopted in 1959, to take on board the conservation of wildlife, tourism development, and

interests of the resident pastoralists, is uncertain. The population in the protected areas has increased from approximately 8,000 when the area was established in 1959 to 93,136 today, an increase of over 1000%. This increase has been accompanied by a number of undesirable effects, including decrease of livestock per capita, increased invasive/unpalatable forage species, decreased food security and nutritional status, and conflicts due to perception held that wildlife is being accorded more priority at the expense of people (Galvin et al. 2015).

### ***12.5.2 Blockage of Wildlife Corridors***

One of the impacts of human population growth in Tanzania's large mammals is blockage and loss of wildlife migratory corridors (Hassan 2007; Kideghesho et al. 2006; Jones et al. 2009; Davenport et al. 2010). The fact that Tanzania conservation laws do not provide any legal protection to wildlife corridors has subjected them to further anthropogenic pressures. Consequently, the ecological roles of corridors in maintaining the viability of isolated populations, conserving ecosystem functionality, and preventing habitat degradation are undermined. Most of the corridors that previously linked protected areas are either already lost or critically threatened (Table 12.5).

A detailed assessment of wildlife corridors across the Tanzania mainland by Jones et al. (2009) identified 31 corridors linking different protected areas. Of these, 24 (77%) were classified to be under "extreme" or "critical" condition, implying that they were predicted to cease being functional within 5 years in the absence of some form of intervention (Caro et al. 2013; Jones et al. 2009, 2012; Davenport et al. 2010).

### ***12.5.3 Growing Pressure to Degazette the Protected Lands***

Human population growth and rapid urbanization have reduced land available for agriculture, livestock, settlements, and other livelihood-supporting activities. Consequently, encroachment into protected areas has been adopted as a strategy to surmount this scarcity. Virtually, all wildlife and forest-protected areas have villages or farms located within participating in illegal activities (Table 12.6; Fig. 12.3).

Encroachment into protected areas is frequently accompanied by antagonism between the protected areas' staff and the local communities. There are known cases where the lives of protected area staff have been threatened or government vehicles destroyed when staff were discharging their responsibilities (personal experience). Besides ongoing encroachment in many protected areas, local people sharing borders with protected areas often exert enormous pressure on government by demanding the opening of protected lands for community use (Kideghesho et al. 2005, 2006). An example of this scenario is the Maswa Game Reserve whose

**Table 12.5** Examples of wildlife corridors under threats in Tanzania due to expansion of human activities

Corridor	Species	Threats
Kilimanjaro-Amboseli (Kitendeni)	Elephants, zebra, wildebeest, Thomson's gazelles, and Grant's gazelles	Agriculture
Selous-Niassa	Elephants, wild dogs, buffalo, eland, impala, greater kudu, hartebeest, Roosevelt sable antelope, hippopotamus, leopard, lion	Settlements, land conversion for agriculture, and settlements on the major migratory routes lead to fragmentation of the ecosystem and increased human-wildlife conflicts; illegal logging, high-value poaching of ivory, uncontrolled fires, and prospecting/mining for uranium and other minerals
Manyara Ranch-Lake Natron (TNP to Lake Natron)	Wildebeest, zebra, elephant, giraffe, buffalo, and eland	The most immediate threat is increasing cultivation. Plans to tarmac the road to Loliondo via Natron are likely to negatively impact wildlife movement
Loazi-Ntantwa-Lwafi	Chimpanzee	Deforestation for charcoal manufacture, agriculture, poaching, and bushmeat (including chimpanzee) is exported from Tanzania across Lake Tanganyika for sale in the Democratic Republic of Congo
Udzungwa-Ruaha	Elephants, leopard, hyena, greater kudu impala, buffalo, and giraffe	Poaching, habitat clearing for farms, extensive grazing, irrigation schemes, and onion cultivation
Tarangire-Simanjiro	Migratory species are zebra, wildebeest, hartebeest, and oryx, and they move between 10 and 110 km out of the park	Agricultural expansion, bushmeat hunting, and resident hunting have reduced wildebeest, hartebeest, and oryx populations by 88%, 90%, and 95%, respectively
Mkungunero/Kimotorok	Elephants, wildebeest, gerenuk, lesser kudu, and wild dogs	Agricultural expansion and settlements
Udzungwa-Mikumi	Elephant, buffalo, sable, waterbuck, and other large mammal species	Poaching, clearing of habitat for farms and settlements
Tarangire-Manyara (Kwakuchinja) corridor	The corridor was once vital to 25 large mammal species, some of which (including elephant) move between the two parks. Some populations of bushbuck, impala, and vervet monkey	Agriculture, livestock keeping, expansion of settlements, phosphate mining, cattle holding, and fishing. Eight large mammal species are locally extinct: eland, hartebeest, buffalo, oryx, lesser kudu, cheetah ( <i>Acinonyx jubatus</i> ), leopard, and lion
The upper Kitete/Selela	Corridor is utilized by elephant, buffalo, and other large mammals	The increased human settlement and cultivation caused interruption to the movement of large mammals from the northern highland FR to the lowlands below the escarpment. Even though cultivation was stopped, homes, domestic livestock, and cattle dips still exist in the corridor. All areas adjacent to the corridor are settled and cultivated by local people

