GOVERNMENT OF THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

Ethiopia's Fifth National Report to the Convention on Biological Diversity

Ethiopian Biodiversity Institute

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Addis Ababa, Ethiopia

ACRONYMS

AAU	Addis Ababa University
ABS	Access and Benefit Sharing
ATA	Agricultural Transformation Agency
BMNP	Bale Mountains National Park
BoA	Bureau of Agriculture
BoEF	Bureau of Environment and Forest
CBD	Convention on Biological Diversity
CBOs	Community Based Organizations
CDM	Clean Development Mechanism
CRGE	Climate Resilient Green Economy
CSA	Central Statistical Agency
DHL	Deutsche Post Express Delivery Company
EBAs	Endemic Bird Areas
EBF	Ethiopian Biodiversity Forum
EBI	Ethiopian Biodiversity Institute
ECXA	Ethiopian Commodity Exchange Authority
EIAR	Ethiopian Institute of Agricultural Research
EIPO	Ethiopian Intellectual Property Office
EOSA	Ethio-Organic Seed Action
EPA	Environmental Protection Authority
EWCA	Ethiopian Wildlife Conservation Authority
EWNHS	Ethiopian Wildlife and Natural History Society
EWNRA	Ethio-wetlands and Natural Resource Association

FDRE	Federal Democratic Republic of Ethiopia
GiZ	German International Technical Cooperation
GTP	Growth and Transformation Plan
HLIs	Higher Learning Institutions
HoPR	House of People's Representatives
IBC	Institute of Biodiversity Conservation
ICARDA	International Center of Agricultural Research in the Dry Areas
IGAD	Intergovernmental Authority on Development
IUCN	International Union for Conservation of Nature
MDGs	Millennium Development Goals
MDTI	Meat and Dairy Technology Institute
MoA	Ministry of Agriculture
MoCT	Ministry of Culture and Tourism
MoD	Ministry of Defense
MoE	Ministry of Education
MoEF	Ministry of Environment and Forest
MoFA	Ministry of Foreign Affairs
MoFED	Ministry of Finance and Economic Development
MoH	Ministry of Health
MoI	Ministry of Industry
MoJ	Ministry of Justice
MoM	Ministry of Mines
MoST	Ministry of Science and Technology
MoT	Ministry of Trade

MoWCYA	Ministry of Women, Children and Youth Affairs
MoWIE	Ministry of Water, Irrigation and Energy
NAIC	National Artificial Insemination Centre
NBSAP	National Biodiversity Strategy and Action Plan
NGOs	Non-governmental Organizations
NPC	National Planning Commission
NTFPs	Non-timber Forest Products
PAs	Protected Areas
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PFM	Participatory Forest Management
RARIs	Regional Agricultural Research Institutions
RBUs	Regional Biodiversity Units
REDD	Reducing Emissions from Deforestation and Forest Degradation
SMNP	Semien Mountains National Park
SNNPRS	Southern Nations, Nationalities and Peoples Regional State
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	World Bank
WCMC	World Conservation Monitoring Centre
WFP	World Food Programme

EXECUTIVE SUMMARY

In accordance with Article 26 of the Convention on Biological Diversity and Decision VIII/14 of Conference of the Parties, Ethiopia has prepared the Fifth National Report on the implementation of the first half of the Strategic Plan 2011-2020. The report is comprised of the following seven chapters.

- Introduction
- Biodiversity resources and their values
- Status and trends of Ethiopian biodiversity
- Threats to Ethiopian biodiversity
- National Biodiversity Strategy and Action Plan, its implementation and mainstreaming of biodiversity
- Progress towards the 2020 Aichi biodiversity targets and contribution to Millennium Development Goals, and
- Conclusion

Ethiopia has great geographic diversity, and macro- and micro-climatic variability. The country has ten ecosystems, and 18 major and 49 minor agro-ecological zones. As the result, the country is endowed with great diversity of plant, animal and microbial genetic resources. Ethiopia is one of biodiversity rich countries in the world. It hosts two of the biodiversity hotspots of the world, namely: the Eastern Afromontane and the Horn of Africa hotspots.

Values of biodiversity

Biodiversity plays key roles in economic, ecological and social fabrics in Ethiopia. Agriculture is the dominant economic sector providing employment for about 83% of the population. It contributes 90% to the country's export value and 45% to the GDP. Earnings from coffee alone contribute 4 to 5% to the GDP, about 20% to the government revenue and 60% to the total foreign exchange. Livestock sector is a source of livelihoods and income, mainly, for the rural and per-urban communities. The sector contributes about 25% to the country's GDP.

Forests play vital roles in ensuring food security and sustainable livelihoods for millions of households throughout Ethiopia. Forest biodiversity provides ecosystem services and contributes an estimated 4% to the GDP. In Ethiopia, protected areas cover 14% of the country.

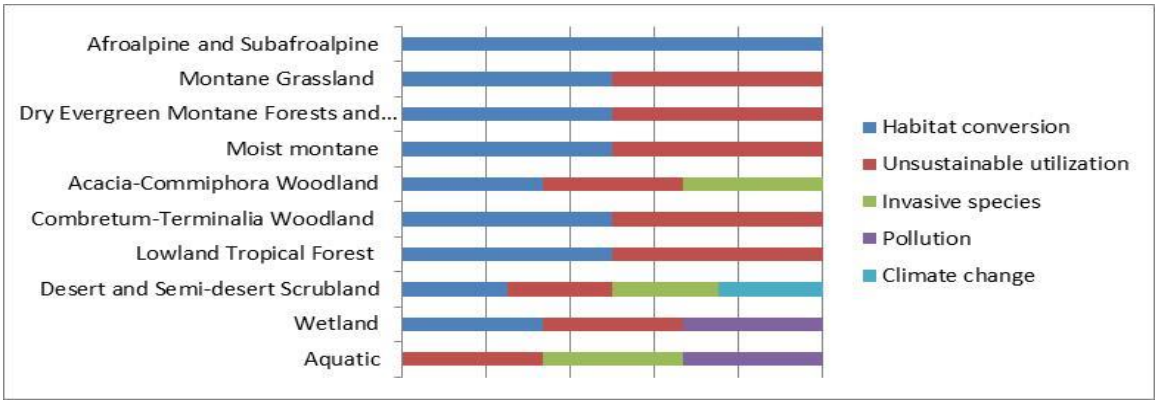
They play significant roles in conservation, recreation, eco-tourism and employment. Direct and indirect annual economic values of some protected areas are estimated at 1.5 billion USD.

Biodiversity status, trends and threats

Ethiopia possesses an estimated number of 6000 species of higher plants of which 10% are endemic. The country has 284 species of wild mammals and 861 species of birds. Data on other wild animals are scanty; and the number of reptile, fish, amphibian and arthropod species identified so far are 201, 200, 63 and 1,225, respectively. Of these faunal resources, 29 wild mammal, 18 bird, 10 reptile, 40 fish, 25 amphibian and seven arthropod species are endemic to Ethiopia.

Ethiopia is a centre of origin for cultivated crops such as coffee, tef, enset, and centre of diversity for many crop species such as durum wheat, barley and sorghum. The country has rich resource of indigenous farm animals also. These are comprised of 28 cattle, 9 sheep, 8 goat, 7 camel, 6 donkey, 8 horse, 2 mule and 7 chicken breeds.

Main direct threats to Ethiopia's biodiversity are habitat conversion, unsustainable utilization of biodiversity resources, invasive species, replacement of local varieties and breeds, climate change and pollution. Indirect causes of biodiversity loss in the country are demographic change, poverty, and lack of awareness and coordination.

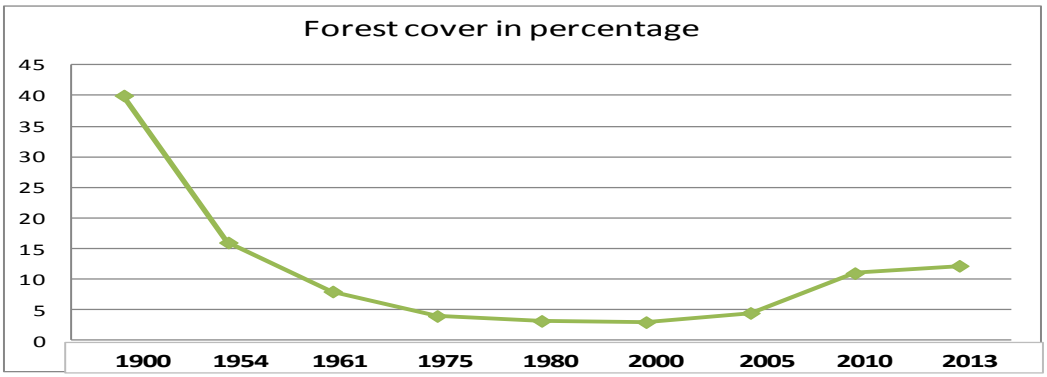


a. summary of major threats by ecosystems of Ethiopia (Fig. 1 in the main text)

Due to direct and indirect pressures, ecosystems and a number of wild plants and animals including endemic species, as well as farmers' varieties and indigenous animal breeds are

declining. Therefore, 103 tree and shrub species, 31 bird, one reptile, nine amphibian, two fish and 14 other invertebrate species are threatened.

In Ethiopia, conservation and sustainable utilization related activities are being conducted vigorously. As a result, significant improvements in the status of some biodiversity resources have been achieved. Rehabilitation and restoration of degraded areas, afforestation and practices of sustainable management of natural resources have, for example, resulted in increased forest cover and enhancement of the associated biodiversity.



b. Change in forest cover (Fig. 7 in the main text)

Implementation of the Convention

In Ethiopia, activities related to conservation and sustainable use of biodiversity and ensuring fair and equitable sharing of benefits accrued from the use of the country's genetic resources are being conducted aggressively. Major such activities that have been conducted in the last five years are described below.

Protected areas: different types of protected areas have been established to conserve and sustainably utilize the country's biodiversity. These are Semien-Gibe and Garameba community conservation areas, Dati Wolel and Arsi Mountains national parks, and Yayu Coffee Forest, Kafa and Sheka Forest Biosphere Reserves. Similarly, re-demarcation of seven PAs, namely: Semien Mountain, Alatish, Gambella, Kafta-shiraro and Bale Mountains national parks as well as Babille Elephant and Sinkele Swayne's Hartebeest Sanctuaries, have been completed.

Control of invasive species: awareness raising on and clearance of invasive species have been conducted to control the spread of these species. In Afar national regional state, for example,

about 10,000ha of land has been cleared from *Prosopis juliflora*. Similarly, *Eichhornia crassipes* has been removed from the reservoirs and canals of Wonji Shewa Sugar Estate, and most parts of Lake Tana and its surrounding wetlands.

Rehabilitation and restoration: about seven million hectares of degarded area has been rehabilited using area closure. Moreover, forest management plans have been prepared for 1.4 million hecatres of natural forests and about 2.9 million hectares of land has been afforested with different tree species. In years 2011 through 2013, a total of 16.8 million seedlings of different indigenous and exotic tree species have been planted in different parts of the country.

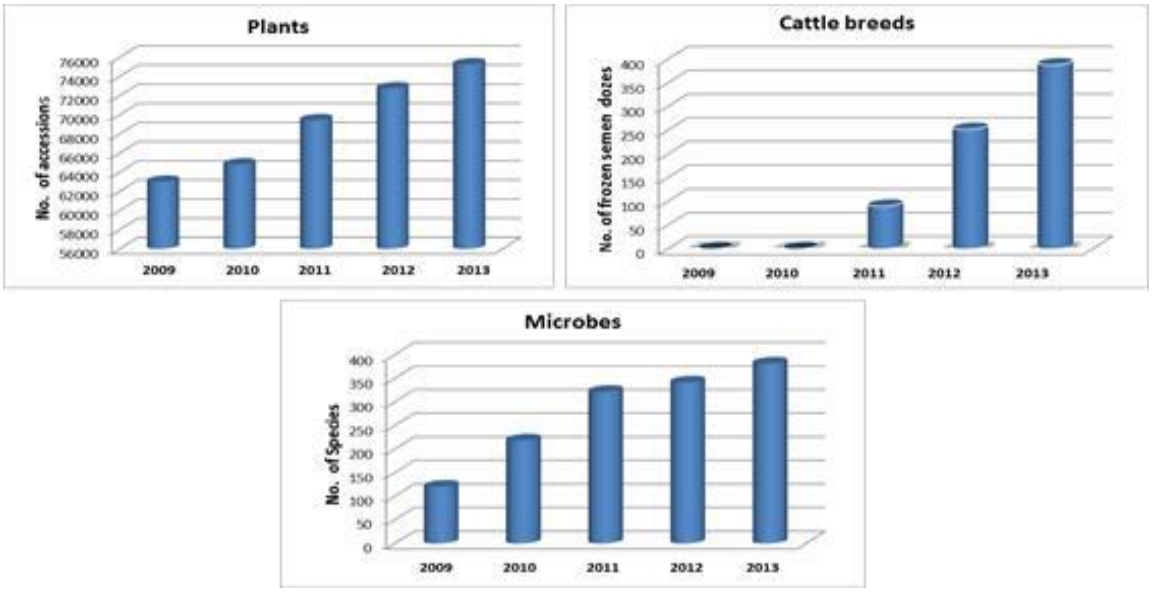
Sustainable biodiversity management: assessment of resource base and development of management plans for protected areas, forest management and proper land use practices have been conducted during the last five years. Other actions that were conducted in most of the national regional states of Ethiopia to ensure sustainable management of biodiversity include organizing local communities around parks under ecotourism and users of non-timber forest products. Land use ownership certification and legal frameworks on forest development and conservation were also put in place and implemented. Moreover, Reduced Emissions from Deforestation and Forest Degradation Project launched in 2011 is evolving as an integral part of a wider green economic growth, which is a component of Climate Resilient Green Economy Strategy. Thus, forest areas of the country such as Bale Mountain forest have already been selected for piloting REDD+ initiatives.

Public awareness: in Ethiopia, awareness raising of the general public and decision makers on biodiversity issues has been conducted using various mediums at different times and levels. Experience sharing programmes among national regional states on soil and water conservation activities and scaling-up of the best practices is one the other successful examples emanating from the vigorous awareness raising activities.

***Ex-situ* and *in situ* conservation:** about 12,000 new accessions of plants have been collected and conserved in the last five years. Within this period, 381 microbial species have been conserved *ex situ* in the national genebank. Moreover, five new field genebanks have been established to conserve coffee, medicinal plants and forest plant species. Ranches were

established in different parts of the country for conservation and sustainable utilization of cattle breeds. About 390 frozen semen dozes have also been cryo-conserved from four indigenous cattle breeds during this period.

Six community genebanks, botanical gardens and bio-parks have also been established in different parts of the country. Eight *in situ* conservation sites are under establishment to conserve enset, durum wheat, tef, coffee, medicinal plants and forest plant species. Moreover, six *in situ* sites have been established to conserve alkaline water ecosystems, and 13 breeds of indigenous cattle, sheep, goat and chicken have been conserved *in situ* in the same period.



c. Changes in *ex situ* holdings of plants, cattle breeds and microbes over time (Fig. 8 in the main text)

Access and benefit sharing*:* Ethiopia has acceded to the Nagoya Protocol and developed Code of Conduct to administer ABS issues. Based on the Code of Conduct, three plants species have been accessed for a foreign commercial company and two plant species have been accessed for local companies. In order to better communicate and ease administration of ABS issues and better conserve and sustainably utilize its biodiversity resources, Ethiopia has translated Nagoya protocol, Proclamation and Regulation on the access to genetic resource and community knowledge and community rights, and the CBD text into some local languages.

Mainstreaming Biodiversity

The Ethiopian Government has put in place policies and strategies for sustainable natural resource management, including biodiversity conservation and sustainable development. The country is taking various measures to mainstream biodiversity into sectoral and cross-sectoral plans and programmes. Devising and implementation of Climate Resilient Green Economy Strategy is one of the major recent steps geared towards successful mainstreaming of biodiversity into agriculture, forest, power and transport. Moreover, biodiversity issues are mainstreamed into different sectors such as tourism, education and energy.

Institutional frameworks: to effectively implement conservation, sustainable use and development of biodiversity, and ensure fair and equitable sharing of benefits accrued from access of the country's genetic resources, Ethiopia has established and restructured some institutions at federal and national regional states. These include re-establishment and restructuring of Ethiopian Biodiversity Institute, establishments of Regional Biodiversity Units, Biodiversity Centres and Ministry of Environment and Forest.

Revision of the NBSAP

The process leading up to the preparation of the revised NBSAP involved broad participation of stakeholders, including policy makers, local communities, academic institutions, civil society and NGOs. The roles of the stakeholders in the NBSAP revision process ranged from providing appropriate data and information to evaluating the Draft National Biodiversity Strategy and Draft NBSAP at two national workshops. Finally, the revised NBSAP containing 18 targets, 41 indicators and 59 actions has been produced.

Progress towards the implementation of *the* Strategic Plan for Biodiversity 2011-2020 and MDG

Ethiopia has shown substantial progress in the implementation of the Strategic Plan 2011-2020. Out of the 20 Aichi Biodiversity Targets, Ethiopia has performed "very good", "good", "fair" and "poor" in 9, 6, 4 and 1 targets, respectively. These achievements have in turn contributed towards achievements of Millennium Development Goals 1, 3, 7 and 8.

