

# ETHIOPIAN WILDLIFE CONSERVATION AUTHORITY ENHANCED MANAGEMENT AND EFFECTIVENESS OF ETHIOPIA'S PROTECTED AREA ESTATE

A REPORT ON ASSESSMENT OF THREAT STATUS IN FIVE SELECTED WILDLIFE PROTECTED AREAS OF ETHIOPIA

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## ACRONYMS

- AEWA African-Eurasian Migratory Waterbird Agreement
- AWF African Wildlife Foundations
- BFF Born Free Foundation
- BES Babille Elephant Sanctuary
- CBD Convention on Biological Diversity
- CCNP Chebera Churchura National Park
- CMS Convention on Migratory Species
- CITES Convention on International Trade in Endangered Species of Wild Flora and Fauna
- EMEPA Enhancement of Management Effectiveness of Ethiopia's Protected Areas
- EWCA Ethiopian Wildlife Conservation Authority
- FZS Frankfurt Zoological Society
- GEF Global Environmental Facility
- GIZ Deutsche Gesellschaft Fuer Internationale Zusammenabeit
- HWC Human Wildlife Conflict
- HEC Human Elephant Conflict
- IBC Institute of Biodiversity Conservation
- IUCN International Union for Conservation of Nature
- KSNP Kafta Sheraro National Park
- MNP Mago National Park
- MoCT Ministry of Culture and Tourism
- ONP Omo National Park
- PARTI Protected Area Relative Threatened Index
- PASI Protected Area Susceptibility Index
- PPAM Prioritization of Protected Area Management

PMU - Project Management Unit

RAMSAR – Convention on Wetlands of International Importance especially as Waterfowl Habitats

RTFSI – Relative Threat Factor Severity Index

SDPASE - Sustainable Development of Protected Area System of Ethiopia

- SNNPRS Southern Nations Nationality People Regional State
- TRARA Threat Reduction Assessment and Rapid Assessment
- UNDP United Nation Development Program
- UNESCO United Nations Education, Science and Cultural Organization

WHC – World Heritage Convention

## **EXECUTIVE SUMMARY**

Ethiopia has a land mass of approximately 1,127,127 km<sup>2</sup> (IBC, 2005), with extremely varied topography. As a result, Ethiopia is blessed with significant wildlife potential, high endemism and extraordinary landscapes which can be the basis for flourishing tourist industry (SDPASE - EWCA, 2015).

In Ethiopia, the milestone towards preserving the diminishing wildlife species and their habitats goes back to 1960's. This was the period when the foundation for the birth of modern concepts of nature and natural resource conservation laid in the country. His Imperial Majesty Emperor Haile Selassie requested UNESCO to support the initiative in rendering technical assistance to assess potential wildlife areas across the country. Then, UNESCO sent team of experts that had conducted intensive field study, encompassing Awash, Jima, Maji, north end of Lake Rudolf, Omo River Delta, Lake Stefanie, Rift Valley Lakes, the Blue Nile Gorges, Lake Tana and Mount Simien Massif.

Following the recommendations of the assessment, the first national park, Awash, was created in 1966. Since then, a chain of protected areas has been designated in various parts of the country encompassing ecologically diverse ecosystems specifically for wildlife conservation.

At present, there are about 73 wildlife protected areas falling under six management categories. These include 27 national parks, 2 wildlife sanctuaries, 6 wildlife reserves, 25 controlled hunting areas, 5 biosphere reserves and 8 community conservation areas. In total, they account for about **8.3%** (9, 3182 km<sup>2</sup>) of the total land mass of the country.

Despite such considerable efforts have been made, Ethiopia is not successful in wildlife conservation. Arrays of factors have contributed to the existence of myriad of conservation challenges. Ethiopia adopted the protectionist conservation approach that had been practiced up until mid-90s. Ethiopia had no clear benefit sharing mechanism for the local community prior to the endorsed wildlife policy in 2007. Such delay in transforming the conservation strategies of the country in regards to the contemporary global strategy had resulted in practicing an outdated conservation approach for about four decades. This circumstance has led the local community to gradually develop negative perception towards the conservation and management of wildlife and protected area, making their sense of ownership considerably fragile.

As a result, currently, almost all protected areas of Ethiopia are not immune from human-induced threats. The rapid growth of human and livestock populations is primarily responsible for creating a high demand for land and biological resources. The local community surrounding the protected areas derives their livelihood directly from them. This has exerted an incredible amount of pressure and threat to wildlife and their habitats. In high potential areas of Awash, Rift Valley Lakes, Omo River Delta, Mount Bale Massif, Lake Stefanie, Maji, Dabus valley and Gambella region, where agriculture, pastoralism and land investment are the predominant land use, most wildlife species have nearly been exterminated including substantial alteration, fragmentation and loss of habitats. The critical challenges of wildlife depository sites. These are compounded by poverty, weak law enforcement, lack of awareness, lack of integration and cooperation, inadequate political

willingness, lack of alternative livelihoods and integrated-land use system. This has created a myriad of problems such as illegal settlement, agricultural expansion, overgrazing, illegal hunting, deforestation, human-wildlife conflicts and incompatible land investment. As a result, some of these threats have reached at irreversible stage due to a continuous trend of encroachments that has been causing irremediable habitat destruction and blocking of wildlife migratory routes and dispersal areas. Attempts have been made to address and mitigate these threats but with back and forth success. The current approach of applying the same strategies across the existing protected areas network to mitigate threats to wildlife and associated habitats or ecosystems will not have any meaningful impacts even in the years to come.

The Ethiopian Wildlife Conservation Authority (EWCA) which was established in 2008 has an objectives to manage national parks and wildlife sanctuaries that are of "national and global significance". Positioned under the Federal Ministry of Culture and Tourism (MoCT) until recently (but now under the newly formed "Environment, Forest and Climate Change Commission), EWCA also develops and manage tourism in the protected areas and regulates the hunting industry. In 2017, the United Nations Development Program (UNDP) has granted the Government of Ethiopia ~\$7.2 million with the funding from the Global Environment Facility (GEF 6) to strengthen management and law enforcement in the protected areas of Ethiopia. This funding is allocated for the implementation of a six-year project titled "Enhanced Management and Effectiveness of Ethiopia's Protected Area Estate Project (EMEPA project". EWCA has been charged to implement two of the three components (Component 3 is implemented by Ethiopian Biodiversity Institute) of the project. The project management unit is housed within EWCA HQs in Addis. As such, EWCA and EMEPA PMU have contracted the study "Assessment of Threat Status in Five Selected Wildlife Protected Areas of Ethiopia" to a National Individual Consultant who produced this report.

The need for launching of the "Enhanced Management and Effectiveness of Ethiopia's Protected Area Estate Project" is one of the responses to mitigate the ever increasing threats and their impacts to biodiversity in the protected areas. The main objective of the project is to build the capacity of protected area managers and authorities and promote management effectiveness of the protected areas through (i) development of management plans, (ii) development of tools necessary for standard operational procedures, (iii) establishment of coordinated and collaborative law enforcement activities and (iv) implementation of illegal wildlife trafficking and trade controlling systems. As such, data/information on the nature, extent/severity and impacts of human-induced threats to each protected areas covered under the project is needed to serve as, among others: i) input for the preparation and implementation of both management plans and standard operational procedures; ii) a baseline to evaluate success of project implementation; iii) basic information for prioritizing protected areas most threatened and threat factors to be dealt with; and iv) a baseline to evaluate overall management effectiveness of the protected areas in the near and long-term future.

The objective of this particular assignment is to collect, analyze and synthesize data/information on the nature, extent/severity and impacts (where possible) of human-induced threats to each targeted protected area, which would be used as (i) input for the preparation of both management plans and standard operational procedures, (ii) a baseline to evaluate success of the project and (iii) input for making informed management decisions on which protected areas and which threat factors need to be addressed urgently. In accordance with the Terms of Reference agreed for the study, this threat assessment study was carried-out in five protected areas: Omo, Mago, Chebera Churchura and Kafta Sheraro National Parks and Babille Elephant Sanctuary. These sites were specifically selected because they are currently covered by the EMEPA project; the sites contain the majority of the remaining elephant populations in the country which are the main target of the project. The study used both qualitative and quantitative data collection approaches to assess type, extent and impacts of threats in each protected area.

In order to achieve the objectives of the assignment both primary and secondary data were collected. Primary data were collected from interviews of key staff of EWCA at the headquarters, and field-level staff from the respective protected areas which included Wardens, Ecologists, Community and Tourism Experts and Senior Game Rangers. Field visits were made to the target protected areas. A checklist of structured questionnaire on major threats to protected areas was prepared and used during interviews. In addition to identifying threat types and determining their severity levels, other related data needed for The Theory of Change Model construction were also collected. This included the target biodiversity component affected by each threat, human behaviors/or actions that caused the threats (indirect threat factors), contributing factors (bearers and challenges) and actions needed to mitigate/control the threats. Secondary data collection was made through desk reviews of all relevant documents which include current management plans (if there is any), published and unpublished research articles, monthly and annual reports and other relevant government documents.