**Table 12.6** Villages located or conducting economic activities inside the selected protected areas

Protected area	Villages located inside the protected area
1. Katavi National Park	Situbwike subvillage (82 households)
2. Kilimanjaro National Park	Lerang'wa, Kitendeni, Irkaswa, and Kamangwa
3. Liparamba Game Reserve	Ndondo-Jangwani (60 households living inside); Mitomoni, Mseto, Liparamba, Mipotopo (farming activities)
4. Mahale National Park	Sibwesa, Kalilani
5. Mkungunero Game Reserve	Arkasupai-Kimotorok (Simanjiro), Maasasi, and Lombenek-Irkiushibour (Kiteto District) and Msumbiji, Maasasi and Lombenek-Kisondoko (Kondoa District)
6. Moyowosi-Kigosi	Ilunde village (illegal livestock grazing)
7. Mpanga-Kipengele Game Reserve	Machimbo, Kigala, Igomelo, Ikuwo, Imalilo (Makete District), Wangama, Luduga, Mpanga Mpya, Malangali, Mambegu, Wangamiko (Wang'ingombe District)
8. Serengeti National Park	Mbalibali, Bonchugu, Bisarara, Nyambuli, Machochwe, Nyamakendo, Marenga, Mbirikili (Serengeti District), Matongo (Bariadi District), Vijiji vya Masanga, Kegonga, and Gibaso (Tarime District)
9. Swaga Game Reserve	Handa, Mkulu, Mongoroma, Banguma, Thawekwa Lahoda-Kilambo, Serya, Mtiriangwi, Mukulu na Bugutole
10. Tarangire National Park	Kimotorok, Gedamar, Gijedbung, Ayamango

**Fig. 12.3** A part of Situbwike subvillage inside Katavi National Park, Tanzania

boundaries were realigned three times causing 15% loss of the original area (Kideghesho et al. 2013). Despite this, the game reserve still experiences encroachment from pastoralists and farmers (Masinde, personal communication).

The demand for conversion of protected land to alternative uses has backing from the politicians and government leaders. Intense debates and pressure over the need to degazette the protected areas often dominate the Tanzanian parliamentary sessions, especially when the budgets for the Ministry of Natural Resources and Tourism are tabled. During the sessions, the pastoralists come to Dodoma<sup>1</sup> to meet Members of Parliament (MPs) and lobby for support as they seek government intervention to allow livestock grazing inside the protected areas. This demand has often won popular support from MPs hailing from those areas where cattle-keeping is the main economic activity. In one of the parliamentary sessions, one MP lamented:

Sioni hoja ya msingi ya kukataza ng'ombe wasichungwe ndani ya hifadhi. Ng'ombe hali hata sungura wala hali miti. Anachokula Ng'ombe ni nyasi. (Swahili words literally meaning: There is no logic to prohibit livestock grazing inside the national park. Neither does a cow eat a rabbit nor a tree. It eats grasses.)