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CHAPTER ONE

1 INTRODUCTION

Ethiopia is located in the horn of Africa stretching from 3°N to 15°N latitude and from 33°E to 48°E longitude with an area of 1,127,127km^2. It is a country of great geographic diversity with wide altitudinal and physiographic variations. The altitude ranges from 116 meters below sea level in the Danakil Depression in Afar national regional state to the highest peak of 4,620 meters above sea level on Mount Ras Dashen in Amhara national regional state. The Great Rift Valley divides the western and south-eastern highlands, and the highlands on each side give way to vast semi-arid lowland areas in the east and west, especially in the southern part of the country (EFAP, 1994). Macro- and micro-climatic conditions of the country are highly variable with bimodal rainfall distribution. The major rainy season in most parts of the country lasts from June to September followed by a short rainy season that occurs between February and April. The mean annual rainfall ranges from 500 mm to 2800 mm. Similarly, mean annual temperatures range from below 10 to 30°C. Ethiopia is comprised of nine national regional states and two city councils. Over eighty distinct languages having about 200 dialects are spoken in the country. Amharic is the working language of the Federal Government. Ethiopia is the second most populous country in Africa next to Nigeria with over 80 million people and annual population growth rate of more than 2%. Agriculture is the dominant economic sector providing employment for about 83% of the population, contributing 90% to the country's export value and 45% to the GDP. The per capita income is estimated at USD 380 and the country's GDP is growing by 11% per annum. Coffee, sesame, leather, flower, gold and live animals are major export items (MoFED, 2011).

CHAPTER TWO

2 BIODIVERSITY RESOURCES AND THEIR VALUES

2.1 Biodiversity Resources

Ethiopia is one of the top 25 biodiversity-rich countries in the world, and hosts two of the world's 34 biodiversity hotspots, namely: the Eastern Afromontane and the Horn of Africa hotspots (WCMC, 1994). It is also among the countries in the Horn of Africa regarded as major centre of diversity and endemism for several plant species. The diverse topography gave rise to a wide range of altitude and other environmental factors. According to a classification based on agro-ecosystem known as agro-ecological zones (AEZ), Ethiopia has 18 major and 49 minor AEZs. This has resulted in wide variations in rainfall, humidity and temperature as a result of which the country comprises ten ecosystems that range from Afroalpine at the highest elevations to desert and semi-desert ecosystems at the lowest elevations. Because of the combined effects of topographic and climatic factors, the country is endowed with diverse ecosystems that are inhabited by diverse animal, plant and microbial species.

Plant biodiversity

The Ethiopian flora is estimated at 6000 species of higher plants of which 10% are considered to be endemic. Woody plants constitute about 1000 species (IBC, 2012a).

Ethiopia is a centre of origin for many cultivated plants such as Tef (*Eragrostis tef*), noug (*Guizotia abyssinica*), Ethiopian mustard (*Brassica carinata*), enset (*Ensete ventricosum),* anchote (*Coccinia abyssinica*) and coffee (*Coffea arabica*). The country is also a centre of diversity for species such as wheat (*Triticum* sp.), barley (*Hordeum vulgare*), sorghum (*Sorghum bicolor*), pea (*Pisum sativum*), cowpea (*Vigna unguiculata)*, chickpea (*Cicer arietinum*), lentil (*Lens culinaris*), chat (*Catha edulis*), shiny-leaf buckthorn (*Rhamnus prinoides*), cotton (*Gossypium herbacieum*), castor bean (*Ricinus communis*), oats (*Avena abyssinica)* and clovers (Trifolium sp.). Wild relatives also exist for most of these species.

The Ethiopian forests and woodlands are reservoirs and gene pools for several domesticated and/or important wild plants and wild relatives. Species richness varies across forests, depending on environmental factors characterizing the forests. The country is also known to be

a centre of diversity for a number of important forage species in the genera *Trifolium, Vigna,* and *Dolichos*, among others. Out of the 26 indigenous species of Trifolium, eight are endemic to Ethiopia. Similarly, of the total medicinal plant species, 2.7% are endemic to Ethiopia, and most are found in the wild (IBC, 2012b).

Animal biodiversity

Animal genetic resources of Ethiopia are broadly categorized into farm and wild animals. Cattle, sheep, goats, camels, donkeys, horses and mules are major farm animals that lie under the mammalian category. Under the avian category are chicken (poultry), ostrich and turkey. The number of breeds of cattle, sheep, goat, camel (dromedary), donkey, horse, mule, and chickens identified so far are 28, 9, 8, 7, 6, 8, 2, and 7; respectively. There are also five geographical races of honeybees which are economically important. There are also other bee species called stingless bees (meliponini) or "Tazima nib" which makes special honey underground. Majority of the Ethiopian livestock are indigenous breeds. Exotic cattle, sheep, goats and chicken breeds have been imported by different institutions for the last four decades. The number of breeds of cattle, sheep, goat and chicken imported so far are 7, 7, 3, and 14, respectively (IBC, 2012c). About 3.6% of the poultry breeds are reported to be either pure exotics or hybrids (CSA, 2012).

The Ethiopian wild fauna are comprised of 284 mammal, 861 bird, 201 reptile, 200 fish, 63 amphibian and 1,225 arthropod (324 butterfly) species. Of these; 29 mammal, 18 bird, 10 reptile, 40 fish, 25 amphibians and 7 arthropod species are endemic to the country (IBC, 2009; USAID/Africa, 2008; Redeat Habteselassie, 2012).

Microbial biodiversity

Ethiopia has wide diversity of microbial biodiversity which, however, are hardly explored. Few efforts made by various institutions in the area of fermenter microbes, mycorrhiza, acetic acid and rhizobium bacteria indicated that the country has microbes of diverse economic and ecological importance. Moreover, efforts made in the extreme environments such as hot springs, alkaline aquatic ecosystems and salty areas have shown the existence of highly diversified extremophilic microorganisms in these areas. In Ethiopia, some institutions have so far identified limited number of microbial species out of which 381 species of bacteria, fungi and microalgae have been conserved in national genebank.

Cultural diversity

The diverse ethnic groups in the country gave rise to the existence of cultural diversity such as community knowledge associated with conservation and sustainable use of plant, animal and microbial genetic resources. About 83% of the Ethiopian population are rural and depend on community knowledge and innovations for agricultural production. The farming communities and herders in Ethiopia have maintained diversified crops and livestock through their community knowledge, innovations and practices. As in many other developing countries, over 75% of the rural populations of the country depend on community knowledge and practice for their healthcare delivery. Moreover, rural communities in Ethiopia have diverse customary laws, which have been used or contributed to the management and sustainable use of natural resources.

2.2 Values of Biodiversity and Ecosystem Services

Crop genetic resources have vital roles in agricultural production in terms of economic growth, food security and improvement of local livelihoods. Cereals, pulses and coffee are dominant crop commodities with significant contributions to local livelihoods and the national economy. Five major cereals (tef, wheat, maize, sorghum and barley) contribute 29% of agricultural GDP, 14% of the total GDP and 64% of the calories consumed (ESSP II, 2011). Pulses contribute 9.3% of total grain production and are sources of income for smallholder farmers, as a higher-value crop than cereals; and as a low-cost source of protein that account for approximately 15% of protein intake and have significant roles in national economy. In 2009/10, for example, USD 129 million has been generated from the sales of pulses. Earnings from coffee contribute 4-5% of the GDP, about 20% of the government revenue and 60% of the total foreign exchange (MoFED, 2010).

Similarly, livestock and their products play major roles in improving local livelihoods and the national economy. Livestock provide food, household income, draught, farmyard manure and fuel, ecological and social functions. In addition, livestock serve as sources of commodities for export such as live animals, meat and meat products, hides and skins, and honey and bees wax to earn foreign exchange. About 80% of Ethiopian farmers use animal traction to plough their fields. According to MoFED (2009), contribution of livestock to the GDP in the year 2009,

excluding ploughing services, was 25%. If the value of their ploughing services were included, however, their contribution to the GDP will rise to up to 45% (IGAD, 2011), increasing the overall role of agriculture in the national GDP. In the last two decades, hides and skins provided on average 90% of official livestock sector exports, whereas live animals and meat provided 6% and 4%, respectively. The total value of livestock and their products stands at about 20% of all national exports (IGAD, 2011; IBC, 2012c).

Forest biodiversity provides ecosystem services including provisioning, regulating, supporting and cultural services although monetary values of the services were not precisely quantified. They play vital roles in ensuring food security and sustainable livelihoods for millions of households throughout Ethiopia. They contribute an estimated 4% to the GDP through the production of honey, forest coffee, natural gums and timber. Recent estimates indicate that about 26-30% of the total coffee production of the country originates from wild and semi-managed coffee forests and the value of wild coffee is estimated at 130 million USD/annum (Mulugeta Lemenih, 2009).

Ethiopia is also one of the major producers of natural gums. In the year 2009/10, the country earned USD 12.68 million from the export of gums and incense (MoFED, 2010). Many wild edible plants originating from forests serve as a supplementary, seasonal and emergency food sources for a significant number of rural populations. In Benshangul Gumuz national regional state, for example, wild edible plants were reported to have 30-40% contribution to food security during normal and times of food shortage.

Protected areas have both direct and indirect values. The direct values include recreation, eco-tourism and employment. In terms of environmental services, protected areas play pivotal roles in providing ecological functions such as watershed protection, soil stabilization and erosion control, provision of clean water and associated filtration and storage functions, climate stabilization and carbon sequestration. Protected areas that are managed by Ethiopian Wildlife Authority (EWCA) have an economic values estimated at 1.5 billion USD per year (EWCA, 2009).

Microbial genetic resources also play vital roles in improving local and national economies. Traditional food preparations, agro-industries, pharmaceuticals, soil mineralization, waste

treatment are among the major areas of applications of microbial genetic resources. In Ethiopia, microbes are vital in preparation of traditional foods and local drinks both in the rural and urban areas. Traditional foods such as Injera, Kocho, Bulla and Cheese, and local drinks such as Tella, Tej, Borde, Cheka and Areke are means of the livelihood and sources of income for millions of rural and urban communities. In many part of the country, several species of mushrooms are considered as delicious food, and currently small scale mushroom farming is spreading in urban areas. With growth of agro-industries such as dairy, beverage, food and ethanol production, the contribution of microbes to national economy will increase enormously. Furthermore, values of microbes in the health sector such as vaccine development, pharmaceutics and quality control are increasing from time to time. The increase in agricultural productivity as a result of nitrogen fixing bacteria and others involved in biochemical processes that contribute to improved plant nutrient availability and induced resistance have been reported for different farming systems, including Ethiopian *Coffea arabica* and traditional agroforestry systems (Diriba Muleta, 2007).

CHAPTER THREE

3 STATUS AND TRENDS OF ETHIOPIAN BIODIVERSITY

The status and trends of ecosystems, plants, animals and microbial biodiversity of Ethiopia are described below.

3.1 Ecosystems

3.1.1 Afroalpine and Subafroalpine Ecosystem

Afroalpine and Subafroalpine Ecosystems areas are found between mountain ranges of 3,200 and 4,620 masl. They include, mountain slopes and tops of highest mountains such as Bale and Semien Mountains, Menz Guassa and Mount Guna. Some of the characteristic plant species of this ecosystem include *Alchemilla ellenbeckii, A. haumannii, Erica arborea, E. trimera, Euphorbia dumalis, Hagenia abyssinica, Hebenstreitia dentata, Hypericum revoltum, Knifofia foliosa, Lobelia rhynchopetalum*, *Philippia keniensis, Rosularia semiensis, Thymus schimperi, Festuca sp.*, and *Helichrysum sp.* A number of wild animals including endemic species exist in this ecosystem. Unique mammals found in this ecosystem are Ethiopian Wolf, Gelada Baboon, Walia Ibex, Mountain Nyala, Giant Mole Rat, Grass Rat, Klipspriger, Golden Jackal, Serval Cat, Caracal, Ratel, Rock Hyrax, Grey Duiker, Anubis Baboon, Porcupine and Abyssinian Hare. Some of the characteristic avian species of Afroalpine and Subafroalpine Ecosystem include Blue-winged Goose, Wattled Ibis, Thick-billed Raven, White-collared Pigeon, and many other rare and common birds (Tesfaye Awas et al., 2003; IBC, 2005).

Afroalpine and Subafroalpine Ecosystems are found under pressure of growing human and livestock population in the surrounding areas and subsequent expansion of agriculture. Efforts are underway to improve the status of some areas of this ecosystem. For example, the Bale Mountain National Park (BMNP) is legalized, demarcated and management and business plans have been developed to implement effective protected area system. Improvement of environmental management of the BMNP and its surroundings is also underway. The Semien Mountain National Park (SMNP) has been re-demarcated by increasing the area of the Park from its previous size. Furthermore, community managed protected Afroalpine and Sub-Afroalpine Ecosystem such as Menze-Guassa and Abune Yosef have been demarcated and

legalized as protected regional parks. As a result, the number of threatened and endemic mammals such as Walia Ibex (in SMNP) and the Ethiopian Wolf (in BMNPS and Menz Guassa) are showing improvements over time. Surveillances of Mount Choke and Guna have been completed for subsequent designation as parks, but the demarcation and legalization are not yet complete. However, no data is available on those Afroalpine and Subafroalpine Ecosystem that are found in other parts of the country. Research, monitoring and conservation works aimed at reducing negative impacts of the interaction between humans and critically endangered wildlife, strengthening traditional grassland management systems and awareness raising campaigns are being conducted in this ecosystem. In the SMNP, Integrated Development Project (SMNP-IDP) aimed at alleviating poverty, developing and managing the environment and natural resources of the park has been implemented. Similarly, strengthening of environmental management is being carried out in BMNP and its surroundings.

3.1.2 Montane Grassland Ecosystem

Montane Grassland Ecosystem is found between 1,500 and 3,200 masl. It occurs on the uplands of Central, North and Western Shewa, Arsi, Bale and Borena highlands, Western and Eastern highlands of Hararge and Gojam, Southern and Northern highlands of Gonder and Wello, and Eastern highlands of Tigray, Sidama and Gamo Gofa highlands. Trees and shrubs interspersed with grasses in this ecosystem include species such as *Acacia abyssinica, A. negrii, A. pilispina, Acokanthera schimperi, Allophylus abyssinica, Buddelja polystachya, Calpurnia aurea, Carissa spinarun, Celtis africana, Croton macrostachyus, Dovyalis abyssinica, Draceana afromontanum, Erythrina brucei, Euclea racemosa, Juniperus procera, Maesa lanceolata, Maytenus arbutifolia, Millettia ferruginea, Myrsine africana, Olea europaea, Afrocarpus falcatus,* and *Rosa abyssinica*. Characteristic grass species of *Andropogon, Cymbopogon, Cynodon, Eragrostis, Hyparrhenia, Panicum* and *Pennisetum* are documented from this ecosystem. The ecosystem is known to have high bird diversity, including endemics (IBC, 2009).

Montane Grassland Ecosystem occurs in areas where human activities such as crop cultivation and livestock husbandry have been most intense for years. Livestock density is greater than the caring capacity of the ecosystem. Therefore, it has experienced considerable land degradation. The main threats to this ecosystem include agricultural expansion, overgrazing and over

harvesting of selected species. In Tigray, Amhara, Oromia and Southern Nations, Nationalities and Peoples Regional State (SNNPRS), integrated soil and watershed management and area closure measures are being undertaken to rehabilitate the degraded areas by respective regional governments.

3.1.3 Dry Evergreen Montane Forest and Evergreen Scrub Ecosystem

Dry Evergreen Montane Forest and Evergreen Scrub Ecosystem is situated between altitudinal ranges of 1,500 and 3,200 masl. It covers much of the highland areas and mountainous chains of Oromia, Amhara, Tigray and SNNPRS. Characteristic trees and shrubs of the Dry Evergreen Montane Forest and Evergreen Scrub Ecosystem include *Carissa spinarum, Celtis africana, Ekebergia capensis, Euclea divinorum, Euphorbia ampliphylla, Juniperus procera, Mimusops kummel, Olea europea, Afrocarpus falcatus*, *Prunus africana,* and *Rosa abyssinca.* In some moist areas, there are patches of highland Bamboo. The common grass genera that are found in this ecosystem are *Hyparrhenia, Eragrostis, Panicum, Sporobolus* and *Pennisetum.* Wild mammals found in this ecosystem include Mountain Nyala, Leopard, Menelik's Bushbuck, Warthog, Bohor Reedbuck, Olive Baboon, Grey Duiker, and Spotted Hyena. Common bird species include Harwood's Francolin, Blue-winged Goose, Spot-breasted Plover, Yellow-fronted Parrot, Prince Ruspoli's Turaco, Nechisar Night Jar, Abyssinian Catbird, Abyssinian Long Claw, Black-headed Siskin, Yellow-throated Seedeater and Ankober Serin (EWNHS, 1996; Tesfaye Awas et al., 2003; IBC, 2009).

Habitat conversion is a severe threat to Dry Evergreen Montane Forests and Evergreen Scrub Ecosystem. This is caused by deforestation for wood products (especially fuel wood extraction), fire, agricultural expansion and overgrazing. However, national regional governments are taking various measures to improve the management status of the Ecosystem. In Adaba Dodola wereda (Oromia national regional state), for example, state forests are given on concession and are administered by joint management of government and community through benefit sharing arrangements, carbon trade and other incentive measures. The above approaches are aimed at increasing participation and responsibilities of local communities in the management and conservation of natural resources, mainly forests.