Thirteen main direct threat factors were identified to facing the five protected areas studied, with relative threat factor severity (RTFSI) ranging from 0.01 to 0.40. Wildlife poaching for bushmeat and for other products (ivory, skin, etc.) had the highest RTFSI (0.40), followed by cultivation expansion for subsistence farming (0.35) and overgrazing by livestock (0.32). These threat factors are also widespread, occurring almost in all the protected areas. Other threat factors with higher RTFSI than or equal RTFSI to average RTFSI, and occurring in three or four protected areas, included investment pressure/large scale irrigation (0.27), small scale expansion of permanent agriculture (0.24), human-induced fire burning (0.21) and deforestation for charcoal making, construction, etc (0.20).

Three of the five protected areas were susceptible to the majority (over half of the total) of threat factors identified. These protected areas that are most susceptible to the majority of the threat factors were: Babille Elephant Sanctuary which is susceptible to 10 threat factor types, with Protected Area Susceptibility Index (PASI) of 0.77; Kafta Sheraro National Park susceptible to 9 threat factor types, with PASI of 0.69; and Omo National Park susceptible to 8 threat factor types, with PASI of 0.62.

Most of the widespread threat factors discussed above, such as poaching, overgrazing and subsistence cultivation, were also found to be more severe within each protected area, being ranked as one of the top three threats. However, some threats are specific to some PAs such as canal construction, investment developments and conversion of grassland/bushland were the first ranked threat factors in the Omo National Park, while human settlement expansion was ranked first in the Babille Elephant Sanctuary. Similarly, gold mining in the Kafta Sheraro National park was ranked fourth is specific to the park.

In addition to identifying and assessing the severity of the threat factors, information on the impacts of the factors were also gathered during the study both from the interviewees and secondary sources. The results demonstrated that most of the threat factors identified are posing probably hardly reversible adverse impacts on ecosystems, communities and species in the protected areas. Although some of the threat factors and the underlying causes and human behaviours did vary across the five protected areas, most of these were similar across the study areas. Thus, the goal of EWCA in the five protected areas is: *Improving population status of key wildlife species and the quality of their habitat in the protected areas*. Given these similarities among the protected areas in the components of the theory of change model, the assumptions underlying the theory of change stated in the models are described in generality, rather than separately for each protected area, that works for each respective protected area.

In this assessment study, although thirteen threat factors were identified across the five protected areas studied, with several of them occurring almost in all the protected areas, it should be noted that most of the threat factors are not always mutually exclusive as they are operating against biodiversity of the protected areas in a complex and interactive ways. For example, conversion of grassland/bushland to cultivation fields and canal construction in the Omo National Park are related to investment pressure/large scale irrigation for sugar cane cultivation. Similarly, deforestation is usually performed, in addition to logging for construction and charcoal production, for expansion of small scale permanent and seasonal (subsistence) agriculture. Nonetheless, the findings of this study have highlighted that most of the threat factors are occurring in most of the protected areas, with wildlife poaching for bushmeat and for wildlife products (e.g., ivory, skin, etc), expansion of crop cultivation land (subsistence farming) and overgrazing by livestock being the top most severe and most widespread threat factors. The implication of the findings of the present study is therefore although most protected areas are susceptible to all of the threats, dealing with poaching and human encroachment and associated activities (e.g., deforestation for cultivation and livestock grazing) in the studied area would secure most protected areas.

Moreover, areas outside protected areas are currently highly degraded due to unregulated overuse, being confounded by recurrent drought. As such, the exponentially growing rate of human population in the country, where the majority is under high poverty level, and ecosystem degradation outside protected areas have resulted to increasing demand of previously unoccupied virgin land for cultivation land and livestock pasture. Ultimately, these constraints have caused increased dependency of local communities on the natural resources of the protected areas, as relatively intact and productive areas are only available in such areas that have been set aside for wildlife conservation.

Another key challenge to contain the wide spreading threats to protected areas in Ethiopia is partly attributed to the low capacities of protected areas management to address conservation issues in a holistic approach. Most of the protected areas, including those treated under this study, lack until recently clearly defined boundaries and are suffering from shortage of resources (skilled manpower, funding/budget, infrastructure and equipment) needed for effective conservation. Furthermore, protected area managements systems seldom take into account the need of local communities and the role that they play in pushing conservation forward. This lack of participation of local communities in conservation and management of and benefit sharing from protected areas and, most importantly, coupled to lack of awareness on the conservation values of wildlife and the associated ecosystems to the society, have led to the local communities to develop the feeling that

they are marginalized from conservation initiatives and that wildlife resources are belongings of the government/state.

But most critically important challenges are, lack of political commitment by government bodies almost at all levels and lack of appropriate integrated land use plan policies and/or poor implementation thereof are among the key political factors for the intensive and extensive biodiversity degradation in Ethiopia's protected areas. One best example of the effect of lack of integrated land use plan policy is the recent allocation of land from Omo National Park for large scale irrigation schemes for cultivation of sugar cane that fed the Omo Kuraz Sugar Factory. Similar incidences have been reported from Kafta Sheraro National Park where local investors are given irrigation-based cultivation land within the park boundary.

In conclusion, this study has found that wildlife poaching for bushmeat and for other products (ivory, skin, etc.), cultivation expansion for subsistence farming and overgrazing by livestock RTFSI are identified to be the top severe and widespread threat factors, occurring almost in all the protected areas. Other threat factors with moderate relative severity and lower distribution/localized occurrence/, but are detrimental at site levels, included investment and large scale irrigation pressure, small scale expansion of permanent agriculture and human-induced fire burning. Babille Elephant Sanctuary, Kafta Sheraro National Park and Omo National Park were the most susceptible and threatened protected areas to most of the threat factor types.

The underlying causes of the direct threat factors, herein, are treated as indirect threats or conservation challenges and bearers that are the reasons for the occurrence and expansion of the direct threats to wildlife, include: poor law enforcement (due to resource constraints and lack or poor implementation of enabling policies), availability of fire arms, ethnic conflicts, increased global demand and price of ivory, cultural practices during marriage and to demonstrate social status are reported to be the major causes (indirect threats) for increased wildlife poaching in the protected areas. On the other hand, poverty, human population increase, recurrent drought and declining of pasture outside protected areas have caused local communities to largely rely on natural resources within the protected areas for pasture and water and to practice small scale seasonal and permanent cultivation. These practices have been further fostered due to lack of awareness, lack of benefits to local community and inadequate political commitment by government at all level. Furthermore, lack of clearly developed and implemented integrated development plan (land use plan) both at federal and regional levels, coupled with poor environmental impact assessments during planning and implementation of investment projects, have led to conservation incompatible land allocation for development initiatives.

#### **1. INTRODUCTION**

#### 1.1. General

Ethiopia has a land mass of approximately 1,127,127 km<sup>2</sup> (IBC, 2005), with extremely varied topography. These range from the depressions in the Afar (110 m below sea level) to the spectacular Mountain tops of Ras Dashen (4543 m above sea level) in the north. As a result, Ethiopia is blessed with significant wildlife potential, high endemism and extraordinary landscapes which can be the basis for flourishing tourist industry (SDPASE - EWCA, 2015).

In Ethiopia, the milestone towards preserving the diminishing wildlife species and their habitats goes back to 1960's. This was the period when the foundation for the birth of modern concepts of nature and natural resource conservation laid in the country. His Imperial Majesty Emperor Haile Selassie requested UNESCO to support the initiative in rendering technical assistance to assess potential wildlife areas across the country. Then, UNESCO sent team of experts that had conducted intensive field study, encompassing Awash, Jima, Maji, north end of Lake Rudolf, Omo River Delta, Lake Stefanie, Rift Valley Lakes, the Blue Nile Gorges, Lake Tana and Mount Simien Massif.

Following the recommendations of the assessment, the first national park, Awash, was created in 1966. Since then, a chain of protected areas has been designated in various parts of the country encompassing ecologically diverse ecosystems specifically for wildlife conservation. Formerly, their governance system was exclusively run by the central government. However, such approach has been gradually transformed to inclusive and decentralized system, involving regional states, local communities, hunting operators and particularly NGOs on co-management basis.

At present, there are about 73 wildlife protected areas falling under six management categories. These include 27 national parks, 2 wildlife sanctuaries, 6 wildlife reserves, 25 controlled hunting areas, 5 biosphere reserves and 8 community conservation areas (Annex). In total, they account for about **8.3%** (9, 3182 km<sup>2</sup>) of the total land mass of the country.