On 25 June 2018, it was reported that Manyoni residents backed by their MP requested Deputy Minister for Natural Resources and Tourism to degazette a part of Rungwa–Kizigo–Muhesi GR in order to provide land for agriculture and livestock grazing and to allow them to benefit from gold deposits in the area (ITV 25 June 2018).

On March 10, 2018, the President of the United Republic of Tanzania approved the amendment of the boundaries of the protected areas instead of evicting the communities in 366 villages established inside the protected areas. He also directed that the protected areas that are devoid of wildlife be degazetted and distributed to communities nearby to settle in. The President's decision seems to have emerged from his recognition of the importance of agricultural and livestock sectors economics and concern over the livelihoods of herders and peasants. This followed the remarks he made on March 10, 2018, that Tanzania's population has risen over fivefold from 10 million at independence in 1961 to over 54 million people today. He vowed Government commitment to support peasants and herders and create a conducive environment for Tanzanians to engage effectively in production. "To achieve this goal the Government is considering giving out sufficient land to the people" (Kideghesho 2020).

It is indisputable that for centuries, herders and some peasants in Tanzania and elsewhere in Africa have been victims of conservation policies. Therefore, the President's decision can be considered as rational and inevitable, though this will bear some repercussions on large mammals through the loss of habitats, dispersal areas, and corridors. However, as the President correctly put, his decisions should not be taken as a free license to graze and allow further encroachment into protected areas. Rules of the game should be in place to realize a "win-win" scenario (Kideghesho 2020).

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<sup>1</sup>Dodoma is Tanzania's capital city and Government Headquarters where the parliamentary sessions take place.

### 12.5.4 Escalating Human–Wildlife Conflicts

Besides encroachment, increased proximity between protected areas and human landscapes increases physical contact between humans and wild animals. Farms on wildlife corridors, dispersal areas, and areas at the edge of the protected area boundaries are prone to destruction by wild animals. Likewise, risks of livestock depredation and wildlife-induced accidents to people are higher in areas that are rich in wildlife. Occasionally, people respond to damage and costs caused by wildlife through retaliatory killing by spearing or poisoning the problematic and dangerous species. The cases of retaliatory killing have been reported in different parts of the country as shown in Table 12.7 (also see Fig. 12.4).

**Table 12.7** Examples of reported incidences of retaliatory killing of wildlife species in Tanzania

Area	Species, when, and number	Source
1. Tarangire-Manyara ecosystem	From 2004 to 2013: A total of 226 lions (an average of 25 lions per annum) killed in retaliation for livestock depredation. In 2015: 6 lions were killed	Tarangire Lion Project cited in <a href="http://www.thecitizen.co.tz/News/national/Lion-attack-victims-flee-hospital-at-night/....">http://www.thecitizen.co.tz/News/national/Lion-attack-victims-flee-hospital-at-night/....</a> The Citizen, January 5, 2015
2. Nyichoka village (Western Serengeti)	2018: 11 lions	<a href="https://www.ipppmedia.com/en/news/kingwangalla-orders-arrest-lion-killers-serengeti">https://www.ipppmedia.com/en/news/kingwangalla-orders-arrest-lion-killers-serengeti</a>
3. Loliondo Game Controlled Area (Kertalo and Orkiu villages near the Serengeti National Park border)	September 2012: Over 40 rare wild dogs killed in the Loliondo Game Controlled Area by people claiming that the animals killed 157 goats and 4 cows which belonged to them. The people lit fires in the caves in which the dogs lived	<a href="https://www.serengeti-wildlife.com/.../40-wild-dogs-killed-in-ngorongoro-tanzania">https://www.serengeti-wildlife.com/.../40-wild-dogs-killed-in-ngorongoro-tanzania</a>
4. Ngorongoro Conservation Area	2016: Eight lions were speared to death by villagers after they strayed out of the Ngorongoro Conservation Area	<a href="http://www.xinhuanet.com/english/2016-04/20/c_135294332.htm">http://www.xinhuanet.com/english/2016-04/20/c_135294332.htm</a>
5. Ruaha National Park	14th February 2018: Mass poisoning incident leaved 6 lions and 74 vultures dead near Ruaha National Park, Tanzania	Ruaha Carnivore Project: <a href="https://www.facebook.com/ruahacarnivoreproject/posts/1885442098195035">https://www.facebook.com/ruahacarnivoreproject/posts/1885442098195035</a>