3.1.4 Moist Montane Forest Ecosystem

Moist Montane Forest Ecosystem is found mostly on the Southwestern and Southeastern plateaus with altitudinal range between 800 and 2500 masl, and comprises the high forests of the country. Characteristic trees and shrubs found in this ecosystem include *Coffea arabica*, *Cordia africana*, *Croton macrostachyus*, *Erythrina brucei, Galiniera saxifraga, Ilex mitis*, *Maytenus harennensis, Pouteria adolfi-friederici, Rothmannia urcelliformis, Sapium ellipticum*, *Syzygium guineense* and *Teclea nobilis.*

The ground layer of Moist Montane Forest Ecosystem is mainly made up of herbaceous plants including species of *Acanthus*, *Justicia*, *Piperoma*, *Impatiens*, *Urtica* and several grass species. Epiphytes such as *Canarina*, *Orchids*, *Scadoxus* and fern plants such as *Platycerium, Drynaria*, and mosses are found in the wettest parts of this ecosystem.

The Moist Montane Forest Ecosystem is also a home to a number of wild animals. Larger wild mammals living in this ecosystem include Lion, Leopard, Serval Cat, Common Jackal, Wild Dog, Wild Cat, Bush Pig, Giant Forest Hog, Warthog, Bush Buck, Colobus Monkey, Olive Baboon, Grey Duicker and several species of Bush Baby. Areas such as Bonga, Metu-Gore-Tepi and Tiro-Boter-Becho moist forests contain more than 15, 16 and 32 highland bird species, respectively (EWNHS, 1996; IBC, 2005).

Human activities such as timber extraction, commercial coffee and tea plantations, small-scale agriculture and grazing expansions and settlement are the major threats to Moist Montane Forest Ecosystem. Regional governments are taking measures to manage and maintain the Moist Montane Forest Ecosystem. Some Moist Montane forest vegetation are given on concession for joint government and community management in which local communities are organized and encouraged to work and obtain benefits from non-timber forest products (NTFPs). Participatory forest management (PFM) activities have had noticeable and immediate impacts such as relocation of previous forest dwellers outside of the forest, reduced illegal timber cutting and collecting. Due to lack of data and systematic monitoring, however, it is difficult to show trends of those forests representing this ecosystem.

3.1.5 Acacia-Commiphora Woodland Ecosystem

Acacia-Commiphora Woodland Ecosystem is found between 900 and 1,900 masl, and covers main parts of Southern, Eastern and the Rift Valley of Oromia, Afar, Harari, Somali, and SNNP national regional states. The characteristic woody species of this ecosystem include *Acacia senegal, A. seyal, A. tortilis, A. mellifera, Boswellia microphylla, B. neglecta, Balanites aegyptiaca, Commiphora africana, C. myrrha, C. boranensis, C. cilliata, C. monoica* and *C. serrulata*. These species are characterized by either small deciduous or leathery persistent leaves. Species of *Acalypha, Barleria, Aerva* and *Aloe* are also common in Acacia-Commiphora Woodland Ecosystem. Characteristic wild mammals such as Oryx, Swayne's Hartebeest, Kudu, Gazelle, African Wild Ass, Grevy's Zebra, Waterbuck, Serval Cat, Elephant, Buffalo, Dibatag (Clarke's Gazelle), Gerenuk, Long-necked Antelopes and other plain animals inhabit this ecosystem. The characteristic bird species include Ostrich, Hunter's Sunbird, Shining Sunbird, Golden-breasted Bunting, Salvadori's Seed Eater, Yellow-throated Seed Eater, Ruppell's Weaver, White-headed Buffalo Weaver, Golden-breasted Starling, White-tailed Swallow and Stresemann's Bush Crow (IBC, 2005; 2009).

Expansion of small scale and commercial agriculture such as sugar cane, cotton and bio-fuel plantations are the major development activities taking place in Acacia-Commiphora Woodland Ecosystem. These imply that the ecosystem is shrinking both in size and species diversity. Furthermore, widespread collection of firewood and charcoal making, and expansion of indigenous and exotic invasive species such as *Prosopis juliflora* have contributed to the loss of species diversity and habitat degradation of this ecosystem. To protect biodiversity of this ecosystem, different efforts which include clearing of *P. juliflora* from grazing lands designation of new protected areas (PAs) and re-demarcation of national parks are being carried out.

3.1.6 Combretum-Terminalia Woodland Ecosystem

Combretum-Terminalia Woodland Ecosystem occurs between 500 and 1,900 masl. It is geographically distributed in Northwestern parts of Amhara, Tigray, Benshangul Gumuz, Gambella, Oromia, and SNNP national regional states. The vegetation in this ecosystem has developed under the influence of fire and many of the trees have thick corky barks. Characteristic trees and shrubs include *Anogeissus leiocarpa, Boswellia papyrifera, Combretum*

collinum, Lannea *sp.*, *Oxytenanthera abyssinica, Stereospermum kunthianum,* and *Terminalia laxiflora* (IBC, 2005; 2012a).The herbaceous species of genus *Justecia, Barleria, Eulophia, Chlorophytum, Hossolunda,* and *Ledeburia* exist in this ecosystem. The grasses include species of *Cymbopogon, Hyparrhenia, Echinochla, Sorghum* and *Pennisetum*. Wild mammals such as Swaynes' Hartebeest, Tiang, Grant's gazelle, Greater and Lesser Kudus, Gerenuk, Lion, Leopard, Giraffe, Buffalo, Elephants and Cheetah are common in this ecosystem. Characteristic bird species include Fox Kestrel, Red-throated Serin, Ostrich, Red-pate Cisticola, Green-backed Eremomela, Bush Petronia and Black-rumped Waxbill.

Encroachment and expansion of small scale and commercial agriculture for crops such as sugar cane, cotton, sesame, rice production and bio-fuel plantations are aggressively undertaken in the *Combretum-Terminalia* Woodland Ecosystem. Furthermore, overgrazing and shifting cultivation are deteriorating the ecosystem. Consequently, many wild animals (including Lion, Cheetah, Giraffe and Buffalo) and unique plants such as *Vitellaria paradoxa, Oxythanthera abyssinica, and Boswellia papyrifera* are under threat.

Development of forest legislations, seedling plantation, implementation of PFM, establishment of fire hazard protection committee and some regulatory measures are among the efforts made to halt the worrying situation in this ecosystem. Efforts were made to demarcate and designate the forest vegetation of the ecosystem as protected areas (Alatish, Kafta-shiraro, Gambella national parks, etc.).

3.1.7 Lowland Tropical Forest Ecosystem

Lowland Tropical Forest Ecosystem is situated in the lowlands of the Eastern parts of Gambella national regional state in Abobo and Gog weredas, and adjacent areas of South Sudan. The characteristic species of this ecosystem are *Baphia abyssinica* and *Tapura fischeri* (Tesfaye Awas et al., 2001). Other trees and shrubs include *Alistonia boonei, Antiaris toxicaria, Celtis gomphophylla, C. toka, C. zenkeri*, *Diospyros abyssinica*, *Lecaniodiscus fraxinifolius, Malacantha alnifolia, Milicia excelsa*, *Trichilia prieureana, Vepris dainellii,* and *Zanthoxylum lepreuri* (Tesfaye Awas et al., 2001; IBC, 2012a). Encroachment and shifting cultivation are some of the major threats affecting this ecosystem. Some conservation efforts such as development of forest

legislations and management and establishment of conservation areas are among efforts made to slowdown the impacts.

3.1.8 Desert and Semi-desert Scrubland Ecosystem

Desert and Semi-desert Scrubland Ecosystem is found in Northeastern, Eastern and Southern lowlands of Ethiopia. It occurs in the Danakil Depression, Ogaden, around Lake Chew Bahir and Omo valley. Desert and Semi-desert Scrubland Ecosystem hosts drought tolerant species including woody species such as *Acacia bricchettiana, A. stuhlmanii, A. walwalensis, Boswellia ogadensis, Commiphora longipedicellata, C. staphyleifolia, Hyphaene thebaica*, and other species of *Boscia, Cadaba, Maerua, Grewia, Balanites,* and *Ziziphus*. Grasses like *Dactyloctenium aegyptium* and *Panicum turgidum* species as well as succulents of such species as Euphorbiaceae and Aloaceae families are found in this ecosystem. Wild mammals that are found in this ecosystem include Soemmerring's Gazelle, Greater and Lesser Kudu, Oryx, Grant's Gazelle, Gerenuk, Lion, Leopard and Cheetah. Characteristic bird species include Ostrich, Kori Bustard, Arabian Bustard, Black-headed Plover, Temminck's Courser, Two-banded Courser, Tawny Pipit, Chestnut-bellied Sand Grouse, Lichstenstien's Sand grouse, Singing Bush Lark and Masked Lark.

Overgrazing, bush encroachment and invasive species such as *Prosopis juliflora* and *Acacia drepanolobium* in Eastern and Southern low lands of Ethiopia are among the factors threatening the Desert and Semi-desert Scrubland Ecosystem. Expansion of small scale and commercial agriculture such as palm tree, sugar cane and cotton are major activities taking place in this ecosystem. Furthermore, widespread collection of firewood and charcoal making has contributed to the deterioration of this ecosystem.

3.1.9 Wetland Ecosystem

Wetland Ecosystem consists of areas of swamps, marshes, flood plains, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water depth of which at low tide does not exceed six meters (Ramsar, 1971). Wetlands deliver a wide range of ecosystem services that contribute to human well-being such as food and feed, construction materials, water supply,

water purification, climate regulation, flood regulation and eco-tourism. Estimates in Forum for Environment (2009) showed that Ethiopia has a wetland area of 22,600km^2.

Characteristic species of Wetland Ecosystem include aquatic macrophytes, common tree species such as *Acacia polyacantha, Celtis africana, Diospyros mespiliformis*, *Ficus sycomorus, Kigelia africana, Mimusops kummel, Phoenix reclinata, Syzygium guineense* and *Tamarindus indica.* Wild mammals such as Hippopotamus, Otters, and other vertebrates and invertebrates are common in this ecosystem. Bird species common to Wetland Ecosystem include spot-breasted Plover, Blue-winged Goose, Rouget's Rail, White-winged Flufftail, Wattled Crane, Corn Crake, Shoebill, Black-winged Pratincole, Great Snipe and Lesser Flamingo.

Wetland Ecosystem is under pressure emanating from conversion into agricultural lands; especially for rice production, over exploitation of wetland resources, deforestation, soil erosion and land degradation, siltation, settlement, climate change and pollution. Fogera and Chefa wetlands in Amhara national regional state, for example, are highly affected by excessive use of swamps and flood plains for cultivation of rice and other horticultural crops. Moreover, Boye-Kito wetland located around the town of Jima and Lake Chelelaka in Bishoftu town have shrunk due to expansion of agriculture and urbanization. To reverse this trend, efforts such as integrated watershed management, livelihood improvement, and family planning are being made in some national regional states such as Oromia, Amhara and SNNPR.

3.1.10 Aquatic Ecosystems

Aquatic ecosystem includes rivers, reservoirs and lakes. In Ethiopia, this ecosystem harbors various species of mammals, birds, reptiles, amphibians, fishes and invertebrates. Similarly, numerous species of planktonic and benthic fauna have been reported from different rivers and lakes of the country. Moreover, many important microorganisms such as bacteria, fungi, algae and protozoa exist in this ecosystem. This ecosystem is also serving as a feeding site for a large number of resident and migrant birds; especially Flamingos, Ducks and Pelicans.

Aquatic Ecosystems are highly influenced by various anthropogenic factors such as pollution and over exploitation of fish stocks. Invasive species such as Water hyacinth are becoming threats to Aquatic Ecosystem of the country. Diversion of rivers, channeling and building water

distribution facilities, and indirect influences such as the removal of riparian vegetation cover, mining and similar activities have played roles in altering these habitats. Conservation efforts directed to Aquatic Ecosystems of Ethiopia are minimal. Ethiopia has a painful experience regarding the total loss of Lake Haramaya, and the current trend around Lake Abijata shows the lake's likely disappearance in the near future.

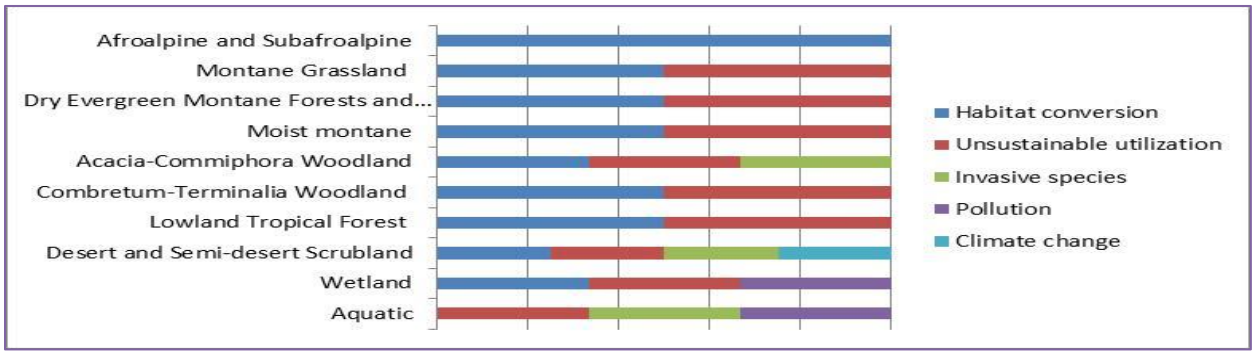

Fig. 1 Summary of major direct threats by ecosystems

3.2 Cultivated Plants

Although the majority of arable land in Ethiopia is cropped with farmers' varieties, there is a decreasing trend in the number of these varieties maintained by farmers. Factors affecting the state of field crop resources are displacement of local varieties by the improved ones, shift to market oriented crop production, disease and pests, and frequent drought and unreliable rainfall. The later affects not only landraces but also improved varieties. Durum wheat and sorghum are examples of crops that are seriously threatened from loss of diversity on farmers' fields.

Most of the crop wild relatives are found growing as weeds in field margins, traditionally managed agricultural lands and in disturbed habitats such as roadsides. Natural populations of many species of crop wild relatives are increasingly at risk. They are threatened primarily by habitat loss, degradation and fragmentation. Climate change is having significant impacts on species distributions by reducing suitable habitat and increasing the rate of habitat fragmentation. Horticultural plant species are being threatened by drought, pests, disease, and replacement by food grains. The gene pool of *Coffea arabica* is highly endangered by increasing

settlement and land-use pressure on the montane rainforests. Imported varieties of horticultural crops are also threatening the local ones.

3.3 Animal Genetic Resources

Although information on the status and trend of farm animals is limited, different indigenous breeds are found at different threat levels. At the moment, Sheko cattle, the only taurine breed in East Africa appears to be highly threatened as a result of interbreeding with the local zebu breed and a change in the production system. Fogera cattle breed is also threatened by the change in production system and interbreeding with other breeds, resulting in decline of the pure line. In addition, Begait, Irob, Ogaden, Afar and Borena cattle breeds; Sinnar donkey, Afar, Menz and Gumuz sheep breeds are also facing various degrees of threats. Moreover, ever increasing demand for export (both legal and illegal) market for cattle, goats, sheep and camels seems to threaten the resource base since the size and selection of export animals does not commensurate the off-take rate or the traditional breeding systems. This can be verified by the large proportion of young and breeding animals supplied to the market (IBC, 2009).

According to the International Union for the Conservation of Nature's Red List (IUCN, 2007), Ethiopia has six critically endangered, 23 endangered, and 70 vulnerable species of wild animals. Of the total of 284 mammalian species, those that require urgent conservation action include Walia Ibex (*Capra walie*), Gelada Baboon (*Theropithecus gelada*), Mountain Nyala (*Tragelaphus buxtoni*), Ethiopian Wolf (*Canis Simensis*) and Starck's Hare (*Lepus starcki).* Some of these endangered species, including Walia Ibex, have very restricted distribution (IBC, 2009).

Out of 861 bird species, 31 are globally threatened; among these, five, namely: *Sarothrura ayresii*, *Tauraco ruspolii*, *Heteromirafra sidamoensis*, *Serinus flavigula* and *Serinus ankoberensis* are critically endangered, 12 are endangered (e.g. *Aythya nyroca*, *Aquila clanga*, *A. heliaca*, *Falco naumanni*, *Francolinus harwoodi*), and 14 are vulnerable to extinction (eg. Prince Ruspoli's Turaco, Greater Spotted Eagle, Lesser Kestrel, Yellow throated Serin, Nechisar Nightjar, Wattled Crane). There are also 16 species of birds, which are nearly threatened (IBC, 2005; IBC, 2009; Bird Life International, 2001). Various migratory birds considered endangered at the international level also visit about fifty sites in Ethiopia every year. Moreover, parts or all

of the three Endemic Bird Areas (EBAs) lie within Ethiopia. These are the Jubba and Shabelle valleys EBA, the South Ethiopian highlands EBA and the central Ethiopian highlands EBA (Bird Life International, 2001).