All the major ecosystems of the country have been represented in this protected areas system. These diverse ecosystems and variable climate conditions have contributed to high diversity of species (Yalden, 1992). Therefore, thus far 320 species of mammals (57 are endemic), 926 species of birds (Lepage, 2006) (18 endemic), 242 species of reptiles (15 endemic), 73 species of amphibians (30 endemic), 180 species of fish (41 endemic), about 6500 species of vascular plants (700 endemic) and 6862 species of insect have been recorded (Berehanu Beyene, 2016).

Ethiopia has taken various actions to conserve wildlife species and their environment. These include the formulation of institutional and policy frameworks and legal instruments. Presently, Ethiopian Wildlife Conservation Authority is the custodian of the country's wildlife resources. The first national conservation strategy was issued in 1997, and laid basis for the development of wildlife policy and conservation strategy in 2007. Subsequently other legal systems such as wildlife proclamation, regulation, directives and guidelines have come in to force to ensure sustainability in wildlife conservation and management.

Furthermore, Ethiopia took actions in signing and ratifying conservation–related global international frameworks and organizational membership. The first signed (but not ratified) regional agreement was the African convention on nature and natural resources in 1968 under the facilitation of the African Union. Since then, other ratified international conventions include: the World Heritage Convention (WHC), 1977; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), 1989; the Convention on Biological Diversity (CBD),

1994; the Convention on Migratory Species (CMS), 2009; African-Eurasian Migratory Waterbird Agreement (AEWA), 2009; and the Convention on Wetlands of International Importance especially as Waterfowl Habitats, Ramsar, not yet ratified. Similarly, Ethiopia is the member of the International Union for Conservation of Nature (IUCN) since 1967. Ethiopian Wildlife Conservation Authority (EWCA) is the focal institution for the implementation of CITES, CMS and AEWA agreements, and IUCN membership.

Despite such considerable efforts have been made, Ethiopia is not successful in wildlife conservation. Arrays of factors have contributed to the existence of myriad of conservation challenges. Ethiopia adopted the protectionist conservation approach that had been practiced up until mid-90s. This approach has also alienated the local communities from participating in wildlife conservation and protected area management in Kenya (Okello, 2007).

Ethiopia had not formulated clear benefit sharing mechanism for the local community prior to the endorsed wildlife policy in 2007. Such delay in transforming the conservation strategies of the country in regards to the contemporary global strategy had resulted in practicing an outdated conservation approach for about four decades. This circumstance has led the local community to gradually develop negative perception towards the conservation and management of wildlife and protected area, making their sense of ownership considerably fragile.

At present, almost all protected areas of Ethiopia are not immune from human-induced threats. The rapid growth of human and livestock populations is primarily responsible for creating a high demand for land and biological resources. The local community surrounding the protected areas derives their livelihood directly from them. This has exerted an incredible amount of pressure and threat to wildlife and their habitats. In high potential areas of Awash, Rift Valley Lakes, Omo River Delta, Mount Bale Massif, Lake Stefanie, Maji, Dabus valley and Gambella region, where agriculture, pastoralism and land investment are the predominant land use, most wildlife species have nearly been exterminated including substantial alteration, fragmentation and loss of habitats. The critical challenges of wildlife conservation in Ethiopia come mainly from human encroachments on prime wildlife depository sites. These are compounded by poverty, weak law enforcement, lack of awareness, lack of integration and cooperation, inadequate political willing, lack of alternative livelihoods and integrated-land use system. This has created a myriad of problems such as illegal settlement, agricultural expansion, overgrazing, illegal hunting, deforestation, human-wildlife conflicts and incompatible land investment. As a result, some of these threats have reached at irreversible stage due to a continuous trend of encroachments that has been causing irremediable habitat destruction and blocking of wildlife migratory routes and dispersal areas (Vreugdenhil *et al.*, 2012).

Ethiopia has mainly begun facing wildlife conservation crisis as of mid-1980s. However, the predecessor of EWCA has taken little proactive measures to gazette, build institutional capacity, mobilize resources, re-examine wildlife conservation approach and objectives and formulate policy. Therefore, the Ethiopian Wildlife Conservation Authority has been faced with complex challenge of overcoming these underlying threats. Indeed, various research works (Menhistu Wale, 2017), mainly for academic purposes, have outlined some of the critical threats to protected areas that need to be seriously addressed. Attempts have been made to address and mitigate these threats but with back and forth success. The current approach of applying the same strategies across the existing protected areas network to mitigate threats to wildlife and associated habitats or ecosystems will not have any meaningful impacts even in the years to come.

#### **1.2. Background of the project**

The Ethiopian Wildlife Conservation Authority (EWCA) was established in 2008 with the objectives to manage national parks and wildlife sanctuaries that are of "national and global significance". Positioned under the Federal Ministry of Culture and Tourism (MoCT) until recently (but now under the newly formed "Environment, Forest and Climate Change Commission), EWCA also develops and manage tourism in the protected areas and regulates the hunting industry. In 2017, the United Nations Development Program (UNDP) has granted the Government of Ethiopia ~\$7.2 million with the funding from the Global Environment Facility (GEF 6) to strengthen management and law enforcement in the protected areas of Ethiopia. This funding is allocated for the implementation of a six-year project titled "Enhanced Management and Effectiveness of Ethiopia's Protected Area Estate Project (EMEPA project". EWCA has been charged to implement two of the three components (Component 3 is implemented by Ethiopian Biodiversity Institute) of the project. The project management unit is housed within EWCA HQs in Addis. As such, EWCA and EMEPA PMU have contracted the study "Assessment of Threat Status in Five Selected Wildlife Protected Areas of Ethiopia" to the author [Dr. Mekbeb Eshetu Tessema, a National Individual Consultant]. Here, presented the report on findings of the assignment.

## **1.3. Rationale for the Study**

Ethiopia harbours several endemic and rare wildlife species and spectacular landscapes with varied ecological zones. Though, the wildlife resources and their associated ecosystems have a great potential in enhancing the country's development efforts through eco-tourism and through the vital ecosystem services they provide to Ethiopian nations, it has not been able to tap economic gain from the sector (Ethiopian Wildlife Policy and Strategy, 2005). This is due to, in the past, the lack of integrated development strategies and activities which undermined the ecological importance

of the country's unique wildlife habitats throughout the country. As a result, multi-faceted anthropogenic factors have been affecting Ethiopia's wildlife conservation efforts, which have continued to exist even today. Currently, the main threats to the country's wildlife include habitat destruction/loss and habitat fragmentation due to the rapid population growth and subsequent illegal agricultural encroachment, illegal settlement, poaching, etc. This human encroachment, coupled to the lack of land use policy, into untouched habitats in Ethiopia have led to loses annually 40,000 ha of forests, 800,000 ha of woodland and 18 tons of fertile soil per ha of land, resulting to more rapid degradation of natural ecosystems and wildlife resources. In order to minimize the threats, the Ethiopian Wildlife Conservation Authority (EWCA) partners with international conservation organizations such as GIZ-Ethiopia, UNDP-GEF, Born Free Foundation (BFF), Frankfurt Zoological Society (FZS) and African Wildlife Foundation (AWF) to address conservation and development issues. This is because the government's inadequate technical and financial capacity has been a limiting factor to develop a feasible and realistic protected area system that involve local communities in the conservation efforts, and create sustainable development that benefits both communities and the wildlife resources.

The need for launching of the "Enhanced Management and Effectiveness of Ethiopia's Protected Area Estate Project" is one of the responses to mitigate the ever increasing threats and their impacts to biodiversity in the protected areas. The main objective of the project is to build the capacity of protected area managers and authorities and promote management effectiveness of the protected areas through (i) development of management plans, (ii) development of tools necessary for standard operational procedures, (iii) establishment of coordinated and collaborative law enforcement activities and (iv) implementation of illegal wildlife trafficking and trade controlling systems. As such, data/information on the nature, extent/severity and impacts of human-induced threats to each protected areas covered under the project is needed to serve as, among others: i) input for the preparation and implementation of both management plans and standard operational procedures; ii) a baseline to evaluate success of project implementation; iii) basic information for prioritizing protected areas most threatened and threat factors to be dealt with; and iv) a baseline to evaluate overall management effectiveness of the protected areas in the near and long-term future.

#### 1.4. Objectives of the Study

The objective of this assignment is to collect, analyze and synthesize data/information on the nature, extent/severity and impacts (where possible) of human-induced threats to each targeted protected area, which would be used as (i) input for the preparation of both management plans and standard operational procedures, (ii) a baseline to evaluate success of the project and (iii) input for making informed management decisions on which protected areas and which threat factors need to be addressed urgently.