**Fig. 12.4** Retaliatory killing – 6 of the 11 lions which were killed by Nyichoka villagers, Western Serengeti

### ***12.5.5 Increased Wildlife Crime***

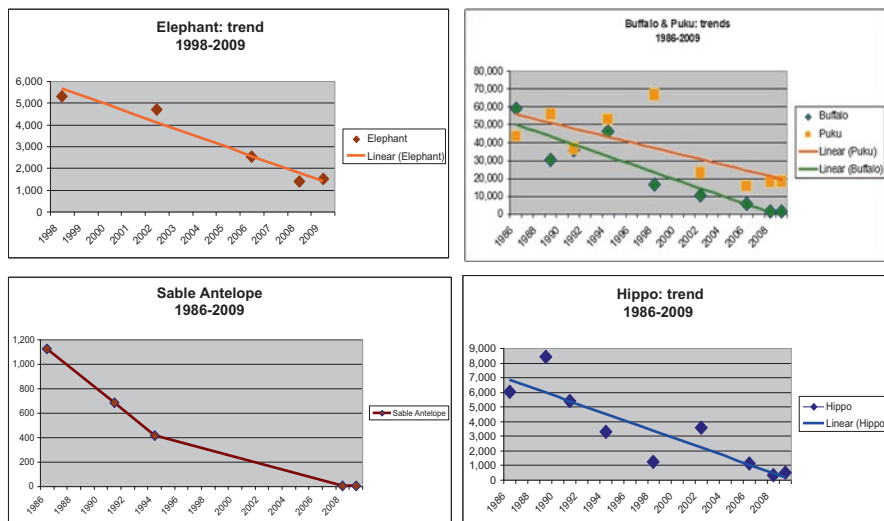
Numerous studies have correlated human population growth and wildlife crime in Tanzania's wildlife areas. For example, illegal hunting in the Great Serengeti Ecosystem has been growing annually to cater for the increased demand of bushmeat. Illegal hunting is used as a coping strategy against poverty and lack of employment among the youth entering the job market (Campbell and Hofer 1995; Loibooki et al. 2002; Kideghesho et al. 2005; Knapp 2007; Bitanyi et al. 2012).

Wildlife crimes also occur in areas beyond the vicinity of the wildlife-protected areas, especially urban areas. The urban populations provide market for wildlife products including bushmeat. Growing population in these areas increases demand and, consequently, raises the price. The higher price stimulates more poaching in order to meet demand of products to potential consumers. Furthermore, the low capacity of the employment sector to absorb a majority of the youth entering the job market annually forces some of the unemployed youth to resort to poaching as a way of earning a living (Kideghesho 2016a).