The number of threatened species (Critically Endangered, Endangered and Vulnerable categories) of reptiles, amphibians, fishes, mollusks and other invertebrates according to IUCN (2008) are 1, 9, 2, 3, and 11; respectively. Among reptiles, "The python" has been Critically Endangered in the Lake Tana sub-basin. Three species of reptiles, namely: The Nile crocodile, Water Snake and Nile Monitor that are found in Lake Tana sub-basin are assigned into vulnerable category (Seyoum Mengistu et al., 2005). There is possibility that some herpes in Ethiopia are facing extinction due to habitat destruction before their existence in the country has even been recognized (Largen and Spawls, 2006).

3.4 Microbial Genetic Resources

Ethiopia is believed to have a wide microbial diversity. Among the little known are those that are used in the fermentation processes of traditional foods and beverages, diseases control, biological pest control, soil fertility, reduction of post-harvest losses, improving human and animal health, improving environmental safety, reduction of wastes and/or its bioconversion into useful products. There exists no exact data on the status and level of threats to microbial genetic resources of Ethiopia. However, all the factors affecting the country's ecosystems, and plant and animal biodiversity will affect directly or indirectly the microbial genetic resource base of the country.

CHAPTER FOUR

4 THREATS TO ETHIOPIAN BIODIVERSITY

4.1 Direct Threats

4.1.1 Habitat conversion

Conversion of natural forests, grazing lands, woodlands, and wetlands to agriculture and settlement are some of the threats to ecosystems and biodiversity in Ethiopia. In agriculture sector alone, the growth achieved between years 2005 and 2010 was due to 40% yield increment and 15% agricultural land expansion. In order to achieve targets set for the growth of agriculture sector for years 2010 through 2030, land expansion of 3.9% per annum is required. Under "business as usual" scenario, this will continue to affect ecosystems and biodiversity of the country, especially of the high woodland forest areas (MoFED, 2011).

4.1.2 Unsustainable utilization

Unsustainable utilization (over grazing/browsing, harvesting and hunting) of biological resources is one of the major threats to biodiversity and ecosystems in Ethiopia. Fish species such as Labeobarbus (in Lake Tana), timber tree species such as *Hagenia abyssinica* and medicinal plant species such as *Taverniera abyssinica* are notable examples that have been threatened due to over-utilization. Overgrazing/browsing by livestock in many ecosystems has also contributed to the degradation of rangelands and forest ecosystems. The consequences of these impacts include ecological disturbance, loss of species and ecosystem services thereby affecting livelihoods of local communities. Furthermore, over pumping or drainage of water from lakes and wetlands has resulted in loss of habitats and species as is the case of Lake Haramaya. The increase in human population along with the increased demand for water in Harar town and its surroundings was the prime cause of the disappearance of Lake Haramaya. Farmers found within the lake watershed were pumping water unsustainably to irrigate chat (*Catha edulis*), the main commercial crop in the area. This eventually resulted in the disappearance of the lake affecting the livelihood of the people that have been dependent on the lake (Brook Lemma, 2011).

4.1.3 Invasive species

Invasive species cause biodiversity loss by competing native species for feed and habitat and altering the physical environment in a way that excludes native species. So far, close to 35 invasive weed species are identified in Ethiopia, and they are posing negative impacts on native biodiversity, agricultural and range lands, national parks, water ways, lakes, rivers, power dams, road sides and urban green spaces with huge economical as well as social consequences. Some of these species include: mesquites (*Prosopis juliflora*), parthenium weed (*Parthenium hysterophorus*), water hyacinth (*Eichhornia crassipes*), lantana weed (*Lantana camara*), *Acacia* species, and other weeds such as Orobanche and Cuscuta species that are identified as major plant invaders. Recent surveys found also emerging plant invaders such as *Cryptostegia grandiflora, Parkinsonia aculeata, Mimosa diplorotricha* and *Nicotiana glauca* (Rezene Fessehaie et al., 2012).

Prosopis juliflora is aggressively invading pastoral areas in the Middle and Upper Awash Valleys, Western and Eastern Harerge zones, Afar and Somali national regional states; driving out more nutritive browse and grazing plant species by forming a thick mono specific scrub, thereby increasing incidence of crop pests and damage to eyes and hooves of both domestic and wild animals eventually leading to death of the affected animals and reduction in the overall biodiversity of the areas. *Parthenium hysterophorus* is spreading rapidly in many rangeland areas and farm lands of Afar, Somali, Oromia, Amhara and Gambella national regional states, causing enormous reduction in crop and forage production. Its impact in natural habitats poses a major threat to the biodiversity in these areas. Yield losses due to *Parthenium* weed in sorghum production reached 46-97% depending on location and year. Manual control of *Parthenium* weed by farmers resulted in developing skin allergies, itching, fever, and asthma in some of the farmers (Rezene Fessehaie, et al. 2012; IBC, 2012d).

Water hyacinth is also becoming a serious threat especially in Wonji and Koka reservoir areas of the Awash River system and Lake Tana, obstructing irrigation, affecting productivity and biodiversity of the infested aquatic ecosystems. At Wonji Shewa Sugar Estate, impact assessment of water hyacinth infested areas of 116.4ha of irrigation water reservoirs,

secondary and tertiary irrigation water supplies, border and central drains indicated that the weed inflicted excess water loss that is estimated in ranges from 393,660 to 2,945,160m^3, restricting water flow and incurring significant management cost (Rezene Fessehaie et al., 2012). Invasive weeds such as *Argemone mexicana*, *Lantana camara*, *Cryptostigma grandifolia* and *Mimosa Sp*. have caused severe damage by reducing crop and forage yields, displacing indigenous species, and favoring the spread of crop pests. Some areas in Borena woodlands, which are known for gums and resin production are deteriorating due to encroachment by such bushes as *Acacia drepanolobium, A. oerfota* and *A. mellifera*. Carmine cochineal (*Dactylopius coccus costa*), the insect that was introduced into the country in 2001 for production of cochineal dye (Tesfaye Belay and Zimmermann, 2006), is reportedly causing heavy damage on cactus species (*Opuntia ficus-indica*) in northern Ethiopia.

4.1.4 Climate change

Over the last several decades, temperature in Ethiopia increased at about 0.2°C per decade. The increase in minimum temperatures is more pronounced with roughly 0.4°C per decade. Precipitation, on the other hand, remained fairly stable over the last 50 years when averaged over the country. However, the spatial and temporal variability of precipitation is high. The future changes in precipitation and temperature in Ethiopia that have been projected by various global climate models are presented in Figure 2 (Keller, 2009).

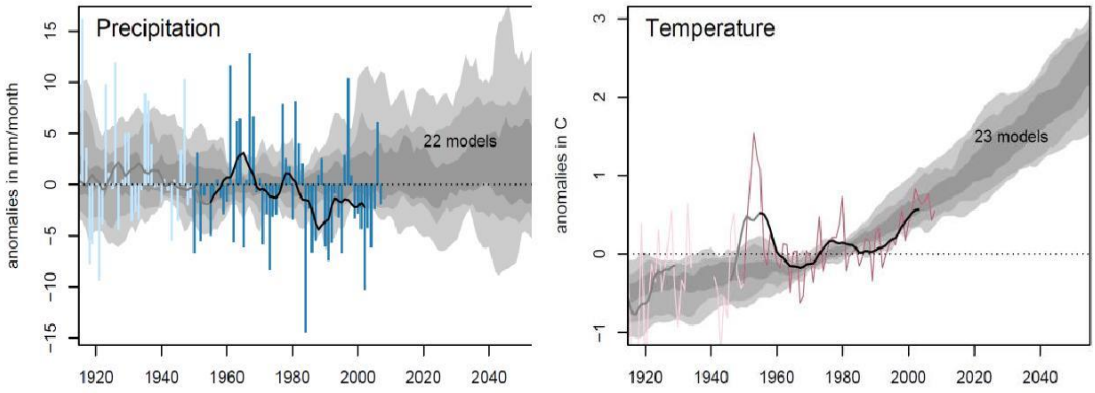

Fig. 2 Observed and simulated precipitation and temperature changes in Ethiopia for 2020-2040

The increasing occurrence of late rains and droughts is consistent with scientific assessments on the impacts of climate change in Ethiopia. Although there is lack of quantified data that

ascertain climate change as the cause of biodiversity loss in Ethiopia, the late rain and droughts which have been occurring are observed to lead to loss of crops, including the improved varieties and livestock, damaging the gene pool of these genetic resources (Keller, 2009). Climate change also causes high disease prevalence such as Pasterolosis and favors invasive species like *Acacia drepanolobium* to invade rangelands.

4.1.5 Replacement of local varieties and breeds

Agricultural biodiversity offers essential raw material for improving productivity and quality of crops, livestock, fish and other resources. Displacement by the improved varieties is one of the causes for the gradual loss of landraces of both plants and animals. Widespread distribution of improved varieties of wheat, tef, barley and maize has displaced many landraces. Some farmers' varieties of wheat (*shehan, Gerey and Gomad*), barley (*Demhay, Gunaza*) and sorghum (*Gedalit*) are among the varieties that have been lost due to various factors, including expansion of improved varieties in Tigray national regional state. Durum wheat is a seriously threatened crop subject to loss on farmers' fields. For example, about 77% of durum wheat landraces have been replaced by improved ones in Eastern Shewa zone. The main reason for this is the displacement by bread wheat varieties which took place gradually in the past three decades (EOSA, 2007).

Among indigenous cattle breeds, Sheko appears to be highly threatened as a result of interbreeding with the local zebu breed and due to changes in the production system (IBC, 2009). Similarly, chicken genetic resources of the country are being replaced rapidly by the exotics and their crosses.

4.1.6 Pollution

Major causes of pollution to aquatic and wetland ecosystems in Ethiopia are large and small scale factories such as brewery, textile, chemical, tobacco, thread and garment, and paint factories. Most of these factories do not have proper waste disposal systems and are dumping and/or draining their wastes into nearby aquatic and wetland ecosystems. This results in causing major damages to the biodiversity of the ecosystems through deposition of heavy metals as it is the case in Akaki River, and Abasamuel and Koka reservoirs. The other most

important large-scale human activities producing dangerous pollutants in Ethiopia include garages, petrol stations, tanneries, slaughter houses, market centres, hospitals, oil and flour mills, metal works and car washing.

4.2 Indirect Causes

4.2.1 Demographic change

Population growth is associated with increase in resource consumption, which causes expansion and intensification of land use, overutilization of biological resources and exploitation of marginal lands and the breakdown of traditional resource-management systems. As indicated in figure 3, Ethiopia's population is increasing steadily over the last three decades from 42.6 million in 1984 to 83.4 million in 2012, and is expected to reach 130 million by 2020 (CSA and ICF International, 2011). Uncontrolled population growth puts undue pressures on all natural resources of the country and would undoubtedly have serious impact on biodiversity.

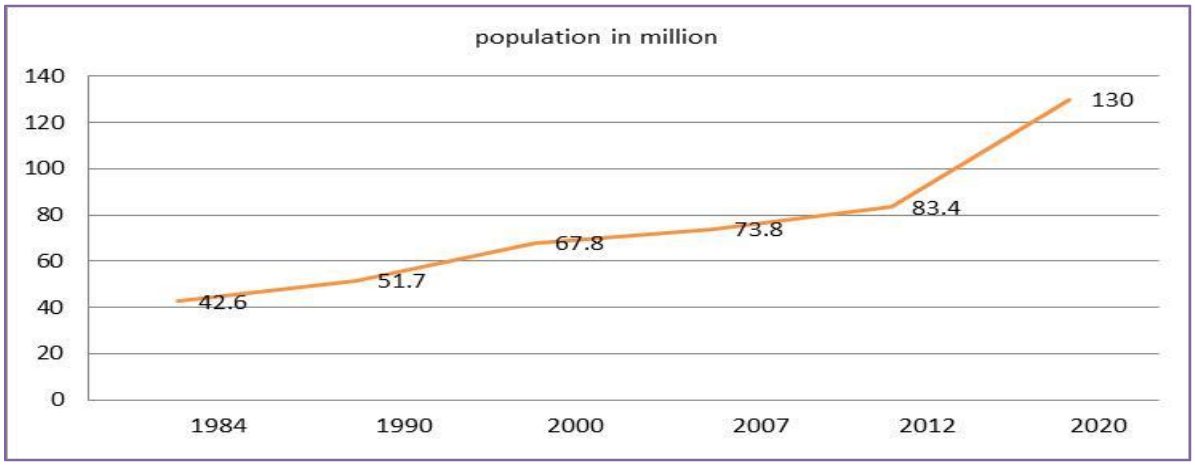

Fig. 3 Trends in human population growth

4.2.2 Poverty

Poverty, particularly in situations where people depend directly upon consumption of biodiversity or other natural resources for survival, is one of the causes of biodiversity loss. There exists a vicious circle of poverty, resource degradation and further impoverishment in Ethiopia. Poor farmers, fishermen, pastoralists and others extract what they can from the

environment to support their livelihoods. According to recent data from MoFED (2012), the national poverty head count indices and inequality reached 29.6%. This, together with low level of literacy rate (36%) and high unemployment rate in cities (17.5%), creates huge pressure on the biodiversity of the country.

4.2.3 Lack of awareness and coordination

The contribution of biodiversity and ecosystem services from PAs, forest reserves and wetlands is undervalued, resulting in the use of the resources in a way that undermines the provision of such services. Decision makers and the public often influence biodiversity through their actions as a result of lack of awareness on biodiversity values. This arises from the lack of effective communication mechanisms to raise awareness on biodiversity and its values. Until recently, biodiversity issues were not well integrated into the formal education system. Promotion and appreciation of community knowledge associated with biodiversity, its local uses and management that can also be used as an informal education and awareness needs to be strengthened. The country is making huge efforts to raise awareness of stakeholders, including the public in areas of biodiversity conservation, sustainable utilization and development.

Summary of threats to biodiversity and analysis of their root causes in Ethiopia is presented in Table 1.

Table 1 Biodiversity threats and analysis of their root causes

Threats	Root cause	Consequences	Gaps/Barriers
Habitat conversion	• increasing human population, agricultural expansion, and settlement	• deforestation • loss of species • ecological disturbance • loss of ecosystem services	• lack of adequate capacity, commitment, organizational set-up and incentives to implement land use policy properly
Unsustainable utilization • Over-exploitation	Due to rising human population: ▪ increasing demand for wood products such as firewood, charcoal and harvesting for construction materials, and for non-timber forest products such as medicinal, spices and stimulants ▪ hunting/harvesting of various animals from aquatic & terrestrial environments for food, medicine, cosmetics and other purposes ▪ limited alternative livelihoods ▪ poverty	• ecological disturbance • loss of species • loss of ecosystem services	• lack of sustainable use regulation and monitoring systems • lack of alternative livelihood and energy sources
• Overgrazing/ Browsing	• increasing livestock number	• regeneration affected • loss of species • ecosystem disturbance • loss of ecological services	• lack of proper management of grazing lands • weakening of traditional resources management systems/institutions
Replacement of local varieties and breeds	• higher demand for food to feed growing population • lower yields from local varieties/breeds	• loss of local varieties and breeds	• agricultural policy promoting the use of improved varieties • lack of incentive for maintaining landraces/breeds
Invasive species	• lack of proper management and/or quarantine system	• loss of species and ecosystem services • health problems • loss of agricultural production • food insecurity	• lack of monitoring of the implementation strategy on the status & trends of invasive species • lack of capacity & resources to control invasive species
Climate change	• emission of greenhouse gases • deforestation and unsustainable land use systems	• natural calamities (drought, floods, frost, etc.) • decline in production and productivity, disease outbreak & loss of species	• low level of climate change mitigation mechanisms • lack of awareness
Pollution	• unregulated discharge of pollutants • improper use of agro-chemicals	• ecological disturbance • loss of species • loss of ecological services	• poor implementation of environmental regulations • poor wetland management • poor waste management system

CHAPTER FIVE

5 NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN, ITS IMPLEMENTATION AND MAINSTREAMING OF BIODIVERSITY

In Ethiopia, revision of National Biodiversity Strategy and Action Plan 2011–2020 started in 2012 and is finalized in June 2014. During the revision process, appraisal data were collected from respective regional and federal government offices, NGOs and private sectors. The collected data were analyzed and stocktaking report was produced out of which draft national biodiversity strategy was synthesized. The draft strategy contained the national biodiversity resource base, and its values, status, trends as well as cause and consequences of the biodiversity loss in the country. It was based on the shared global vision, mission and strategic goals, and contained 16 draft national targets.

The strategy was presented to stakeholders at the first national stakeholders' workshop. The stakeholders' reviewed the draft Strategy and suggested two additional targets to be included in the document. After the review, the stakeholders' comments were incorporated in the document and the strategy containing 18 targets and their corresponding actions was devised. For each action, lead and collaborator implementing institutions, and implementation period have been proposed. It also contained implementation arrangements. The revised draft NBSAP of Ethiopia was presented at second national stakeholders' workshop and comments of the stakeholders were incorporated into the strategy document. The document so finalized contains 18 targets, 41 indicators and 59 actions (Annex I).