## 2. SCOPE AND METHODS OF THE STUDY

#### **2.1. Scope**

In accordance with the Terms of Reference agreed for the study (Annex I), this threat assessment study was carried-out in five protected areas: Omo, Mago, Chebera Churchura and Kafta Sheraro National Parks and Babille Elephant Sanctuary. These sites were specifically selected because they are currently covered by the EMEPA project; the sites contain the majority of the remaining elephant populations in the country which are the main target of the project. The study used both qualitative and quantitative data collection approaches to assess type, extent and impacts of threats in each protected area.

A threat, in this particular study, was defined as: "any factor, resulting either directly or indirectly from human activities (legal or illegal), that actually or has the potential to destroy, degrade, or impair key biodiversity components [found at various organizational level, including an ecosystem, a habitat/community, or a species] in the next 10 years" (Kinahan and Laurenson, 2013).

## 2.2. Description of Study Areas

The five target protected areas are shown on Figure 1, and are briefly described as follow:

- *Omo National Park (ONP)* was established in 1968 as a "proposed" National Park. The total area of the park is 2,936km<sup>2</sup> and currently is managed by EWCA, a federal institution. It lies in a complex area with eight ethnic groups living in the area. Major threats include poaching of wildlife and grazing by livestock and, more recently, large areas of the park have been appropriated for commercial agriculture (specifically sugar plantations) and the infrastructure associated with this has created a barrier to movement of wildlife and exposed it to illegal killings.
- *Mago National Park (MNP)* was established in 1970 but the area was "re-demarcated" in 2003 to an area of 1,942km<sup>2</sup> (taking into account various anthropogenic pressures). Currently, it is managed by the SNNPR Bureau of Culture and Tourism. The park is threatened with overgrazing and illegal killing of wildlife and the elephant population has declined by 52% since the 1980s. The commercial agriculture in Omo NP and adjacent areas has resulted in a loss of connectivity among the areas.



Figure 1. Location of the five protected areas

- Chebera Churchura National Park (CCNP) was established in 2004 and covers an area 1,190km<sup>2</sup>. The area is managed regionally by the SNNPRS Bureau of Culture and Tourism. The park contains an estimated population of 430 elephants. This population of elephants is threatened with poaching. Other threats to the area include expansion of subsistence agriculture and unsustainable use of natural resources.
- *Kafta Sheraro National Park (KSNP)* has an area of 2,176km<sup>2</sup> lies in the far north of the country. It was originally established as a wildlife reserve but upgraded to a national park in 2007. It was formally gazetted in 2015. The park has an isolated elephant population in the area (estimated at 300 animals): this is the most northern population of elephants on the continent and the population crosses the border into Eritrea. The area is threatened with habitat loss as a result of frequent fires, and corridor obstruction by irrigation schemes, settlement and agricultural expansion.

• *Babille Elephant Sanctuary (BES)* was established 1970 with an area of 6,900km<sup>2</sup> is in the semi-arid areas of the east of the country and contains an estimated population of 250 elephants. It is also from this area that the majority of animals (including lions, cheetahs and a number of antelope species) are caught for the trade. The animals are smuggled through the Ethiopian borders and the alleged destination is the Middle East. In addition to poaching and killings of elephants and other species, illegal settlement, livestock grazing and agricultural expansion have also been increasing with subsequent degradation of the habitat and escalation of human-wildlife conflict. High levels of human-elephant conflict have been resulting in perceived injustices, high economic loss and loss of life among people living in the vicinity of the sanctuary.

## 2.3. Data Collection

The type, quality and quantity of data collected in any study are partly determined based on the purpose/objective of the study and planned method of analysis to be used. There are several approaches of assessing threats to wildlife and protected areas, including Threat Reduction Assessment (TRA), Threat Reduction Rapid Assessment (TRARA), and Prioritization of Protected Area Management (PPAM) (Rao et al. 2007); Assessment of status of a species relative to other species in terms of a species' extinction risk (Hilton Taylor, 2000; Baillie et al., 2004); Important Bird Areas Program (Stattersfield and Capper, 2000); Key Biodiversity Area approach (Eken et al., 2004); range-wide priority setting approaches that use threat assessment to set conservation priorities for individual species such as tigers and jaguars (Dinerstein et al., 1997; Sanderson et al., 2002a); and the Theory of Change Approach to threat analysis (Vogel and Stephenson, 2012; Conservation International, 2013). In the present study, "Theory of Change Approach to threat analysis" method was used to collect data. This method is the most recent approach becoming

popular among the conservation organizations in threat analysis whereby a situation analysis (See Figures 2-6) and monitoring models (Figures 7-11) are developed for individual protected area. The monitoring model uses key biodiversity indicators identified to monitor whether the threat level is reduced after the introduction of appropriate intervention. The consultant used this approach to identify types, determine level and assess impacts of threats to the target protected areas. The main advantage of using the Theory of Change Approach is because it is more convenient to customize the analysis for each protected area based on the types and level of threats that the protected areas are facing (Vogel and Stephenson, 2012; Conservation International, 2013). And also, it gives a tool for monitoring of changes on threats level using key indicators identified. Therefore, in order to achieve the objectives of the assignment and use the Theory of Change Approach, both primary and secondary data were collected.

Primary data were collected from interviews of the key staff of EWCA at the headquarters, and field-level staff from the respective protected areas which included Wardens, Ecologists, Community and Tourism Experts and Senior Game Rangers. Field visits were made to the target protected areas. A checklist of structured questionnaire on major threats to protected areas was prepared and used during interviews. Respondents from each protected area were asked to score each of the threat they mention independently and only for the threat type occurring in the protected area where they are currently working. Scoring was done for each of the threat they mention independently on numerical scale ranging from 1 as the lowest threat level to 5 as the highest. To help them determine the extent (and thus to assign a score) of each threat, the interviewees were informed to use the following four criteria: severity (i.e. level of damage), permanence (potential for permanent damage/loss), scope (geographic extent of occurrence), and status (increasing/decreasing) (Kinahan and Laurenson, 2013). In addition to identifying threat types and

determining their severity levels, other related data needed for The Theory of Change Model construction were also collected. This included the target biodiversity component affected by each threat, human behaviors/or actions that caused the threats (indirect threat factors), contributing factors (bearers and challenges) and actions needed to mitigate/control the threats. Secondary data collection was made through desk reviews of all relevant documents which include current management plans (if there is any), published and unpublished research articles, monthly

and annual reports and other relevant government documents.

#### 2.4. Data Analysis

#### 2.4.1. Descriptive Analysis

Prior to undertaking the Theory of Change Analysis, data were analyzed using the methods of Okunlola and Tsujimoto (2009), by calculating indexes of threat factor indicators. Accordingly, the following indexes were calculated as indicators of how serious a threat factor was both within and across protected areas, and vulnerability of protected areas to these threats:

- **Protected Area Susceptibility Index (PASI) to the threat factors** = (Number of threat factors mentioned for each protected area/ Total number of threat factors identified across protected areas, 13)
- Mean score of each threat factor = (sum of all the scores for that particular threat factor) / (the total number of respondents, 25)
- Relative Threat Factor Severity Index, across protected areas, RTFSI<sub>(across)</sub> = (The mean score for a particular threat factor) / (the maximum possible score, 5)
- Relative Threat Factor Severity Index, within a protected area, RTFSI<sub>(within)</sub> = (The mean score for a particular threat factor arranged in ascending order)

• **Protected Area Relative Threatened Index, PARTI** = total score of the thirteen threat factors from the interviewed officers of a given protected area) / total responses (65)

A ranking system based on (i) RTFSI (across) showed which of the threat factors was more serious across the protected areas considered, (ii) both PASI and PARTI showed which protected areas were most vulnerable to the identified threat factors, and (iii) Relative Threat Factor Severity Index (rank) within a protected area, RTFSI (within), showed which of the threat factors was more serious within a protected area or which protected area was most vulnerable to which threat factor.

#### 2.4.2. Construction of the Theory of Change Model

Construction of the Theory of Change Model is a two-step process. The first step is compiling background information on the situation of the protected areas (i.e., carrying-out situation analysis). Thus, a situation analysis was conducted for each protected area based on the threat factors identified and their effect on the target biodiversity component and the underlying causes of the threats. This situation analysis is a conceptual model which relates the Conservation Target (i.e., ecosystem, habitat/community, or a species) being affected by each of the identified threat factors, human behaviors/or actions and contributing factors (Figures 2-6). The second step is, using the results of situation analysis as input, constructing the theory of change model, which by itself was undertaking following the following five main steps: i) defining long-term goal(s) of management interventions; ii) mapping the pathway to change [i.e., building intermediate (outcomes) and immediate (output) results framework to achieve the goal]; iii) selecting a set of activities/interventions needed to achieve the outputs and outcomes (i.e., actions needed change contributing factors and human behaviors so as to reduce threats); iv) identifying biodiversity

indicators and their monitoring methods to track progress; and v) articulating key assumptions (see Figures 7-11).