### ***12.5.6 Decline of Population of Large Mammals***

Destruction of wildlife habitats, blockage of wildlife corridors, human-wildlife conflicts, and wildlife poaching have all worsened due to human population growth and rapid urbanization, leading to a decline and extinction of large mammals (Brashares et al. 2001; Hassan 2007; Jones and Davenport 2009; Kideghesho et al. 2006; Kideghesho and Msuya 2012; Mtui et al. 2016). A case in point is Kilombero





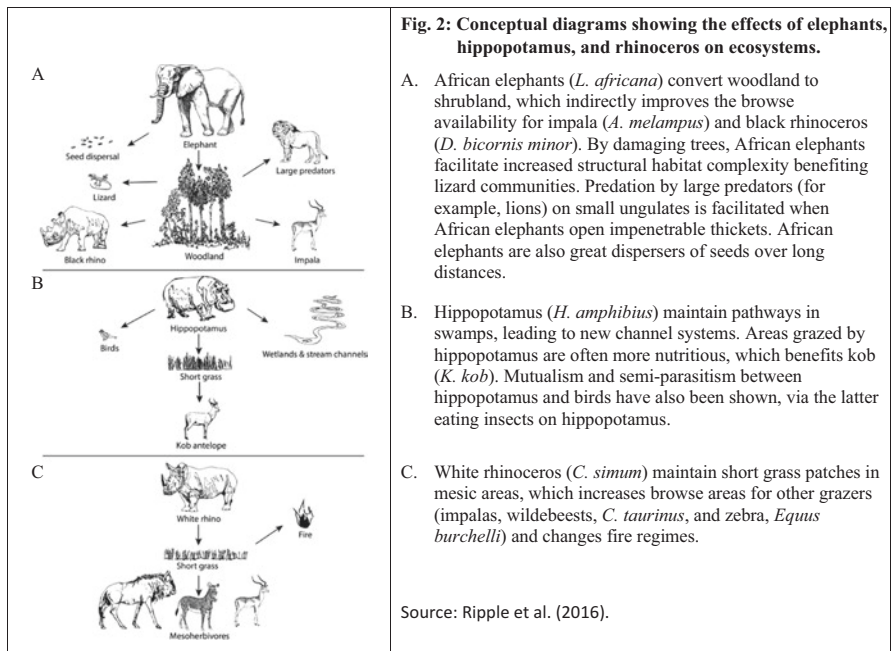
**Fig. 12.5** Trends of five large mammals in Kilombero Game Controlled Area (1986–2009)

Game Controlled Area where human population growth over the past three decades has led to an expansion of agriculture and pastoralism at the expense of large mammals, including elephants, sable antelope, puku, hippo, and buffalo (Fig. 12.5).

An influx of refugees from Rwanda, Burundi, and the Democratic Republic of Congo to the western part of Tanzania in the 1990s serves to expound the impacts of population growth on large mammals. Destruction of wildlife habitats and poaching, enhanced by availability of firearms from the war-waged countries, caused a dramatic decline of large mammals in Burigi-Biharamulo Game Reserves. In 1998, census indicated a decline of the ungulate population to 10% of the population that was recorded in 1990 (Jambiya et al. 2007; Stoner et al. 2007; Kideghesho and Msuya 2012; Kideghesho et al. 2013). Thirteen species that were hunted for bushmeat were affected, including buffalo (*Syncerus caffer*), bush buck (*Tragelaphus scriptus*), eland (*Tragelaphus oryx*), hartebeest (*Alcelaphus lichtensteini*), impala (*Aepyceros melampus*), reedbuck (*Redunca redunca*), roan antelope (*Hippotragus equines*), sable antelope (*Hippotragus niger*), sitatunga (*Tragelaphus spekii*), topi (*Damaliscus korrigum*), waterbuck (*Kobus ellipsiprymnus*), warthog (*Phacochoerus aethiopicus*), and zebra (*Equus burchelli*) (Jambiya et al. 2007; Kideghesho et al. 2013).