5.1 Status of Implementation of the NBSAP

This report focuses on activities that have been implemented between 2009/10 and 2014 by different stakeholders. Major activities that have been conducted during this period are establishment and re-demarcation of protected areas, control of invasive species, rehabilitation and restoration of degraded areas, sustainable biodiversity management, awareness raising, *ex-situ* and *in-situ* conservation, equitable sharing of benefits accrued from the use of accessed genetic resources and changes/rearrangements in legal and institutional set ups. Details of these activities and their outcomes have been outlined in Chapter 6 (Table 2).

5.1.1 Protected areas

Ethiopia has so far established several protected areas (PAs) which include 21 national parks, two sanctuaries, three wildlife reserves, 20 controlled hunting areas, six open hunting areas, six community conservation areas and 58 national forest priority area of which 37 are protected forests (Young, 2012; IBC, 2012a). Proportion of area of the country covered by PAs varies from one source to the other. According to IBC (2009), it covers 19.05% of the country. According to EWCA (2012), however, PAs of Ethiopia constitute 14% of area of the country. The variation in proportion of PAs emanated from continuing re-demarcations of the PAs that have been conducted since 2009.

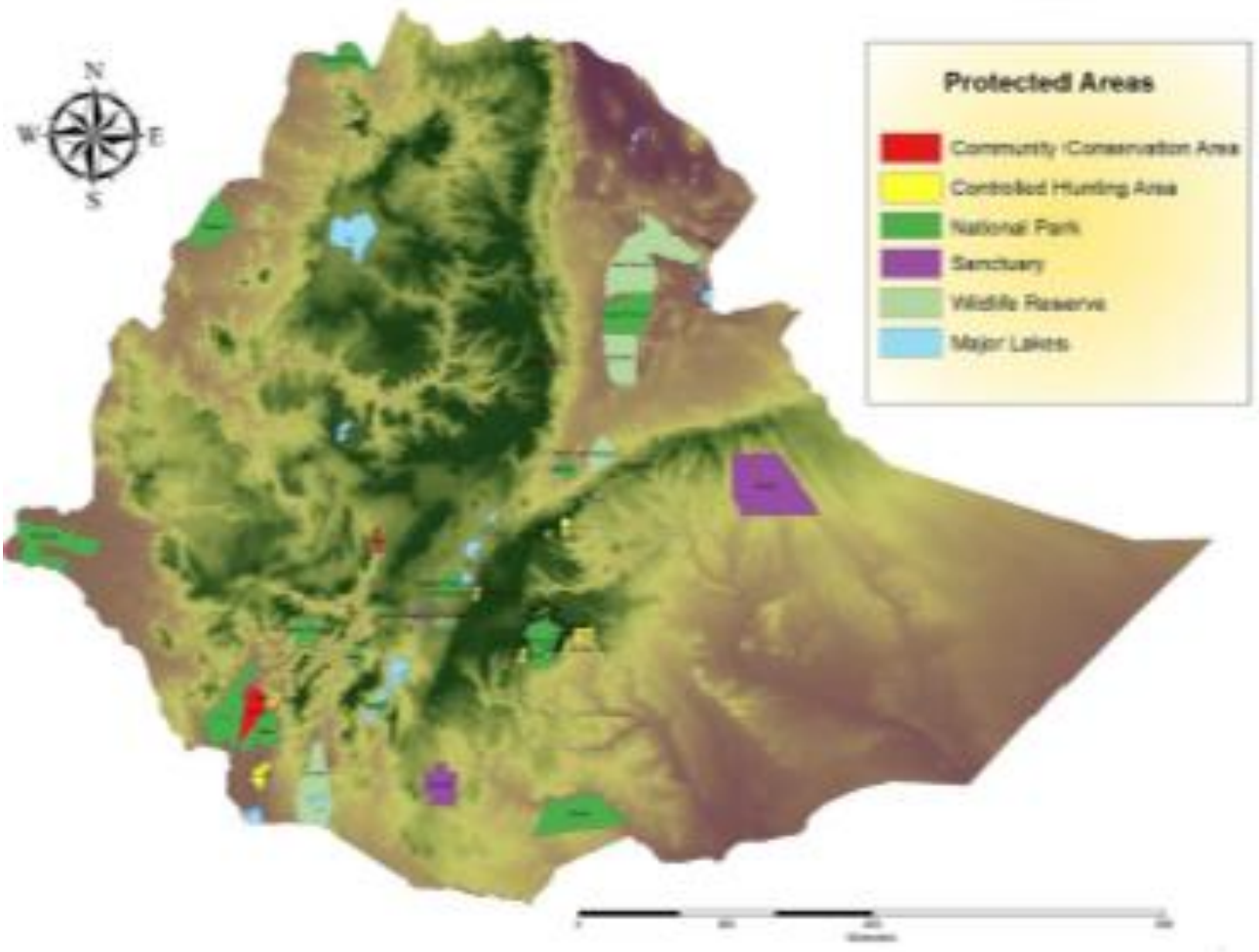

Fig. 4 Distributions of PA types (source: Vreugdenhil et al., 2012)

Since 2009, establishment of different types of new PAs is underway in different national regional states. Semien-Gibe and Garameba are community conservation areas that are established in SNNPRs during this period. In Amhara national regional state, PAs such as Bakussa national park and Menz Guassa community conservation area have got recognition by the council of the national regional state, and surveillance is completed for other potential conservation areas such as Wef Washa, Guna, Weleka Abay and others. In Oromia national regional state also, Dati Wolel and Arsi Mountains national parks were established within the stated period (Young, 2012).

Ethiopia is working towards improving the status of PAs. Re-demarcation of seven PAs, namely: Semien Mountain, Alatish, Gambella, Kafta-shiraro and Bale Mountains national parks as well as Babille Elephant and Sinkele Swayne's Hartebeest Sanctuaries have been completed while that of others is underway (Young, 2012). Moreover, clearing of the invassive species and restoration of degraded lands of Babile Elephant Sanctuary and Yangudi-rasa, Omo, Awash and Nech-sar national parks has been carried out in the last five years.

Similarly; Yayu Coffee Forest Biosphere Reserve, Kafa Biosphere Reserve and Sheka Forest Biosphere Reserves have been recognized and registered by UNESCO in years 2010 through 2012. The Yayu Coffee Forest Biosphere Reserve has an area of 167,021ha and is situated in Oromia national regional state. It includes Eastern Afromontane Biodiversity Hotspot and important bird areas of global significance. It is one of the last remaining montane rainforest fragments with wild *Coffea arabica* populations. The Kafa Biosphere Reserve is located in the Kafa Zone of SNNPRS and has a surface area of 760, 114ha. The focus of Kafa Biosphere Reserve is on protection of endemic and globally important genetic resources of *C. arabica* and its associated ecosystems. The Sheka Forest Biosphere Reserve has a surface area of 238, 750ha. It is located in Sheka zone SNNPRS and is part of Southwest Moist Montane Forests of Ethiopia. It is important for conservation of Afromontane forest vegetation types, especially the Afromontane Rainforest and Alpine Bamboo thickets.

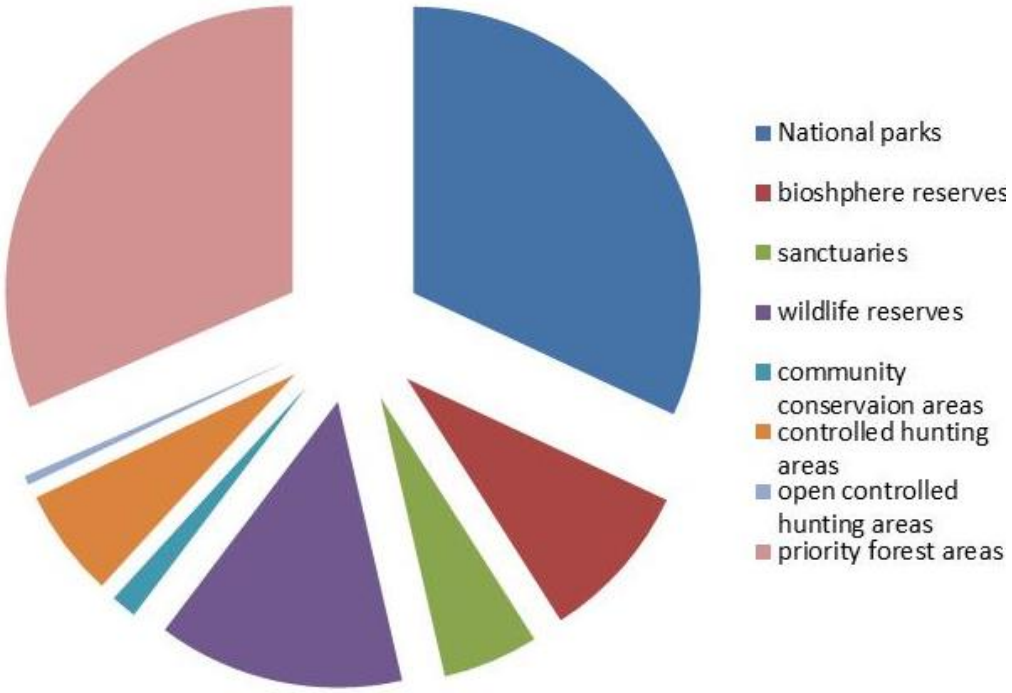

Fig. 5 Proportions of different PA types

5.1.2 Control of invasive species

In order to control invasive species, Ethiopia is taking various measures. To control the spread of *Prosopis juliflora*; awareness raising, guideline preparation and clearance of areas invaded by the species have been conducted. Thus, about 10,000ha of land at more than 15 sites in Afar national regional state, including neighboring localities of the Awash national park has been cleared mechanically (Rezene Fessehaie et al., 2012).

Efforts are being made to clear Parthenium weed from farm and range lands of the country employing mechanical, chemical and biological methods. Recently, Ambo Plant Protection Research Centre of the Ethiopian Institute of Agricultural Research is conducting laboratory experiments using *Zygogramma biclorata* and *Listronotus setosipennis* as biological control, and the effectiveness of this control mechanism is yet to be tested in the fields.

Measures taken to control Water hyacinth are mainly limited to mechanical clearing. In the reservoir and canals of Wonji Shewa Sugar Plantations, in addition to mechanical means chemicals have also been used to eradicate the weed infestations (Rezene Fessehaie et al.,

2012). In Amhara national regional state, an effective and exemplary action has been taken to clear Water hyacinth from Lake Tana and its surrounding wetlands (Box 1).

Box 1 Removal of Water hyacinth from Lake Tana and its surrounding wetlands

In 2011, monitoring activities indicated that the northern part of Lake Tana was infested by Water hyacinth that gradually expanded to 20,000ha of the lake area and its surrounding wetlands. Based on the above observation, outcomes of the studies conducted by the Bureau of Environment and Land Administration and Use of the Amhara national regional state, and Bahir Dar University indicated that the weed infestation was affecting 15 kebeles of three adjacent weredas and was spreading fast into the unaffected lake and surrounding wetland areas. The reports of the studies revealed also that the infestation was causing severe economic, social and environmental impacts, thus recommending for immediate interventions.

In 2012, recommendations of the studies received due attention from the national regional government. Consequently, a steering committee comprised of major stakeholders and chaired by the then vice president of the national regional state was established. This was followed by awareness raising campaigns that involved preparations and wide distribution of manuals on the impacts and ways of removal of the weed to the general public. As a result, a public campaign that lasted for three months and involved about 160,000 of the local communities was able to clear mechanically about 90-95% of the weed infestation. Observations after removal of the weed indicated that the aquatic birds that were deprived of their feeding, breeding and brooding habitats returning to the lake and wetland areas cleared off the infestation, and resumption of growth of forage on the area that has been rehabilitated.

The experience gained from this action is the need for early monitoring, dedication of decision makers and stakeholders, the importance of participatory planning, mobilization of the public and strong coordination can make changes.

Source: Teklu Damte (2012)

5.1.3 Rehabilitation and restoration

Ministry of Agriculture is leading various schemes to restore and rehabilitate degraded areas in Ethiopia. The schemes include area closure, integrated community based watershed management and natural forest management.

Two main types of area closure are being implemented for rehabilitation and restoration of degraded areas in the country. One is by closing an area from livestock and people so that natural regeneration of the vegetation can take place and the other is closing off degraded lands while implementing additional measures such as planting of seedlings, mulching and establishing water harvesting structures to enhance and speed up the regeneration process.

Using these approaches, about seven million hectares of degarded area has been rehabilited since 2010/11.

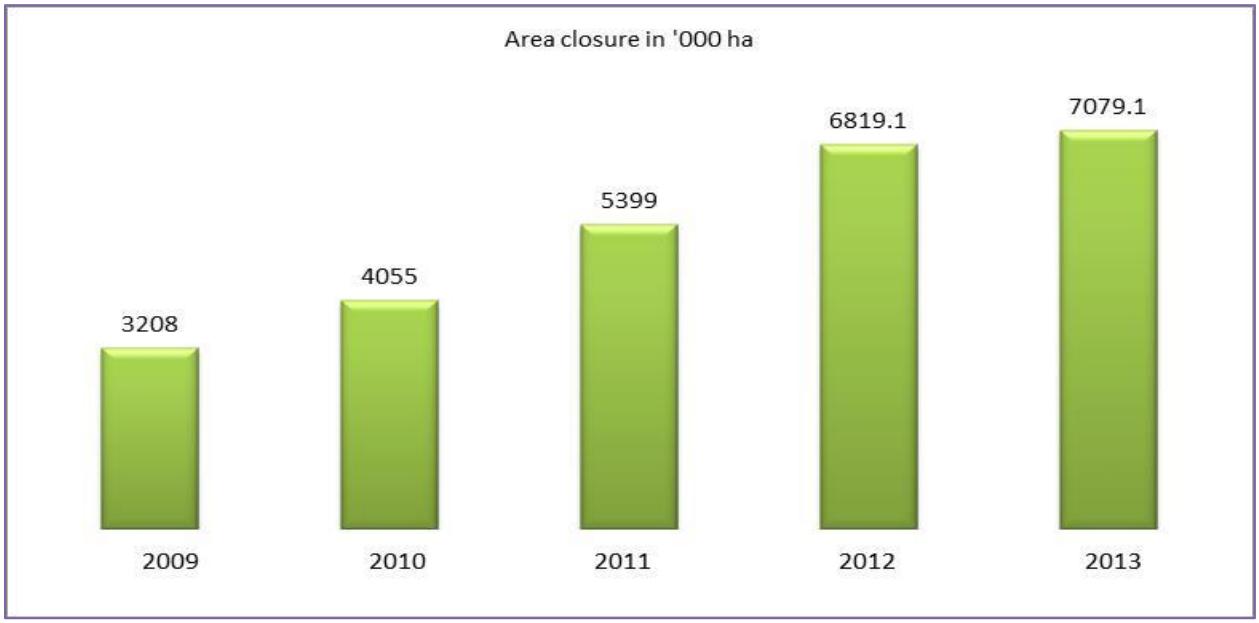

Fig. 6 Extent of performances of area closure (between 2009 and 2013)

During this period, soil and water conservation schemes have been carried out in 57,000 community based watersheds that cover about 13 million hectares of land. The soil and water conservation structures have been supported with biological soil conservation measures such as planting of multipurpose trees, shrubs and grasses. Bylaws agreed and approved by communities have become operational to govern the management and use of communal lands. In the last five years, forest management plans have also been prepared for 1.4 million hecatre of natural forests. Moreover, about 2.9 million hectares of land have been afforested with different tree species. In years 2011 through 2013, for example, a total of 16.8 million seedlings of indegeneous and exotic trees have been planted in various parts of the country (MoA, 2014a,b). Consequently, rehabilitation, restoration and afforestation schemes that have been implemented so far have made large contribution to enhance biodiversity and increase the forest cover of the country (figure 7). Some of the achievements are being used as models and have received national and international recognitions (Box 2).

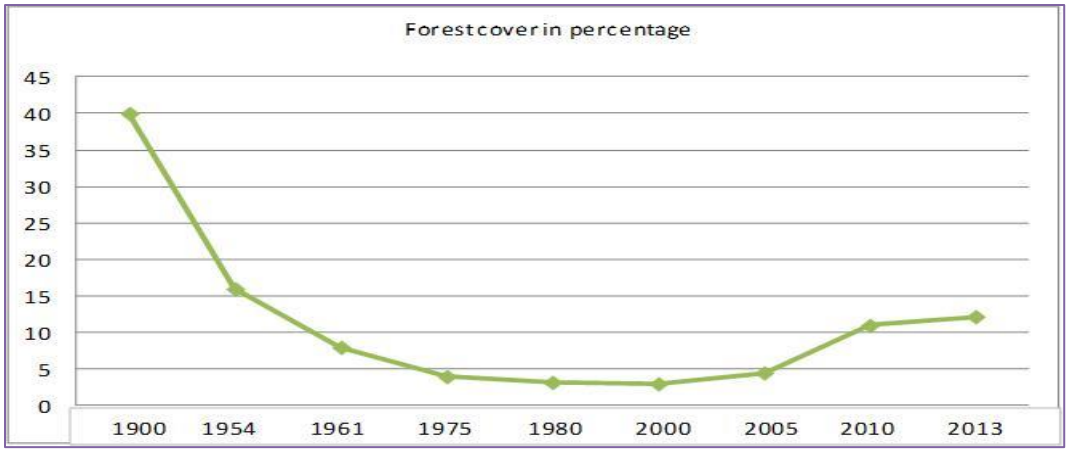

Fig. 7 Trends in change of forest cover

Box 2 Rehabilitation of degraded hillsides in Abraha Atsebeha Village

The farm lands in Abraha Atsbeha village (North Tigray) became dry and barren after years of degradation; and since the village no longer appeared suitable for human settlement, the idea of resettling the villagers in a new area emerged as an agenda of the national regional government. Before the final decision, however, the people of Abraha Atsbeha were given two choices: accepting the proposed resettlement scheme or rehabilitating their lands. The people chose to stay in their village, and worked hard on their lands. With the assistance from MoA in collaboration with such international donors as WFP, WB and GiZ, the village communities applied extensive soil and water conservation measures. Terraces were constructed and percolation trenches were excavated on the mountain slopes in order to halt the massive erosion and to replenish the groundwater. To stabilize the soil, trees and grasses were planted and new grazing bylaws were agreed. This regeneration activity that was conducted on 530 hectares since 1998 benefited about 910 households.