## **3. RESULTS**

#### **3.1.** Threat status

Thirteen main direct threat factors were identified to facing the five protected areas studied, with relative threat factor severity (RTFSI) ranging from 0.01 to 0.40. Five (~39%) of the threat factors are operating at relatively higher relative severity level (RTFSI) of 0.20 (Table 1). Wildlife poaching for bushmeat and for other products (ivory, skin, etc.) had the highest RTFSI (0.40), followed by cultivation expansion for subsistence farming (0.35) and overgrazing by livestock (0.32). These threat factors are also widespread, occurring almost in all the protected areas. Other threat factors with higher RTFSI than or equal RTFSI to average RTFSI, and occurring in three or four protected areas, included investment pressure/large scale irrigation (0.27), small scale expansion of permanent agriculture (0.24), human-induced fire burning (0.21) and deforestation for charcoal making, construction, etc (0.20). The rest of the threat factors are localized (occurring only in one or two protected areas) and had relatively lower than the average RTFSI (see Table 1).

Threats	Sum of Threat Factor Score	Mean (±SE) Threat Factor Score	RTFSI
Poaching	51	$2.00 \pm 0.32$	0.40
Overgrazing	40	$1.58\pm0.41$	0.32
Settlement	22	$0.90\pm0.46$	0.18
Cultivation/ subsistence farming	44	$1.76\pm0.37$	0.35
Human induced wildfire	26	$1.04\pm044$	0.21
Canal Construction	15	$0.60\pm0.60$	0.12
Conversion of grassland & bushland	15	$0.60\pm0.60$	0.12
Human-Wildlife Conflict	17	$0.66\pm0.59$	0.13
Deforestation	25	$1.00\pm0.45$	0.20
Mining	11	$0.44\pm0.39$	0.09
Ethnic Conflict	1	$0.04\pm0.04$	0.01
Investment pressure/large scale Irrigation	33	$1.34\pm0.69$	0.27
Expansion of permanent agriculture (small scale)	30	$1.20\pm0.49$	0.24

**Table 1.** Sum of threat factor score (n = 25), mean threat factors score (n = 25) and Relative Threat Factor Severity Index, RTFSI ( $_{across}$ ) of the 13 threat factor types identified across the five protected areas.

Three of the five protected areas were susceptible to the majority (over half of the total) of threat factors identified. These protected areas that are most susceptible to the majority of the threat factors were: Babille Elephant Sanctuary which is susceptible to 10 threat factor types, with Protected Area Susceptibility Index (PASI) of 0.77; Kafta Sheraro National Park susceptible to 9 threat factor types, with PASI of 0.69; and Omo National Park susceptible to 8 threat factor types, with PASI of 0.62; (Table 2).

The protected area relative threatened index (PARTI) values provided on Table 2 showed that those protected areas that appeared to be most susceptible to the majority of the threat factors (see above) also had PARTI values of greater than the average index of the five protected areas (average PARTI = 0.20). Accordingly, Kafta Sheraro National Park had the highest PARTI (0.26), followed by Omo National Park (0.23) and Babille Elephant Sanctuary (0.22) (Table 2).

More detail analysis of relative threat factor severity (RTFSI) within each protected area was conducted by ranking based on their mean threat severity score. Interestingly, this analysis had enabled to disclose the fact that those threat factors that are localized, and thus which would have been considered as little conservation concern had only the results obtained from across the protected areas were interpreted/reported, are in fact detrimental to biodiversity conservation at local scale (i.e., within the protected area where they occurred). For example, canal construction, investment developments and conversion of grassland/bushland (in both cases, mean score = 3.0) were the first ranked threat factors in the Omo National Park, while human settlement expansion (mean score = 2.5) was ranked first in the Babille Elephant Sanctuary. Similarly, gold mining in the Kafta Sheraro National Park was ranked fourth (Table 3). Otherwise, most of the widespread threat factors discussed above, such as poaching, overgrazing and subsistence cultivation, were also found to be more severe within each protected area, being ranked as one of the top three threats; (for detail, see Table 3).

Name of PA	Poaching	Overgrazing	Settlement	Cultivation/ subsistence farming	Human induced wildfire	Canal Construction	Conversion of grassland & bushland	Human Wildlife Conflict	Deforestation	Mining	Ethnic Conflict	Investment	permanent agriculture (small scale)	No. Threat Factors	Protected Area Susceptibility	Sum of Threat Factor Scores	PARTI
Mago NP	15	10	5	5	9	0	0	0	0	0	0	0	0	6	0.46	44	0.14
Omo NP	10	9	0	4	7	15	15	0	0	0	0	15	0	8	0.62	75	0.23
Chebera Churchura NP	10	0	0	10	0	0	0	15	10	0	0	0	10	4	0.31	55	0.17
Kana Sheraro NP	5	12	5	13	10	0	0	0	5	10	0	15	10	9	0.69	85	0.26
Babille Elephant Sanctuary	11	9	12	12	0	0	0	2	10	1	1	3	10	10	0.77	71	0.22

**Table 2.** Sum of threat factor score within each protected area, protected area susceptibility index (PASI) and relative protected area threatened index (RPATI).

Threat	Mago NP	Omo NP	Chebera Churchura NP	Kafta Sheraro NP	Babille Elephant Sanctuary
Poaching	3.0(1)	2.0 (2)	2.0 (2)	1.0 (5)	2.1 (3)
Overgrazing	2.0 (2)	1.8 (3)		2.3 (3)	1.8 (5)
Settlement	1.0 (4)			1.0 (5)	2.5 (1)
Cultivation/subsistence farming	1.0 (4)	0.8 (5)	2.0 (2)	2.7 (2)	2.3 (2)
Human induced wildfire	1.8 (3)	1.4 (4)		2.0 (4)	
Canal construction		3.0 (1)			
Conversion of grassland & bushland		3.0(1)			
Human wildlife conflict			3.0 (1)		0.3 (7)
Deforestation			2.0 (2)	1.0 (5)	2.0 (4)
Mining/mineral extraction				2.0 (4)	0.2 (8)
Ethnic conflict					0.2 (8)
Investment pressure/large scale Irrigation		3.0 (1)		3.0 (1)	0.7 (6)
Expansion of permanent agriculture (small scale)			2.0 (2)	2.0 (4)	2.0 (4)

Table 3. Relative threat factor severity index within each protected area [RTFSI (within)]

## 3.2. Underlying causes of the direct threat factors

Underlying causes of the direct threat factors, herein, are treated as indirect threats or conservation challenges and bearers that are the reasons for the occurrence and expansion of the direct threats to wildlife. Although poor law enforcement (due to resource constraints and lack or poor implementation of enabling policies) is the primary reason for the expansion of the threat factors across the protected areas, there are a number of underlying causes (indirect threats and other causatives) of the direct threat factors in the protected areas (Table 4). Although these indirect threats are not mutually independent of each other and some of them are site-specific (i.e., the case of a particularly protected area), the majority are found to be prevailing across the whole protected areas. For example, among the most frequently mentioned indirect threats (including challenges and bearers) such as availability of fire arms, ethnic conflicts, increased global demand and price of ivory, cultural practices during marriage and to demonstrate social status are reported to be the

major causes (indirect threats) for increased wildlife poaching in the protected areas. On the other hand, poverty, human population increase, recurrent drought and declining of pasture outside protected areas have caused local communities to largely rely on natural resources within the protected areas for pasture and water and to practice small scale seasonal and permanent cultivation. These practices have been further fostered due to lack of awareness, lack of benefits to local community and inadequate political commitment by government at all level. Furthermore, lack of clearly developed and implemented integrated development plan (land use plan) both at federal and regional levels, coupled with poor environmental impact assessments during planning and implementation of investment projects, have led to conservation incompatible land allocation for development initiatives. The consequences of this lack of clear policy and/or its poor implementation on protected areas have been manifested in the Omo National Park where Kuraz Sugar factor was established and in the Kafta Sheraro National Park where irrigation-based cultivation land was leased-out for private investments along Tacazze River (Table 4).