### 12.5.7 Ecological Cascade Effect

In many ecosystems, loss of large mammal species is associated with a risk of an ecological cascade effect (Ripple et al. 2015; Ripple et al. 2016; Poulsen et al. 2018; Diplock et al. 2018; Daskin and Pringle 2018). Cascade effect is defined as a series



**Fig. 12.6** The ecological importance of keystone species on survival of co-occurring species

of secondary extinctions that is triggered by the primary extinction of a key stone species in an ecosystem. The conceptual diagram (Fig. 12.6) demonstrates the ecological importance of keystone species on the survival of co-occurring species.

Documentation showing the ecological cascade effects caused by loss of large mammals is either inadequate or lacking in Tanzania. However, based on scientific judgment and experience from elsewhere in the world, it is unlikely that Tanzania has escaped this scenario, having lost some of its keystone species, including elephant and rhino, in some localities.

### 12.5.8 Economic Loss

The tourism sector in Tanzania excels because of the diversity of large mammals as a principal resource. Therefore, it is apparent that their loss will have a detrimental impact on the local and national economy. Over 80% of the country’s tourism is supported by wildlife, particularly large mammals, including elephants, rhinos, lions, leopards, and buffalo. In the 2016–2017 financial year, the tourism sector accounted for 17.5% of the GDP and 25% of foreign exchange, ranking second after agriculture (WWF 2015). *The 2018 Tourism Statistical Bulletin* released by the Ministry for Natural Resources and Tourism (URT 2018b) indicates that a number of tourists visiting wildlife-protected areas and other attractions in the country grew

from 1,137,182 in 2015 to 1,505,702 in 2018, an increase of 32.4%. The county's tourism earnings rose by 26.8% from USD 1901.95 million recorded in 2015 to USD 2412.30 million in 2018. The tourism sector creates 600,000 direct jobs and over a million indirect jobs.

Besides game viewing, tourist hunting is another popular form of wildlife utilization. The hunting industry has grown considerably in the past two decades, and Tanzania is among the leading hunting destinations in the world. The earnings from tourist hunting between 2011 and 2016 amounted to approximately 145 billion Tanzanian Shillings (URT 2018a). Other forms of wildlife utilization permitted in Tanzania are resident hunting and wildlife farming and ranching.

## 12.6 Conclusions and Recommendations

In the face of growing human population and rapid urbanization, conservation of wildlife resources, particularly large mammals, is increasingly becoming a challenge. As human population increases, the demand for natural resources, plants, and wildlife resources also increases. When humans seek to meet these demands, they destroy the habitats, migratory corridors, and dispersal areas, and they overexploit the wildlife resources including large mammals. On the other hand, conversion of wild lands to urban land cover leads to loss of wildlife habitats, especially if it occurs in the vicinity of, or within the wildlife reserves. Urban areas are also important markets for wildlife products, including bushmeat.

In order to realize effective conservation of large mammals in the face of growing anthropogenic pressures resulting from population growth and rapid urbanization, and consequently avoid negative effects associated with their loss, multiple strategies should be employed. These strategies, among others, should aim at:

- Treating human population growth as a matter of urgency and a cross-cutting issue.
- Reducing a need for more land conversion by improving agriculture, the biggest employer in rural areas. The strategy should be to use small acreage to produce more.
- According adequate and legal protection status to wildlife corridors to prevent further encroachment.
- Preparing and implementing land-use plans to preclude conversion of wildlife habitats to uses that are incompatible with wildlife conservation.
- Improving people's living standards through provision of alternative and sustainable livelihood strategies that do not involve destruction of wildlife areas or illegal hunting.
- Implementing policy decisions to shape the long-term effects of urbanization in the vicinity of protected areas.
- Implementing policies that promote wildlife conservation as important land use capable of competing effectively with land uses that are ecologically destructive.

- Subsidizing goods and services that will motivate people to refrain from activities that negatively impact wildlife habitats and species.
- Devising a compensatory scheme for losses that communities incur from wildlife damage in order to prevent retaliatory killing and other actions which are harmful to wildlife.
- Promoting and supporting further studies on impacts of human population growth and urbanization to uncover more facts and solutions for effective conservation of large mammals.

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