Since the villagers have taken up the fight against drought and erosion, many things changed. The groundwater table has risen from 15 to 3 meters depth in the dry season. The villagers cultivated vegetables, fruit and maize even in the dry season–often in such quantities that they can sell the surplus on the local markets. Families have a steady source of income and the means to get through the lean season, even when the rains were less than usual. As the result of this success, the people of Abraha Atsbeha were awarded the UN Equator Award at Rio+20 in 2012. The experience of Abraha Atsbeha was exemplary and is being up-scaled in to different areas of the country.

Source: GiZ; WFP

Similarly, significant efforts have been made to restore and manage degraded wetlands in Ethiopia. In Oromia national regional state, for example, watershed management scheme has been implemented to manage wetlands in six watersheds in Illuababor zone. The management scheme includes terracing supported with plantation of Vetiver grass. Moreover, wetlands and

associated environments rehabilitated are being used sustainably in the form of cut and carry of the grass, beekeeping and as sources of medicinal plants. This experience has been promoted into other parts of the country such as Fogera plains and Gibe wetlands.

In Ethiopia, carbon related rehabilitation, restoration and afforestation projects are also emerging. The Humbo Natural Regeneration Project is one of such projects working on rehabilitation of degraded areas. It is promoting natural regeneration of degraded area through enclosing the area from grazing and human interferences and planting of agroforestry trees. This resulted in increased vegetation cover, decreased soil erosion and downstream siltation, and enhanced biodiversity. Due to this, the Project has been awarded Africa's 1st Temporary Emission Reduction Award and has been registered in Kyoto Protocol's Clean Development Mechanism (Box 3).

Box 3 Humbo Farmers Managed Natural Regeneration Project

Before the inception of Humbo Farmers Managed Natural Regeneration Project (FMNRP), the land around Humbo (Wolayita zone, SNNPR) was highly degraded suffering from soil erosion, and landslides. The area was also suffering from successive years of drought and food insecurity. In 2006, the World Vision Ethiopia, in collaboration with the government of Ethiopia and the World Vision Australia, initiated FMNRP. The goal of the Project was to rehabilitate 2,778ha of degraded area and its adjacent villages through Farmer Managed Natural Regeneration and improve the livelihoods of the communities by enhancing ecosystem services and carbon revenue.

The Project used community based participatory approach involving all concerned stakeholders, including active participation of local communities that were organized into cooperatives, and decisions were made based on the consensus of all the stakeholders; especially the local communities. The Project area was closed from grazing and human interference by the communities and was managed by promoting natural regeneration and planting of indigenous and agroforestry trees. The Project was so successful in achieving its goal. It increased vegetation cover, decreased soil erosion and downstream siltation, and enhanced biodiversity in the Project area. It also increased the community's institutional capacity. As the result, the Project was awarded Africa's 1st Temporary Emission Reduction Award (Carbon Credit) in Oct 2012 (73, 000 credits out of 880,295t $C0_2$ expected to be reduced over 30 years' time) under UN's Clean Development Mechanism (CDM). The carbon credit was purchased by World Bank and was issued in October 2012. The fund is being invested on local infrastructure and food security initiatives.

Source: World Vision- Ethiopia

5.1.4 Sustainable biodiversity management

To use natural resources sustainably; resource assessment, developing management plans for PAs, forest management and land use; and organizing local communities around parks and users of non-timber forest products are among the actions that have effectively been carried out in most of the national regional states of Ethiopia since 2010.

The Bureau of Agriculture in Amhara national regional state has assessed, quantified and mapped the status of the region's forest cover in 2012. In the region, PFM has been implemented on 82,000ha of natural forests. In Oromia national regional state also Participatory Forest management is being implemented in 10 forest areas covering a total of 333,704ha, with 76 cooperatives consisting of 148,796 members of local communities. Furthermore, similar activities are being undertaken in Benshangul-Gumuz, SNNPRS, and Tigray national regional states. In Gambella national regional state, PFM is being implementing by establishing cooperatives of local communities that produce oil from the seeds of *Vitellaria paradoxa* sub sp. *nilotica*.

In Ethiopia, land use certification and guidelines, legislations and regulations on regional forest development and use, policy, regulation and strategies on forest development and conservation were prepared/devised and implemented within the past few years that contribute to the sustainable use of the country's biodiversity.

Moreover, Reduced Emissions from Deforestation and Forest Degradation (REDD+), launched in 2011, is evolving as an integral part of a wider green economic growth, through the Climate Resilient Green Economy (CRGE) Strategy. It is also evolving in the context of a policy environment that is promoting reforestation and afforestation. Some Forest areas of the country such as Bale Mountain REDD+ Project have already been selected for piloting REDD+ initiatives. The Project will be implemented over 700,000ha of forests in the Bale Mountains Eco-region of Ethiopia (Tsegaye Tadesse, 2009). A similar project in SNNPRS has been measuring and monitoring forest carbon in Kafa Biosphere Reserve to consider the biosphere reserve for REDD+.

5.1.5 Public awareness

In Ethiopia, raising awareness of the general public and decision makers has been integrated in most of the activities related to biodiversity and other environmental issues. Most of the government institutions and NGOs incorporate awareness creation as one of their major activities in their annual plans. Watershed management and PFM programmes that are being implemented in the country are, for example, making awareness raising activities an integral part of their works to address decision makers and local communities.

Awareness raising activities that are geared towards mobilizing the public to control different invasive species are also being carried out in different national regional states. In Amhara national regional state, for example; brochures have been prepared and distributed to the public regarding water hyacinth infestation and clearing of the weed from Lake Tana and its surrounding wetlands. Similarly, guidelines to prevent and control the spread of *Prosopis juliflora* have been prepared in local language in Afar national regional state.

The government of Ethiopia has been organizing different experience sharing programs among national regional states on soil and water conservation and to eventually scale-up best practices. Consequently, farmers of each national regional state have allocated 30 to 60 days/year for soil and water conservation activities since 2011 that are to be conducted in their respective areas.

Public awareness raising activities are getting momentum through the use of media and annual events such as International Day for Biological Diversity, the Tree Day, World Environment Day, Green Award Programs and Annual Tree Planting programmes that are organized and carried out by governmental and non-governmental organizations. In addition, knowledge created through research, carried out by various institutions in the areas of biodiversity is communicated using different media outlets, and these have been used to devise plans to conserve and sustainably utilize biodiversity resource of the country.

5.1.6 *Ex-situ* and *in situ* conservation

Ex situ conservation

In Ethiopia, over 75,000 accessions of plants have been conserved under *ex situ* conditions in cold storage and field gene banks so far. Of these, about 12,000 accessions have been collected and conserved in the last five years. Within this period, 381 microbial species belonging to bacteria, fungi and microalgae have been conserved *ex situ* in national genebank. Moreover, five new field genebanks have been established to conserve coffee, medicinal plants and forest species. Ranches have also been established in different parts of the country between 2009 and 2014 for conservation and sustainable utilization of Begait, Borena, and Horro cattle breeds. Semen has been collected and cryo-conserved from Fogera, Begait, Sheko and Irob indigenous cattle breeds. Construction of duplicate genebank is underway at Fiche town to ensure the safety of *ex situ* collections.

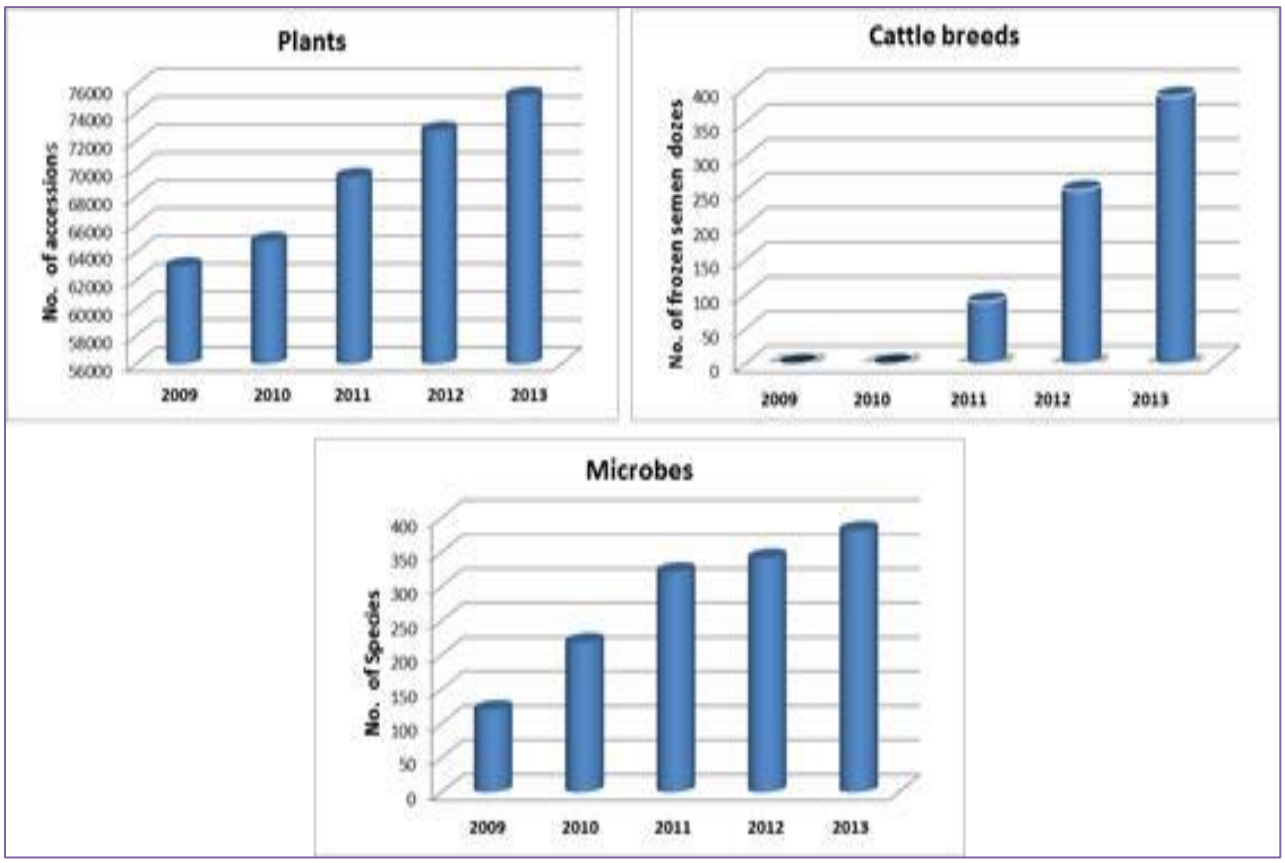

Fig. 8 Changes in *ex situ* holdings of plants, cattle breeds and microbes over time

In situ conservation

Eight *in situ* conservation sites are under establishment to conserve enset, durum wheat, tef, coffee, medicinal plants and forest plant species. In addition, six community genebanks, botanical gardens and bio-parks have been established in different parts of the country since 2009.

Three *in situ* sites have been established to conserve alkaline water ecosystems which contain unique micro-algal biodiversity at Lakes Chitu, Arenguade and Killole between 2012 and 2013. In addition, three Lakes have been managed through ecosystem approach in Afar national regional state within the same period. Similarly, 13 *in situ* conservation sites have been established for cattle, sheep, goat and chicken breeds between 2009 and 2013.

5.1.7 Access and benefit sharing

Ethiopia has put in place domestic legislation to facilitate access to its genetic resources and ensure fair and equitable benefit sharing. Furthermore, Ethiopia has acceded to the Nagoya Protocol and developed Code of Conduct to administer the ABS issues. The recently signed agreement between EBI and a private USA based company on access and benefit sharing from the use of *Dichrostachys cinerea, Osyris quadripartitum* and *Withania somnifera* species for the purpose of producing essential oils, cosmetics and herbal medicine is a notable example. From the agreement, Ethiopia earned an upfront payment and the agreement stipulates that the benefits accrued from the access of the above genetic resources will be shared equitably between the company and the local communities/the government of Ethiopia. The benefits are incentives to the local communities/government to conserve and sustainably utilize biodiversity. Moreover, local companies that were using different genetic resources such as Aloe and *Moringa stenopetala* species for various commercial purposes came into legal agreements with EBI for the use of the genetic materials in a way that the agreements enable income generation for the companies as well as the local communities and sustainably utilize the resources base.

5.2 Mainstreaming Biodiversity

The Ethiopian Government has put in place policies and strategies for sustainable natural resource management including biodiversity conservation. The country is taking various measures to mainstream biodiversity into sectoral and cross-sectoral plans and programmes. Devising and implementation of rules and regulations that will reduce adverse and promote beneficial impacts of different sectors on biodiversity are some of the measures that have been conducted in the past five years.

5.2.1 Legal and institutional frameworks

5.2.1.1 Legal frameworks

Ethiopian Climate Resilient Green Economy Strategy

Ethiopia is striving to achieve a middle income status by 2025. To achieve this, the "business as usual" scenario would result in a sharp increase in greenhouse gas emissions and unsustainable use of natural resources. Therefore, the government has devised Climate Resilient Green Economy (CRGE) Strategy to build a climate resilient green economy. The development of a green economy will be based on four pillars, namely: agriculture, forestry, power and transport including industrial sectors and buildings. As stated in the CRGE Strategy document, because Ethiopia's economy and the wellbeing of the society are closely linked to agriculture and the use of natural resources such as water, land, forests and fisheries; adaptation and mitigation actions towards climate resilience will come in part through focusing on improving performance and management in these resources and the activities planned to be undertaken in the strategy will have a positive impact on conserving biodiversity. Adoption of agricultural and land use efficiency measures and protecting and re-establishing forests for their economic and ecosystem services, which include using of them as carbon stocks, are among the actions that have direct relation with biodiversity conservation and sustainable use. As part of the CRGE Strategy, REDD+ is a policy incentive aimed at promoting forest and biodiversity conservation and enhancing carbon stocks.

Growth and Transformation Plan

The Growth and Transformation plan (GTP) is a successor of a Plan for Accelerated and Sustainable Development to End Poverty (PASDEP). The GTP (2011-2015) recognizes that environment is a vital pillar of sustainable development, and among the key strategic directions to be pursued during the plan period are building a Green Economy and implementation of ongoing environmental laws. In the Plan, issues of biodiversity are mainstreamed mainly through agriculture and tourism sectors. In the Plan period, the Ministry of Agriculture has planned activities that enhance biodiversity restoration. These include, among others, preparation of land use guidelines, rehabilitation of degraded areas, increased community based natural resource conservation, increased coverage of protected forest and land covered with multipurpose trees.

Millennium Development Goals

Ethiopia has adopted the Millennium Development Goals (MDGs). The targets under Goal 7 of the MDG, which are related to environment and biodiversity, require the country to integrate the principles of sustainable development into national policies and programmes and to reverse the loss of environmental resources. To this effect; the country has, among others, developed and is implementing GTP and CRGE strategy that ensure sustainable development.

CBD and Nagoya Protocol on Access to Genetic Resources

Ethiopia acceded to the Nagoya Protocol, and this will eventually enhance implementation of the National ABS Law by creating conducive environment for cooperation between parties, providing for user country obligations to support compliance, establish proper follow up mechanisms and harmonization of existing ABS legislation. At present, EBI has formulated Code of Conduct to accessing genetic resources and community knowledge and benefit sharing, a further move to effective use of the Protocol.

In order to better communicate and ease administration of ABS issues, and better conserve and sustainably utilize its biodiversity resources, Ethiopia has translated Nagoya protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization to the convention on biological diversity into three local languages, namely: Amharic, Afan

Oromo and Tigrigna. It has translated Proclamation on access to genetic resource and community knowledge and community rights (No. 482/2006), and Regulation of Councils of Ministers on access to genetic resource and community knowledge and community rights (No. 169/2009) into two local languages, namely: Afan Oromo and Tigrigna. Moreover, Ethiopia has translated the CBD text into Amharic.

5.2.1.2 Institutional frameworks

To effectively implement conservation, sustainable use and development of biodiversity; Ethiopia has established and restructured some institutions at federal and national regional states since 2010. Some of such arrangements that have been made at federal level have been outlined below.