On	no NP				
Indirect Threats		Cause of Direct Threat	Target species by poachers (and other threat factors)		
•	Sand mining	• Inadequate Political commitment by govt. at	•	Elephant	
•	Blockage of wildlife	all level Increased demand for pasture, water &	•	Eland Buffalo	
	canal	cultivation by locals	•	Giraffe	
•	Ethnic conflicts	• Demand for bushmeat & Ivory			
	(Surma & Bume)	• Ethnic conflicts (Bume & Surma, Dizi &			
•	Illegal influx of fire	Surma)			
	arms from South	• Unintegrated development & allocation of			
	Sudan	land for large scale irrigation schemes			
•	Trespassing of	• Weak conservation practice (lack of capacity)			
	Tofossa tribe from	Lack of integration with other sectors			
	South Sudan	• Shortage of pasture & water outside the park			

**Table 4.** Underlying causes (indirect threats) of the main direct threats identified in the five protected areas.

	<ul> <li>Recurrent drought</li> <li>Lack of awareness</li> <li>No defined boundary and gazettement of the park</li> </ul>	
Mago NP		
<ul> <li>Fire arm influx</li> <li>Ethnic conflicts</li> <li>Drought</li> <li>Ivory smuggling</li> <li>Dogs</li> <li>Omo Sugarcane plantation</li> </ul>	<ul> <li>Cultural practice (for marriage &amp; social status), bushmeat &amp; increasing demand for ivory</li> <li>Demand for pasture &amp; water</li> <li>Demand for agricultural land</li> <li>Lack of awareness</li> <li>Weak law enforcement</li> <li>Lack of benefits to local community</li> <li>No defined boundary of the park</li> <li>Weak conservation practice (lack of skilled manpower, commitment &amp; professionalism)</li> <li>Inadequate political commitment by govt. at all level</li> <li>Decline of pasture outside the pasrk boundary</li> </ul>	<ul> <li>Elephant</li> <li>Buffalo</li> <li>Greater Kudu</li> <li>Lesser Kudu</li> <li>Hartebeest</li> <li>Defassa waterbuck</li> <li>Warthog</li> <li>Dikdik</li> </ul>
Chebera Churchura NP		
	<ul> <li>Human population increase</li> <li>No clear boundary of the park</li> <li>No buffer zone</li> <li>Inadequate political commitment</li> <li>Weak conservation practice (low capacity)</li> <li>Poverty</li> <li>Dependency on the natural resources.</li> </ul>	<ul><li>Elephant</li><li>Buffalo</li></ul>
Kafta-Sheraro NP		
	<ul> <li>Expansion of settlements around the park</li> <li>Poverty and population increase in surrounding community by influx of newcomers via govt. settlement schemes</li> <li>Bad investment policy and incompatible land allocation for development activities</li> <li>Weak law enforcement</li> <li>No clear land use plan</li> </ul>	<ul> <li>Elephant,</li> <li>Red-fronted gazelle,</li> <li>Roan antelope,</li> <li>Greater kudu,</li> <li>Demoiselle crane</li> </ul>
Babille ES		

•	allocation of land for new settlers within the boundary of the sanctuary Need for land by the new comers Need for Berhsa soil used for house construction Competition over the resources use in the sanctuary by Hawya & Oromo ethnic groups	<ul> <li>Demand for ivory</li> <li>Need for charcoal production &amp; land clearing for cultivation</li> <li>Population increase surrounding the sanctuary</li> <li>Poverty</li> <li>Drought/Desertification</li> <li>Low capacity (inadequate funding/budget, inadequate trained manpower)</li> <li>Weak law enforcement</li> <li>Lack of Political will</li> <li>No benefit sharing to local communities</li> <li>Lack of professional ethics and passion</li> </ul>	•	Elephant
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## **3.3. Impacts of threat factors to biodiversity in the protected areas**

In addition to identifying and assessing the severity of the threat factors, information on the impacts of the factors were also gathered during the study both from the interviewees and secondary sources. The results demonstrated that most of the threat factors identified are posing probably hardly reversible adverse impacts on ecosystems, communities and species in the protected areas. These impacts are described in detail under subsection 4.3 of the "Discussion" section.

#### **3.4. Results of the Theory of Change Model**

Summary results of situation analysis for each protected area studied are shown on Figures 2-6, which is simply a graphical illustration of the results presented above while showing the links (cause-effect relationships) existing between the threat factors, underlying causes, and their effect of target ecosystem component (see Figures 2-6). The Theory of Change Model (see Figures 7-11), on the other hand, is simply the reverse of the situation analysis model in a way that depict the expected results achieved if the underlying causes of the threat factors are acted upon. As such, clearly stating, this theory of change model demonstrates the links among: Biodiversity target

result (impacts or goal of threat reduction interventions), Threat reduction result (outcome of intervention), behavioural change results (outputs of interventions), and work plan (management interventions/actions needed to reduce threat factors) (Figure 7-11). The potential functionality of these models' components was demonstrated by certain assumptions, which are briefly described below.

Although some of the threat factors and the underlying causes and human behaviours did vary across the five protected areas, most of these were similar across the areas. Similarly, as was also highlighted both in the situation analysis and theory of change models, the target ecosystem components (those most affected by the threat factors) are some key wildlife species, elephant being common to all PAs, and critical habitats of these species. Thus, the goal of EWCA in the five protected areas is: *Improving population status of key wildlife species and the quality of their habitat in the protected areas*. Given these similarities among the protected areas in the components of the theory of change model, the assumptions underlying the theory of change stated in the models are described in generality, rather than separately for each protected area, that works for each respective protected area.

The five key assumptions underlying the theory of change (as clearly shown on the figures 7-11) are as follows:

i. Awareness raising and community dialogue campaigns [Interventions] would help reduce/avoid wildlife hunting for cultural practices and the demand of bushmeat and ivory [outputs]. This in turn will result to reduced poaching [outcome] and ultimately to "Increased populations of key wildlife species such as Elephant, Buffalo, etc" [goal].

- ii. Forging and maintaining strong collaboration with relevant neighboring and middle-east countries will result to "Reduced demand for ivory", thereby to "Reduced poaching" and "Improved wildlife population".
- iii. Strengthening law enforcement through stakeholder collaboration and adequate resource allocation (finance, equipment and human resources) will lead to "Reduced illegal activities such as unregulated grazing, fire, deforestation for cultivation, etc", which in turn results to "Improved wildlife habitat quality".
- iv. Developing and implementation of integrated community development initiatives for protected area-associated people will "Reduce people's dependence on protected areas' resources". As a result, pressures from cultivation, grazing, etc will be mitigated and wildlife populations and their habitat conditions improved/maintained.
- v. Promoting awareness of local communities and admins on the importance of the park and wildlife laws and lobbying relevant govt. bodies at all levels will ensure to gain their political commitment to support wildlife conservation and incorporate conservation in community priority development agendas. Gaining their commitment will (i) facilitate defining of protected areas' boundary and gazettement; and ii) help to mitigate/ reverse the effects of development projects (e.g., sugar factory, irrigation canals and investments in and around some protected areas) on ecosystems. Provided that these actions would be taken, then their outcomes and impacts will be "Rehabilitation of Open woodland, bushland and grassland habitats, especially in Omo and Kafta NPs" and "Maintenance of elephant movement corridors" in these parks.













Figure 7: Mago NP: The theory of change model showing intervention needed, changes expected and monitoring its success.



Figure 8: Omo NP: The theory of change model showing intervention needed, changes expected and monitoring its success.

Figure 9: Chebera Churchura NP: The theory of change model showing intervention needed, changes expected and monitoring its success.



Figure 10: Kafta Sheraro NP: The theory of change model showing intervention needed, changes expected and monitoring its success.





Figure 11: Babille ES: The theory of change model showing intervention needed, changes expected and monitoring its success.

#### 4. DISCUSSION

#### 4.1. Severity of Threat Factors and Vulnerability of Protected Areas

In this assessment study, although thirteen threat factor types were identified across the five protected areas treated, with several of them occurring almost in all the protected areas, it should be noted that most of the threat factors are not always mutually exclusive as they are operating against biodiversity of the protected areas in a complex and interactive ways. For example, conversion of grassland/bushland to cultivation fields and canal construction in the Omo National Park are related to investment pressure/large scale irrigation for sugar cane cultivation. Similarly, deforestation is usually performed, in addition to logging for construction and charcoal production, for expansion of small scale permanent and seasonal (subsistence) agriculture. Nonetheless, the findings of this study have highlighted that most of the threat factors are occurring in most of the protected areas, with wildlife poaching for bushmeat and for wildlife products (e.g., ivory, skin, etc), expansion of crop cultivation land (subsistence farming) and overgrazing by livestock being the top most severe and most widespread threat factors. These results are in agreement with several similar reports in Ethiopia (e.g., Asefa et al., 2015; Wale et al., 2017; EWCA, 2018) and elsewhere in Africa (e.g., Kiringe and Okello, 2007). The implication of the findings of the present study is therefore although most protected areas are susceptible to all of the threats, dealing with poaching and human encroachment and associated activities (e.g., deforestation for cultivation and livestock grazing) in the studied protected areas would secure most protected areas.

Other threat factors with higher or equal to RTFSI than average, and occurring in three or four protected areas, include investment pressure/large scale irrigation (0.27), small scale expansion of permanent agriculture (0.24) human-induced fire burning (0.21) and deforestation (0.20). The rest

of the threat factors are localized (occurring only in one or two protected areas) and had relatively lower than the average RTFSI (see Table 2).

The findings that a majority of the protected areas considered for the study are threatened by a majority of threat types imply that wildlife conservation in the country, in general, and in these protected, in particular, is currently at huge crisis. The fact that conservation crisis in Ethiopia has become in an overwhelming challenges has already been highlighted in reports of several studies and national development plans, including the Growth and Transformation plan. The primary cause of threats to biodiversity in Ethiopia is the ever-increasing land demand for cultivation, settlement and livestock grazing—which is due to the unbridled increasing human population in the country, including around protected areas—, thereby putting more pressure on biodiversity and protected areas (Williams et al., 2004). In addition to this, however, there are a number of bottlenecks to achievement of effective protected area conservation and management in the country. The key barriers and challenges to effective law enforcement pertaining to biodiversity conservation and protected area management in Ethiopia are related to socio-cultural, economic, environmental, management system of protected areas, and political factors; these factors are affecting conservation practices independently or interactively. For example, from socio-cultural/economic and environmental points of view, most socio-economic activities (e.g., way of cultivation and animal husbandry) of the nation are still in the traditional mode. Subsequently, areas outside protected areas are currently highly degraded due to unregulated overuse, being confounded by recurrent drought. As such, the exponentially growing rate of human population in the country, where the majority is under high poverty level, and ecosystem degradation outside protected areas have resulted to increasing demand of previously unoccupied virgin land for cultivation land and livestock pasture. Ultimately, these constraints have caused increased

dependency of local communities on the natural resources of the protected areas (Acha and Temesgen, 2015; Megaze, 2017), as relatively intact and productive areas are only available in such areas that have been set aside for wildlife conservation. Similarly, conservation incompatible cultural practices, such as killing wildlife to demonstrate bravery and serving bushmeat during marriage ceremonies, and coupled to the increasing demand and price of ivory on the global markets, has motivated locals to do poaching.

Another key challenge to contain the wide spreading threats to protected areas in Ethiopia is partly attributed to the low capacities of protected areas management to address conservation issues in a holistic approach. Most of the protected areas, including those treated under this study, lack until recently clearly defined boundaries and are suffering from shortage of resources (skilled manpower, funding/budget, infrastructure and equipment) needed for effective conservation. Furthermore, protected area managements systems seldom take into account the need of local communities and the role that they play in pushing conservation forward. This lack of participation of local communities in conservation and management of and benefit sharing from protected areas and, most importantly, coupled to lack of awareness on the conservation values of wildlife and the associated ecosystems to the society, have led to the local communities to develop the feeling that they are marginalized from conservation initiatives and that wildlife resources are belongings of the government/state. The consequences of such negative attitude have been increased abuse of natural resources in the protected areas, which have been more demonstrated during civil unrests where protected area properties and wildlife have been severely destroyed by locals (Jacobs and Schloeder, 2001).

Finally, but most critically important challenge, lack of political commitment by government bodies almost at all levels and lack of appropriate integrated land use plan policies and/or poor

implementation thereof are among the key political factors for the intensive and extensive biodiversity degradation in Ethiopia's protected areas. One best example of the effect of lack of integrated land use plan policy is the recent allocation of land from Omo National Park for large scale irrigation schemes for cultivation of sugar cane that fed the Omo Kuraz Sugar Factory (Gebre, 2018). Similar incidences have been reported from Kafta Sheraro National Park where local investors are given irrigation-based cultivation land within the park boundary (KSNP, 2016; Asefa et al., In Prep.).

In addition to characterizing key threat factors across the protected areas, based on the PASI and PARTI values, this study has also enabled to identify [the three] protected areas most susceptible and most threatened to overall threat factors and to each individual threat factor. Accordingly, threat factors such as canal construction, investment developments and conversion of grassland/bushland in the Omo National Park are key issues that should be addressed in a matter of urgency, while human settlement expansion and elephant poaching in the Babille Elephant Sanctuary. Similarly, gold mining and irrigation farming along the course of Tacazze River in the Kafta Sheraro National Park are top priority issues to be dealt with in the short term. Livestock grazing is a common practice across the protected areas, except in Chebera Churchura National Park, and thus requires implementation of regulatory systems across all protected areas, if prevention may not be possible at all, so as ensure sustainability of ecosystems. Further, although incidences of human-wildlife conflicts are also identified to be among threats to other protected areas in Ethiopia, including Babille Elephant Sanctuary and Kafta Sheraro National Park (Kiringe and Okello, 2007; Wale et al., 2017; EWCA, 2018), it is a major threat factor in the Chebera Churchura National Park (Acha and Temesgen, 2015; Megaze, 2017). This growing humanwildlife conflict in Chebera is a function of human population increase and encroachment to the

park and arises from conflicts between human and wildlife needs, particularly are due to livestock depredation, crop-raiding by ungulates and human damage by Elephants and buffalos (Acha and Temesgen, 2015; Megaze, 2017). Any action such as controlling problem animals would reduce negative attitudes to protected areas (Kiringe and Okello, 2007; Asefa and Didita, 2018).

Overall, the few facts discussed above illustrate the importance of the approach used to assess and rank the threat factors, as well protected areas, in that the findings can be used to identify specific problems ailing each conservation area in a prioritized manner and deal with them on individual basis based on their severity indices or relative threat factor severity index (RTFSI). It is critical for EWCA to have structured and focused priorities for its protected areas. This study therefore suggests that most of management actions should be based on actual measurement of threat indices or a reliable index such as RTFSI in addressing specific threat factors. Despite the similar trend reported herein between protected area relative threatened index (PARTI) and susceptibility index (PASI), this study recommends that further prioritization of Protected Areas most affected should be done based on a threatened status using indices such as PARTI, rather than on susceptibility (PASI) which is simply a catalogue of threats recorded without considering its magnitude or severity (Kiringe and Okello, 2007).

## 4.2. Impacts of the key threat factors to biodiversity in the protected areas

The results of the present study demonstrated that most of the threat factors identified are posing probably hardly reversible adverse impacts on ecosystems, communities and species in the protected areas. These findings are similar to some previous studies (e.g., Gebre, 2018; Hika et al., 2018; EWCA, 2018; Asefa et al., In Prep.) conducted on quantification of severity and impacts of certain threats in some of the protected areas. These are briefly summarized below for each or groups of related key threat factor.

## Wildlife Poaching

Wildlife poaching/illegal killing is a common practice throughout protected areas of the country, which usually is committed to meet their demand for bushmeat (e.g., ungulates) and for wildlife products for sale (e.g., ivory, leopard skins, etc) and to demonstrate bravery (e.g., elephant, Buffalo, lion and leopard) (Hika et al., 2018; EWCA, 2018). For instance, of the total 547 incidences of wildlife mortalities reported from Omo National Park, 371 (68%) of the cases were due to subsistence and commercial poaching (Gebre, 2018). Similar reports have also been indicated increasing killing of wildlife, particularly elephants Elephant poaching for ivory, in particular, have been remained the most severe immediate threat facing all populations of the species (EWCA, 2015). Some of the reviewed previous reports indicate that: i) in the Mago National Park, at least, 8 elephants were killed only in 2013/14 (Hika et al., 2018); ii) 73 Elephants were killed in the Babille Elephants Sanctuary from 2011-2014 (EWCA 2015), and 3 Elephants in 2018 (BES, 2018); iii) ~20 elephants were killed between 2012 and 2014 in Mago (EWCA, 2015); and iv) 4 elephants were killed in the Kafta Sheraro National Park in 2006 (Shoshani et al., 2004), and another four elephant tusks were confiscated in 2015 from poachers living around the park, in addition to five Leopard, five Greater kudu and two Red-fronted Gazelle skins (KSNP, 2016). In general, Elephant poaching in Ethiopia has been remained the most threat to their long-term survival; it has led to decline in its populations by 90% since the 1980s and extirpation from at least 6 of the 16 areas in which elephants were found in the early 1990s (EWCA, 2015). The interviewees have informed that indiscriminate poaching, interactively with other threat factors though, have ultimately resulted to the extinction of several mammal species in the protected areas, such as Giraffe, Rhino, Oryx, Tiang, Zebra, Gerenuk and Grant's Gazelle in the Mago NP, and Zebra, Oryx and Rhino in the Omo NP.

## Settlement and Crop Cultivation

Settlement and cultivation (both small-scale subsistence and large-scale permanent) inside Ethiopia's protected areas are a recent history, just following the downfall of the then Derg regime in 1991. Since then, these have been increasing alarmingly due to intrinsic population growth and immigration from other areas. For example, in the KSNP has been due to the high intrinsic population growth rate resulted from resettlement programmes and illegal immigration to the area. Currently, there are 14 (12 outside and 2 inside) villages found in/around the park, with their ~64,000 estimated people (KSNP, 2016). This rapid increase of human population in the area has led to increased demand of arable land. At present, ~415 km<sup>2</sup> (18% of the total area of the park) of natural habitat has been converted to sesame and sorghum cultivation fields.