Re-establishment and Restructuring of Ethiopian Biodiversity Institute

In 2013, Council of Ministers of the FDRE issued a regulation for the re-establishment of the Ethiopian Biodiversity Institute, the former Institute of Biodiversity Conservation (Regulation No. 291/2013). According to the regulation, the objective of the Institute is revised to ensure that the country's biodiversity and the associated community knowledge are properly conserved and sustainably utilized, and its communities get fair and equitable share of benefits arising from their utilization.

One of the steps taken by EBI to effectively implement its mandate of conservation, sustainable use and ABS issues in the country; is restructuring of its technical wing into Directorates. These are Crop and Horticulture Biodiversity, Forest and Rangeland Plants Biodiversity, Animal Biodiversity, Microbial Biodiversity and Access and Benefit Sharing Directorates.

Moreover, the Institute has signed memorandum of understandings with national universities working with biodiversity and international institutions such as ICARDA that will make the signatories work together in research and development of biodiversity related themes.

Regional Biodiversity Units and Biodiversity Centres

To ensure effectiveness in conservation, sustainable use of biodiversity and ABS issues of the country at the grass root levels; regional biodiversity units are being established/strengthened

in nine regional states and Dire Dawa City Council. In addition, establishment of seven biodiversity centres has been approved by the government in 2014. The centres will be established at representative agro-ecologies.

Establishment of Ministry of Environment and Forest

Establishment of Ministry of Environment and Forest has been proclaimed to amend the proclamation on the definition of powers and duties of the executive organs of the Federal Democratic Republic of Ethiopia (Proc. No. 803/2013). The Proclamation transfers rights and obligations of the Environmental Protection Authority re-established under Proclamation No.295/2005, and powers and duties of Ministry of Agriculture that are related to forestry to the Ministry.

5.2.2 Sectoral strategies, plans and programs

Agriculture

Agriculture is the leading sector of the Ethiopian economy, and 83% of the population depends on agriculture. The sector recognizes the importance of conserving natural resources, of which biodiversity is the core component for sustainable development. Mainstreaming natural resource conservation into the agriculture sector is helping to reduce pressure on biodiversity. In its GTP, the MoA has set objectives such as implementation of sustainable land use planning and management system, strengthening natural resource conservation and use, strengthening conservation and use of water resources, and building capacity on natural resource conservation and use. Agricultural Investment Policy also gives due attention to the natural resources.

Tourism

Ministry of Culture and Tourism (MoCT) has set objectives and activities with the aim of increasing revenue from wildlife tourism and eco-tourism. These activities have direct positive impacts on conservation of wild life resources. The MoCT works to increase the number of legally recognized PAs, decrease illegal hunting and trade of wild animal and their products, and protects endangered wild animal species.

Energy

The majority of Ethiopia's national energy needs are derived from fuel wood, crop residues and animal waste. It has been realized that reliance on fuel wood and charcoal leads to widespread land degradation, soil erosion, gully formation and siltation. Cognizant of this, Ethiopia is currently investing on renewable energy sources, mainly hydroelectric plants to make electricity the main source of energy and alleviate the pressure on natural resources. There is also a National Improved Cook Stoves Programme being implemented by the Ministry of Water, Irrigation and Energy. The objective of this Programme is to support the dissemination of nine million improved energy saving cook stoves in Ethiopia up to 2015 through building sustainable and vibrant market for improved cook stoves and institutional capacity. Through this Programme, it is planned to save approximately 2.1 tons of woody biomass per year per household (EPA, 2012).

Education

Ethiopia's achievement in the pace of knowledge creation in educational sector is gradually increasing in areas of both formal and informal education. To strengthen the formal sectors; more than 30 Universities have been established within the past ten years. Most of these universities consist biodiversity related colleges and departments. Moreover, universities are working with the community and are conducting biodiversity related researches. Adult education and extension works are also supported by informal training to assist farmers in adoption and implementation of technologies as well as raising awareness of the public on biodiversity issues.

CHAPTER SIX

6 PROGRESSES TOWARDS THE 2020 AICHI BIODIVERSITY TARGETS AND CONTRIBUTIONS TO MILLENNIUM DEVELOPMENT GOALS

6.1 Progress Towards 2020 Aichi Biodiversity Targets

In Ethiopia, several biodiversity conservation, sustainable utilization and ABS related activities have been carried out for years. Such activities that have been conducted in years 2009 through 2014 to achieve Aichi Biodiversity Targets 2011-20120 and the levels of achievements are presented in Table 2.

Table 2 Summary of Ethiopia's progress towards the Aichi Biodiversity Targets

Key for the colours to the level of achievement

very good
Good
Fair
Poor

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Strategic Goal A: **Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society**			
Target 1 By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably	• raising public awareness • mainstreaming biodiversity into education, agriculture, tourism and other related sectors • translating, conservation, sustainable use and ABS related documents into local languages	• public awareness on the values of biodiversity increased • farmers agreed to allot 30 to 60 days a year for soil and water conservation activities in their respective areas • community participation on biodiversity conservation and sustainable utilization improved • adverse impacts on biodiversity reduced • beneficial impacts on biodiversity enhanced • CBD text, Nagoya Protocol, Proclamation and Regulation on the access to genetic resource and community knowledge and community rights translated into local languages	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Target 2 By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems	• integrating natural resources conservation to national development and poverty reduction strategies	• natural resource conservation integrated into different national strategies, development plans and reporting systems (poverty reduction, food security, growth and transformation plan, Climate Resilient Green Economy Strategy)	
Target 3 By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	• issuing land use ownership certificate • establishing annual Green Award • linking tree planting with annual events • putting in place legal instruments to share benefit fairly and equitably for local communities accrued from access of the genetic resources	• land use ownership certificate issued for about three million farmers • soil and water conservation and practices of agro-forestry increased • participation of the public and private sectors on natural resource conservation increased • benefits accrued from the access of genetic resources fairly and equitably shared to the local communities	
Target 4 By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	• devising legislations and strategies on forest conservation, development and use • setting up and/or restructuring of institutions • mainstreaming biodiversity into development and business sectors	• adverse impacts on biodiversity reduced and positive ones promoted • government and business sectors involvement in sustainable production increased	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Strategic Goal B: **Reduce the direct pressures on biodiversity and promote sustainable use**			
Target 5 By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	• employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands) • expanding renewable energy use • modernizing agriculture	• management plan for priority forest areas and national parks developed and implemented • productivity per unity input increased • alternative livelihoods created • energy saving stoves distributed to rural communities • use of non-timber forest products enhanced • dependency on forest for fuel decreased through the use of energy from hydropower, wind and biogas	
Target 6 By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	• conserving threatened ecosystem and species • conducting awareness raising for fishermen on the sustainable utilization	• use of species specific fishing gear exercised • use of destructive fishing activities such as poisoning prohibited • six threated alkaline lakes brought under conservation using ecosystem based management approach	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Target 7 By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	• implementing sustainable management to conserve and sustainably utilize agriculture, aquaculture and forests	• use of non-timber forest products utilization promoted • degraded forest rehabilitated through enclosure • participatory forest management employed • integrated watershed approach to conserve soil and water employed • agro-biodiversity mainstreamed into production systems • national aquaculture development strategy devised	
Target 8 By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	• carrying-out of environmental impact assessment on development activities • enforcing environmental regulations to abate pollutions of, especially industries, factories , and hospitals	• discharge of wastes from industries reduced • awareness on waste management increased	
Target 9 By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment	• assessing, controlling and eradicating invasive species • raising public awareness on invasive species	• major invasive species and their impacts identified • means of control for the major invasive species recommended • guidelines, manuals and pamphlets on control of invasive species prepared and distributed • community participation in controlling and eradication of invasive species increased • some areas invaded by major invasive species (*Prosopis juniflora*, *Eichhornia crassipes* and *Parthenium hysterophorus*) cleared	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Target 10 By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning	• developing adaptation and mitigation strategies	• Climate Resilience Green Economy Strategy devised and under implementation • climate change issues mainstreamed into national development and poverty reduction plans and strategies	
Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity			
Target 11 By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	• establishing, re-demarcating, and developing management plans for PAs	• two national parks established • two community conservation areas established • three biospheres with the area of 966,885ha established • management plan for natural forests covering 1.4 million hectares developed • seven national parks re-demarcated and management plans developed	
Target 12 By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	• conserving threatened plant, animal and microbial species	• semen from four breeds of cattle cryo-conserved • macro algal species of three alkaline lakes managed using ecosystem management approach • five in *situ* sites for conservation of threatened forest plant species established • conservation status of Ethiopian Wolf and Walia Ibex improved	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Target 13 By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	• conserving genetic diversity of crops and their wild relatives, and farm animals, based on conservation priorities • mainstreaming agro-biodiversity into local production systems • building capacity for ABS, conservation and sustainable use of medicinal plants	• over 12,000 new accessions of plants conserved *ex situ* • 381 species of microbes conserved *ex situ* • aquatic biodiversity of three lake ecosystems protected and managed using ecosystem management approach • three medicinal plant conservation sites established • 13 breeds of domestic animals conserved *in situ* • wild coffee conservation through biosphere establishment conducted • four crop species conserved through community based management • strategy for conservations, sustainable use and development of domestic animal genetic resources devised and implemented	
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services			
Target 14 By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	• rehabilitating degraded areas • conducting afforestation • developing management plans • establishing PAs	Ecosystems and its essential services restored through: ▪ rehabilitation of seven million hectares of degraded areas through area closure ▪ preparation and implementation of management plan for 1.4 million hectares of natural forests ▪ afforestation of 2.9 million hectares of land with over 16.8 million seedlings of different tree species ▪ two national parks, two community conservation areas and three biospheres reserves established ▪ several wetlands rehabilitated	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Target 15 By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	• rehabilitating degraded areas, and establishing and sustainably managing forests	Ecosystem resilience and the contribution of biodiversity to carbon stocks enhanced through: ▪ rehabilitation of seven million hectares of degraded areas through area closure ▪ preparation and implementation of management plan for 1.4 million hectares of natural forests ▪ afforestation of 2.9 million hectares of land with over 16.8 million seedlings of different tree species	
Target 16 By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	• ratifying Nagoya protocol • developing ABS Code of Conduct	• Nagoya Protocol acceded • Code of Conduct for ABS developed • Based on the Code of Conduct: ▪ three plants species accessed for foreign commercial company ▪ two plant species accessed for local companies to promote conservation and sustainable use of the species ▪ ABS funds secured and disbursed for conservation that benefit respective local communities ▪ many Material Transfer Agreements signed with national and international institutions	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building			
Target 17 By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	• updating NBSAP	• updated NBSAP produced	
Target 18 By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	• reviewing, documenting, and communicating knowledge, innovations and practices of local communities relevant to biodiversity	• traditional knowledge, innovations and practices of local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources respected, • review, documentation and communication of knowledge, innovations and practice of local communities relevant to biodiversity carried out	

Table 2 Summary of Ethiopia's,…

Aichi Targets by goals	Activities conducted towards achievements of the targets	Achievements	Levels of achievements
Target 19 By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	• reviewing the existing knowledge and innovations, functioning, status and trends, and the consequences of biodiversity loss, creating knowledge and technologies related to biodiversity, its values, functioning, status and trends, and the consequences of biodiversity loss	• reports on status, values, functioning, threats and trends of Ethiopia's crop, forest and domestic animals genetic resources produced and measure are in place • knowledge on: ▪ conservation, ▪ sustainable use and development ▪ values, status and trends, and ▪ consequences of loss of biodiversity and its ecosystem service generated • annual values of major non-wood products (wild coffee, gums and incense, honey and bees wax, herbal medicine, eco-tourism, bamboo, species and civets) estimated	
Target 20 By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	• mobilizing financial resources for the effective implementation of the updated NBSAP	• implementation arrangements, including resource mobilization mechanism for the effective implementation of the updated NBSAP, proposed	

6.2 Contributions to Millennium Development Goals

Biodiversity and its ecosystem services are fundamental sources of livelihoods for about 83% of Ethiopians living in rural areas. It is also an integral part of agriculture, forestry, fisheries, and tourism and industry sectors. Conservation, sustainable utilization as well as access and benefit sharing related activities that have been carried out in the country by different actors (Chapter Five), boost and sustain benefit of the resource to current generation without compromising benefits of the next. The achievements of these activities have contributed to improve livelihood of the local communities and overall national development. These in turn have contributed to achieving Millennium Development Goals particularly; Goals 1,3, 7 and 8.

MDG 1: Eradicate extreme poverty and hunger

Goal one of the MDGs addresses issues of extreme poverty, hunger and malnutrition, which are major problems of the rural households and communities of Ethiopians living in marginal environments and areas with low agricultural productivity. Rehabilitation and restoration of degraded areas, and soil and water conservation activities have contributed to efforts geared towards eradicating extreme poverty and hunger through improving agricultural productivity, diversifying livelihoods, and increasing and diversifying incomes of rural communities. Similarly, sustainable biodiversity management such as participatory forest management improved benefits of local communities from forest resources through creating access to non-timber forest products (honey, spices, medicine, etc.), value addition and linking to the potential niche markets.

MDG 3: Promote Gender Equality and Empower Women

The MDG 3 focuses on promotion of gender equality and empowerment through elimination of gender disparity in education at all levels. In Ethiopia, major factors that hinder women's access to education are, *inter alia*, lack of awareness, limited sources of income, and burdensome duties such as collecting fuel wood, fetching water and responsibilities to care for their families. Activities carried-out so far in areas of biodiversity conservation and sustainable utilization, namely: soil and water conservation, participatory forest management, legislations and land use ownership certification and awareness raising have contributed towards increasing

women's income, and access to and control over biodiversity resources. Moreover, area closure, afforestation, and integrated watershed management carried out so far have also contributed to increase productivity per unit area of their household holdings as well as to enhance environmental provisions such as water and fuel wood. Therefore, increased benefits from biodiversity through conservation, sustainable utilization and access and benefit sharing has increased household income and provision of environmental services that cumulatively helped to decrease gender disparity in education at all levels.

Goal 7: Ensure Environmental Sustainability

The environmental sustainability issue of Millennium Development Goal 7 contains three targets that address interlinked issues of sustainable development while ensuring environmental sustainability. All the Activities that have been carried out in the past five years (Chapter Five and Table 2) have contributed towards the achievements of MDG 7 directly to the first and second targets of the Goal and indirectly to its third target.

Ethiopia has made strong progress in integrating the principles of sustainable development into its development policies and programmes through the medium term strategy of the Growth and Transformation Plan and Climate Resilient Green Economy Strategy. In the past five years, the country also took measures in the area of legal and institutional frameworks to effectively implement the policies and programmes. These efforts have contributed to decrease the loss of environmental resources and to attain sustainable utilization.

Reversing the loss of environmental resources, of which biodiversity is the primary element, is also a component of target one of MDG 7. Achievements in areas of PAs establishment, re-demarcation and management, control of invasive species, rehabilitation and restoration of degraded areas, sustainable biodiversity management, public awareness raising, *ex-situ* and *in-situ* conservation and access and benefit sharing have contributed towards the reduction and reversing of loss of environmental resources through reducing pressure on biodiversity, improving vegetation cover and improving public care towards the environment.

Halving proportion of people without sustainable access to safe drinking water and basic sanitation is the second target of MDG 7. The interventions that are being carried out in the

country in the areas of soil and water conservation, watershed management, establishment and management of PAs and natural forest, afforestation, and other environmental protection schemes have resulted in a rise on water table, revival and formation of springs. These achievements have enhanced ecosystem services such as water flow regulation and filtration and purification, and water cycling and provision of freshwater, contributing towards the achievement of target two of the MDG 7.

Goal 8: Global Partnership for Development

The MDG 8 focuses on means of achieving the first seven goals which requires considerable resources, good governance and empowerment of civil society in decision making and creative use of both existing and new resources. Ethiopia has made significant progress towards achieving the Goal. These include improving role of civil society in decision making process, integrating environmental issues into decision making processes, building partnerships among business, government, and civil society to integrate ecosystem approaches into investment planning at both macro and micro levels. As the result of these interventions, the country has made significant progress toward creating, maintaining and expanding global partnerships for development. Through these partnerships, the country is implementing several multilateral financed projects that are aimed at ensuring environmental sustainability and sustainable development in the area of renewable energy, climate change adaptation and mitigation, and biodiversity conservation and sustainable utilization.

CHAPTER SEVEN

7 CONCLUSION

Ethiopia has shown substantial progress in the implementation of the Strategic Plan 2011-2020. Out of the 20 Aichi Biodiversity Targets, Ethiopia has registered very well(Aichi Targets 1, 2, 7, 10, 11, 13, 14, 15 and 18), good (Aichi Targets 3, 4, 12, 16, 17 and 19) and fair (Aichi Targets 5, 6, 8 and 9) achievements in the first half of the Plan Period. However, implementation of Aichi Target 20 has been poor. These performances were, among others, attributed to improved communications between the focal institute and stakeholders, increased commitment of the government in the areas of conservation and sustainable use of biodiversity, and access and benefit sharing issues, and improved awareness of the public and decision makers on the importance of biodiversity for human well-being and the country's development. These achievements have contributed towards improving livelihoods of the people and overall national development.

The NBSAP is a guiding document for conservation, sustainable utilization and development of biodiversity of Ethiopia. Therefore, familiarization and mainstreaming of the NBSAP to different sectors will remain one of the top priorities of implementation of the updated NBSAP in the second phase of Strategic Plan Period.