## Investment and Irrigation Canals

Although a localized threat factor, only occurring in the Kafta-Sheraro and Omo National Parks, Investment/irrigation canals are among the top ranked threat factors at these areas. In Kafta, nearly 15km<sup>2</sup> of natural vegetation of the park has been cleared and converted by local private inventors to irrigation-based Banana plantation along Tekeze River (Wendim et al., 2016). The case of Omo National Park, establishment of the Omo Kuraz Sugar Factory Project in the lower Omo Valley, may perhaps represent one of the most devastations have been occurred in the country due to government investment expansion. This recently launched Sugar Factory Project is found to be established in the core wildlife habitats in the Omo National Park, which has now influenced the park via construction of roads, bridges, irrigation canals, sugar factories, accommodations for migrant workers, and land clearing for sugarcane plantation (Gebre, 2018). This happened as the process was less inclusive of relevant stakeholders, like EWCA, during feasibility studies of the project so that the environmental impacts that the development might have (as is now clearly evident) have not been assessed and mitigation measures are not in place. As a result, over 25,000ha virgin land (grassland and bushland) of the park is converted to sugar cane fields.

The impact of the investment is also associated with irrigation canal; it is estimated that a minimum total of 250km canals (main, primary, etc.) is needed for the operation, which has an average dimension of L250 km x W100m x H4m. Thus, canal construction has resulted to a permanent loss of 100sq km pristine habitat (Gebre, 2018). The problem with canal does not end soon after excavation, the excavated soil materials are damped at several sites of a considerable size just along the canals, and in the process, covering the most suitable habitat and creating artificial hills. Overall, the canals and such artificial hills obviously have not only jeopardized the security and vital activities of wild animals, but potentially have (would) also caused habitat fragmentation and population separation that affect genetic diversity of less mobile smaller animals. In addition to causing habitat loss and fragmentation, the canals have a long-lasting effect on wild animals by acting as a barrier separating populations—a phenomenon that reduce genetic diversity and fitness of animals of less mobile smaller-sized species-and a venue for drowning. Gebre (2018) has reported that canals are responsible for 21% of the total wildlife mortality cases in the Omo Valley. Finally, the construction of factories or sugar cane plantations in South Omo Zone has also resulted to blockade of the wildlife movements within the park through a massive excavation of canals and blocked elephant movement corridors between Mago and Omo NPs (Figure 12). Such corridor blockade are thought to finally lead species with a small population sizes to loss of gene flow which in turn results to lack of fitness, thereby accelerating their vulnerability to extinction.



Figure 12. Map of Omo National Park showing area of the park converted to sugarcane cultivation field.

## Livestock Grazing

Pastoralism and incursion into the protected areas have caused disturbance and habitat degradation and loss within the parks. As result, the elephant range of Mago NP has decreased by more than 52% since the 1980s (Yirmed and Bekele, 2000), with similar devastation occurring in the key habitats of Babille Elephant population. Over grazing by the livestock is a serious problem in Kafta Sheraro NP mainly during the rainy season when the lands outside the park are covered by crops. During this season, on average ~ 520,000-530,000 heads of livestock from the surrounding areas and other parts of Tigray region, as well from Eritrea, use the park for grazing year round (KSNP, 2016).

#### **Other Localized Threat Factors**

Other threats factors that occur only one or two protected areas, but are of critical issues that should be dealt with, include gold mining in the Kafta Sheraro NP, human-wildlife conflicts in the Chebera Churchura and Kafta Sheraro NPs, and ethnic conflict in Babille Elephant Sanctuary.

*Mining Kafta Sheraro NP*: Gold and marble are among the most economically important precious mineral deposits found in/around KSNP (KSNP, 2016). Although traditional gold mining inside the park was started recently, just before six 6 years, a survey conducted in 2012 revealed that more than 10,000 youth (both males and females) were found to be engaged in illegal gold mining in the park (Asefa et al., In Prep). Wendim et al. (2014), who surveyed along 179 km long transect, have reported the presence of ~10,000 (i.e. 56 pits per km) gold mining pits that have 20-35m depth at ~300 quarrying sites. Apart from modifying the ecosystem through ecological successions, such activities pose a significant threat to wildlife, because such pits can act as a trap even for larger animals like Elephants (Wendim et al., 2014). Urgent management actions are needed to reverse the situation and rehabilitate sites affected by quarrying activities.

<u>Human-Wildlife Conflicts (HWC)</u>: HWC occurs due to damage incurred to the local community by wildlife through depredation of livestock, damage to human body/life and crop raiding. Critical issue is the case of human-elephant conflicts occurring in the Kafta and Chebera NPs and Babille. In Kafta Sheraro this is occurring on the irrigated land in the park, with elephants being chased and some equipment destruction by elephants, while in Chebera is due to Elephants' attraction crops outside the boundary (bananas, sugar cane, cassava, etc). Even though this human elephant conflict (HEC) in Kafta and Chebera national parks occurs at a low rate, it is a critical challenge in Babille. Conflict and crop raiding mainly results from the illegal settlement within the BES as 50-90% of incidents are within the park along both sides of the Gobele Valley and the Upper part of the Erer Valley. Reports indicate that, as a result of HEC, 19 human deaths and/or injuries had occurred between 1997 and 2014 (EWCA, 2015) and 3 human deaths/injuries occurred only in 2018 (BES, 2018). Conflict and crop raiding mainly results from the illegal settlement within the BES as 50-90% of incidents are within the park along both sides of the Gobele Valley and the Upper part of the Erer Valley. Although this may not be seen as a direct threat to elephants but note that it is a significant problem to BES staffs and have led to decreased support for elephant conservation and a scale up of poaching as a result.

<u>Ethnic Conflict</u>: Although it occurs in Mago and Omo NPs, it is also the case in Babille Elephant Sanctuary where insecurity and conflict across the Somali/Oromia RS boundaries are making it very difficult to conduct law enforcement operations and community support is low.

## 5. CONCLUSION AND RECOMMENDATIONS

This study has found that wildlife poaching for bushmeat and for other products (ivory, skin, etc.), cultivation expansion for subsistence farming and overgrazing by livestock RTFSI are identified to be the top severe and widespread threat factors. , occurring almost in all the protected areas. Other threat factors with moderate relative severity and lower distribution/localized occurrence/, but are detrimental at site levels, included investment and large scale irrigation pressure, small scale expansion of permanent agriculture and human-induced fire burning (see Table 1). Babille Elephant Sanctuary, Kafta Sheraro National Park and Omo National Park were the most susceptible and threatened protected areas to most of the threat factor types (see Table 2).

The underlying causes of the direct threat factors, herein, are treated as indirect threats or conservation challenges and bearers that are the reasons for the occurrence and expansion of the direct threats to wildlife, include: poor law enforcement (due to resource constraints and lack or

poor implementation of enabling policies), availability of fire arms, ethnic conflicts, increased global demand and price of ivory, cultural practices during marriage and to demonstrate social status are reported to be the major causes (indirect threats) for increased wildlife poaching in the protected areas. On the other hand, poverty, human population increase, recurrent drought and declining of pasture outside protected areas have caused local communities to largely rely on natural resources within the protected areas for pasture and water and to practice small scale seasonal and permanent cultivation. These practices have been further fostered due to lack of awareness, lack of benefits to local community and inadequate political commitment by government at all level. Furthermore, lack of clearly developed and implemented integrated development plan (land use plan) both at federal and regional levels, coupled with poor environmental impact assessments during planning and implementation of investment projects, have led to conservation incompatible land allocation for development initiatives. The consequences of this lack of clear policy and/or its poor implementation on protected areas have been manifested in the Omo National Park where Kuraz Sugar factor was established and in the Kafta Sheraro National Park where irrigation-based cultivation land was leased-out for private investments along Tacazze River (Table 4).

The results also demonstrated that the threat factors have been posing probably hardly reversible adverse impacts on some ecosystem components, including key wildlife species such as elephant and their habitat. The Theory of Change Model (see Figures 6-10) is constructed to demonstrate for EWCA and respective protected area managers to implement the suggested interventions in the model. These models link Biodiversity target result (impacts or goal of threat reduction interventions), Threat reduction result (outcome of intervention), Behavioural change results (outputs of interventions), and Work plan (management interventions/actions needed to reduce

threat factors) (Figure 7-11). The potential functionality of these models' components was demonstrated by certain assumptions, which are briefly described below.

In short, in order to improve population status of the key wildlife species and the quality of their habitat, both of which are presumed to be affected by the threat factors, the top severe threat factors (poaching, cultivation, settlement, investment, fire, etc) should be mitigated in each respective protected area. This in turn requires addressing the underlying causes of these threats. Therefore, the suggested key management interventions shown in the theory of change models should be implemented in a matter of urgency and the effects (results = outputs, outcomes and goals) of these interventions on the proposed goals should be monitored based on the periodic evaluation/monitoring of the status of the target biological components (e.g., elephant population and habitat quality).

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