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9 ANNEXES

ANNEX I. Strategic goals, targets, actions, implementing agencies and period of implementation

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implement ation period
			Lead	Collaborators	
Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society					
1. By 2020, awareness of public and decision makers on the values of biodiversity and ecosystem services is raised, and the steps they can take to conserve and use them sustainably is improved	• Percentage of the public and decision makers aware of biodiversity and ecosystem services • Percentage of decision makers addressing the sustainability agenda • Percentage of the public participating in caring biodiversity and environment	1.1. Conduct national baseline survey on the level of awareness of public and decision makers on biodiversity	EBI	CSA, regional biodiversity units (RBUs), MoA	2015
		1.2. Conduct awareness raising activities on biodiversity for public and decision makers	EBI	RBUs, Ethiopian Biodiversity Forum (EBF), EWNHS, Media, EWCA, MoA, concerned NGOs, HoPR	2015-2020
		1.3. Revise educational curricula relevant to biodiversity	MoE	EBI, HLIs, regional bureau of education including Addis Ababa and Dire Dawa City Councils, EWCA, MoA, MoEF	2015-2016
		1.4. Start implementation of the revised educational curricula	MoE	HLIs, regional bureau of education including Addis Ababa, Dire Dawa City Councils	2016
		1.5. Make awareness creation part of the extension and adult education programmes	MoA	MoE, MoH, EBI, bureaus of agriculture (BoA)/Pastoral/Agropastoral	2016
		1.6. Evaluate the level of awareness of public and decision makers on biodiversity	EBI	CSA, RBUs, MoA	2020

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Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
2. By 2020, the existing biodiversity related laws, regulations and strategies, including those associated with incentives are reviewed and gaps are addressed	• Number of revised laws, regulations and strategies • Number of identified incentives that reward positive contributions and addressed perverse incentives • Number of mainstreamed laws, regulations and strategies	2.1. Review laws, regulations and strategies related to biodiversity, including those associated with incentives	EBI	MoA, MoEF, EIPO, EWCA, Investment Agency, EBF, MoJ,	2015
		2.2. Draft/harmonize laws, regulations and strategies related to biodiversity	EBI	HoPR, MoA, Agricultural Transformation Agency (ATA), MoEF, EIPO, EWCA, Investment Agency, EBF, MoJ, Council of Ministers, national regional governments, MoI,	2016-2017
		2.3. Approve and mainstream regulations and strategies	EBI	MoA, MoEF, BoA/pastoral/Agropastoral, Bureau of Environment and Forest (BoEF), EIPO, EWCA, Investment Agency, EBF, ATA	2017-2020
3. By 2020, biodiversity values and ecosystem services are communicated and integrated into national and local development and poverty reduction strategies and plans	• Strategies integrating biodiversity values and ecosystem services	3.1. Review studies on valuation of biodiversity and ecosystem services	EBI	MoA, MoEF, EWCA, HLIs, EIPO	2015
		3.2. Communicate and integrate values of biodiversity and ecosystem services into local and national development and poverty reduction strategies and plans	EBI	MoA, HoPR, MoEF, National Planning Commission (NPC), EWCA,	2016-2020

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Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use					
4. By 2020, habitat conversion from the existing of about 10% per year through expansion for agricultural land is halved	• Rate of annual conversion of habitats into agricultural land	4.1. Create alternative jobs for local communities	MoI	MoA, MoCT, MoT, MoM, regional governments	2015-2020
		4.2. Increase alternative energy sources and use of energy efficient technologies	MoWIE	MoA, MoT, MoI, MoM, MoST, national regional governments, concerned NGOs	2015-2020
		4.3. Adopt technologies and innovations for increased productivity of small holder farmers and pastoralists	MoA	EIAR and regional agricultural research institutes (RARI), EBI, RBUs, MoST, all BoA/Pastoral/Agropastoral, NAIC, HLIs that are dealing with agriculture, ATA	2015-2020
5. By 2020, over exploitation of biodiversity and ecosystems are reduced	• Number of ecosystems and species/breeds managed sustainably • Number of ecosystems restored	5.1. Develop and implement regulations and guidelines to control open access to grazing lands, aquatic ecosystems, wetlands and other communal lands	MoEF	EBI, MoEF, EBF, MoWIE, HoPR, concerned NGOs, RBUs, BoA/Pastoral/Agropastoral and BoEF, regional Forest Enterprises, Oromia Pastoral Commission	2015-2017
		5.2. Improve productivities of forage, grazing and rangelands	MoA	EIAR, RARI, BoA/Pastoral/Agro-pastoral, HLIs	2015-2020
		5.3. Ensure sustainable use of natural fish stock, applying ecosystem based management approaches, and expanding aquaculture	MoA	EBI, MoEF, RBUs, EWCA, EIAR, MoWIE, BoA, BoEF, HLIs, RARI	2015-2020
		5.4. Promote afforestation and use of non-wood forest products	MoEF	MoA, EBF, concerned NGOs, BoA/Pastoral/Agropastoral, BoEF Forest enterprises	2015-2020

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
6. By 2020, area invaded by the invasive species is reduced by 75% and measures are in place to monitor invasiveness of newly introduced species	• Area cleared from invasive species and properly managed • General trends in invasive species • Mechanisms for monitoring invasiveness of newly introduced species put in place	6.1. Conduct study on the status, trends and impacts of major invasive species (Prosopis, Parthenium weed, Water hyacinth, lantana weed and Cochineal insect and others) and revise their control strategy	EIAR	MoEF, MoA, EBI, HLIs, BoA/Pastoral/Agropastoral, BoEF	2015
		6.2. Implement the revised control strategies on major invasive species	MoA	EIAR, MoEF, MoA, RBUs, BoA/Pastoral/Agropastoral, BoEF, RARI ,EBI, national regional governments, Dire Dawa City Council	2015-2020
		6.3. Put in place a system to monitor invasiveness of newly introduced species	MoA	EIAR, MoEF, EIAR, EBI, HLIs	2017
Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity					
7. By 2020, area coverage of ecologically representative and effectively managed PAs is increased from 14% to 20%	• Percent increase in area coverage of ecologically representative PAs • Percentage of properly managed PAs	7.1. Identifying gaps in the level of representativeness of the existing PAs	EWCA	EBI, MoEF, MoA, concerned NGOs, Oromia Forest and Wildlife Enterprise, Bureaus of Wildlife and Tourism of regions, RBUs where PAs are located	2015
		7.2. Establish ecologically representative PAs	EWCA	EBI, MoEF, MoA, Oromia Forest and Wildlife Enterprise, Bureaus of Wildlife and Tourism of Amhara, SNNPR, Gambella, Benshangul Gumuz, Somali, Tigray, Dire Dawa City Council, RBUs	2016-2020

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
		7.3. Re-demarcate 11 of the existing PAs and develop management plans for seven PAs	EWCA	EBI, MoEF, MoA, Oromia Forest and Wildlife Enterprise, Bureaus of Wildlife and Tourism of regions where PAs are located, RBUs	2015-2017
		7.4. Conduct economic valuation for seven PAs	EWCA	EBI, MoEF, MoA, HLI, Ethiopian Economic Association	2015-2020
		7.5. Integrate benefits arising from PAs into poverty alleviation and overall national development plan	NPC	EWCA, MoA, MoEF, MoFED, HoPR	2016
8. By 2020, *ex situ* conservation of agro-biodiversity, wild plants, animals and microbes with special emphasis on; endemic, endangered, economically or ecologically important species/breeds is increased and the standard of the existing *ex situ* conservation is improved and Natural History Museum is established	• Number of ecologically representative *ex situ* conservation sites • Number of species/breeds under *ex situ* conservation • Number of *ex situ* conservation sites to which standard conservation practices have been developed • A Natural History Museum established	8.1. Identify threatened species of agro-biodiversity, wild plants, animals and microbial genetic resources, and set priority for collection and conservation	EBI	RBUs, HLIs, EIAR, RARI	2015-2017
		8.2. Establish Natural History Museum	EBI	AAU, EWCA	2017-2019
		8.3 Increase *ex situ* collection from: • 75,007 to 79,692 accessions of plants • three to eight breeds of domestic animals • 381 to 751 species of microbes	EBI	RBUs, EIAR, RARI, HLIs	2015-2020

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Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implement ation period
			Lead	Collaborators	
		8.4 Increase the number of: • botanical gardens from three to five sites • *ex situ* from nine to 12 sites	EBI	HLIs, RBUs, BoEF, BoA/Pastoral/Agropastoral	2015-2020
		8.5 Identify gaps in and improve the standards of *ex situ* conservation	EBI	EWCA, HLIs, RBUs, EIAR, RARI	2015-2018
9. By 2020, *in situ* conservation sites/ecosystems and species/breeds are increased and the standards of the existing *in situ* conservation is improved	• Number of *in situ* conservation sites • Number of species/breeds under *in situ* conservation • Number of *in situ* conservation sites to which standard conservation practices have been developed	9.1. Identify threatened species and sites/ecosystems and set priority for *in situ* conservation	EBI	RBUs, EWCA, MoEF, MoA, HLIs	2015-2017
		9.2. Increase the number of *in situ* conservation from: • 13 to 24 sites for plants • Six to 11 community genebanks • 13 to 23 breeds of domestic animals • three to 13 sites for wild animals • three to four sites for micro algae	EBI	EWCA, RBUs, BoA/Pastoral/Agropastoral, BoEF, concerned NGOs	2015-2020
		9.3. Develop management plans for *in situ* conservation sites	EBI	EWCA, RBUs, BoA/Pastoral/Agropastoral, BoEF, concerned NGOs	2016-2020

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services					
10. By 2020, contribution of biodiversity for ecological services, including climate change adaptation and mitigation is improved through increasing forest cover from 12% to 14%; increased designation of wetlands from 4.5% to 9.0% and doubling restoration of degraded areas	• Percent increase in forest cover • Percent increase of designated wetlands • Percent increase of restored areas	10.1. Increase area under forest cover by 2% through afforestation and re-forestation	MoEF	MoA, EBI, RBUs, BoA, and BoEF, Regional Forest and Wildlife Enterprises, concerned NGOs	2015-2020
		10.2. Double area of designated wetlands	MoEF	MoA, EBI, RBUs, EWCA, BoA , and BoEF, Regional Forest and Wildlife Enterprises, concerned NGOs	2015-2020
		10.3. Increase restored area of degraded land from 10 to 20 million ha	MoA	MoEF, EBI, RBUs, BoA and BoEF, Regional Forest Enterprises, concerned NGOs	2015-2020
		10.4. Generate incentives for the local communities through REDD+ from high forests, woodlands and traditional agroforestry	MoEF	MoA, RBUs, EWCA, BoA, and BoEF, Regional Forest and Wildlife Enterprises, concerned NGOs	2015-2020
11. By 2020, the number of potential genetic materials accessed for research and development, and equitable benefit sharing are increased by 35 and 39% , respectively	• Number of genetic materials accessed for research and development • Number of genetic materials accessed for equitable benefit sharing	11.1. Build material and human capacity for bio-prospecting and negotiation	EBI	MoA, MoFED, HLIs, EIAR	2015-2020
		11.2. Promote and increase the number of genetic materials for research and development from 120,000 to 161,252 accessions and access and benefit sharing from 13 to 18 species	EBI	MoA, EIAR, regional research institutions, HLIs, EIPO, Media, MoJ, RBUs	2015-2020

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
		11.3. Control unauthorized movement of genetic resources	EBI	Customs and Revenue Authority, Civil Aviation, National Post Office, DHL, RBUs, MoD, Police	2015-2020
		11.4. Increase number of bio-prospecting: • four to 14 species/products • four to 12 community knowledge, and conduct market promotion	EBI	EIAR, RBUs, HLIs, RARI, MoA	2015-2020
12. By 2020, Women's access to and control over biodiversity resources and ecosystem services are improved	• Percent increase in women's access to and control over biodiversity resources and ecosystem services	12.1. Generate baseline data on the level of Women's access to and control over biodiversity resources and ecosystem services	EBI	CSA, MoA, MoWCYA, MoA, RBUs	2015
		12.2. Develop and implement national gender mainstreaming guideline on biodiversity resources and ecosystem services	EBI	MoA, MoWCYA, MoEF, concerned NGOs	2016-2020
		12.3. Evaluate the level of improvement of women's access and control over biodiversity resources and ecosystem services	MoWCYA	EBI, MoA, MoEF, CSA, RBUs	2020

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
13. By 2018, benefits from biodiversity through value addition for at least 12 agricultural products, and creating market links to the products and five medicinal plants, taking into account the needs of women local communities, are increased	• Number of value added products • Number of newly established market links	13.1 Conduct value addition activities for at least 12, agricultural products (tef, enset, wheat, coffee, sesame, haricot bean, black cumin, barley, soya bean, chick pea, meat and milk), including studying their value chains, taking into account geographic origin	MoA	MoA, Ethiopian Standards Authority, MoI, EBI, MDTI, ECXA, Cooperative Agency, private sector, ATA, concerned NGOs, cooperatives/associations EIAR, RARI, HLIs	2015-2018
		13.2 Create linkage to potential niche markets for the value added agricultural products and other local products as well as for five medicinal plants (*Hibiscus sabdariffa, Moringa stenopetala, Witania sominfera, Embelia schimperi and Podocarpus falcatus*)	MoA	EBI, Ethiopian Standards Authority, MoI, Cooperative Agency, private sector, MDTI, ECXA, ATA, cooperatives/association, MoFA	2015-2020
Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building					
14. By 2020, stakeholders' integration, including the participation of local communities in biodiversity conservation and sustainable utilization is strengthened	• Level of local communities and stockholders participation • Level of NBSAP implementation	14.1 Establish and strengthen 10 Biodiversity Units at national regional states and seven Centres at representative areas of the country	EBI	MoA, MoEF, regional governments, Dire Dawa City Council	2015-2020
		14.2 Put in place effective governance structure for follow-up of the implementation of the NBSAP	EBI	HoPR, MoA, MoEF, EWCA, EIAR, MoFED, MoE	2015

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
15. By 2017, national biodiversity database is strengthened, information dissemination strategy is devised and Clearing House Mechanism is updated	• Status of National Biodiversity Database • Status of CHM	15.1 Establish and strengthen national biodiversity database and dissemination strategy	EBI	MoA, MoEF, EWCA, EIPO, HLIs, EIAR, RARI, concerned NGOs BoA/Pastoral/Agropastoral, MoEF, BoEF	2015-2020
		15.2 Update Clearing House Mechanism and network to national regional states	EBI	MoA, MoEF, EWCA, EIPO, HLIs, EIAR, RARI, BoA/ Pastoral/ Agropastoral, MoEF, BoEF, concerned NGOs	2015-2020
		15.3 Establish ABS Clearing House Mechanism	EBI	MoA, MoEF, EWCA, EIPO, HLIs, EIAR, RARI, CBOs, concerned NGOs	2016
16 By 2020, knowledge and innovations related to biodiversity values, functioning, status and trends, and the consequences of its loss are generated, reviewed, compiled and applied	• Number of compiled knowledge and innovations on biodiversity • Number of generated knowledge and innovations on biodiversity • Number of knowledge and innovations applied in biodiversity conservation and use	16.1 Conduct research on status, trends and threats, uses of biodiversity and its conservation status, and ABS related issues	EBI	EIAR, RARI, MoST, HLIs, EWCA RBUs, EIPO, concerned NGOs	2015-2020
		16.2 Conduct valuation studies on at least two species and three ecosystems	EBI	MoEF, MoFED, MoA, EWCA, Economic Society of Ethiopia, HLIs, concerned NGOs	2016-2020
		16.3 Apply generated knowledge and innovations for development and further research	NPC	EBI, MoFED, EIAR, HLIs, MoEF, MoA, EWCA, MoWIE, MoM, MoI, HoPR	2016-2020

ANNEX I. Strategic goals, …

Ethiopian targets by goals	Indictors	Actions	Implementing Agency		Implementation period
			Lead	Collaborators	
17. By 2020, community knowledge, innovations and practices of local communities related to biodiversity are documented, subject to the national legislation, and relevant international obligations, and integrated into the national development strategies with the full and effective participation of local communities	• Number of documented community knowledge, innovations and practices • Number of community knowledge, innovations and practices integrated into local and national development strategies	17.1 Review, document and communicate knowledge, innovations and practices of local communities relevant to biodiversity	EBI	EBF, HLIs, RBUs, EIPO, concerned NGOs, MoCT	2016-2018
		17.2 Integrate knowledge, innovations and practices of local communities relevant to biodiversity into national and local development strategies	NPC	EBI, MoFED EBF, HLIs, MoI, EIPO, RBUs	2017-2020
18. By 2019, internal and external financial resources required for the effective implementation of the Strategy are secured	• Amount of funds secured • The level of implementation of NBSAP	18.1 Develop country environmental profile and competent project proposals for securing funds	EBI	MoA, MoE, EWCA, MoEF, MoFED	2015-2019
		18.2 Devise disbursement strategy for funds secured from different sources to support the implementation of the NBSAP	EBI	MoA, MoE, EWCA, MoEF, MoFED	2016

Annex II Strategic Goals and Aichi 2011-2020 Biodiversity Targets

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1
By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target
By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3
By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4
By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5
By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6
By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7
By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8
By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9
By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10
By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11
By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12
By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13
By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14
By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15
By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16
By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

Target 17
By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19

By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20

By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.