**GOVERNMENT OF THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA**



**ETHIOPIA’S REVISED NATIONAL BIODIVERSYTY STARATEGY AND ACTION PLAN**

**ETHIOPIAN BIODIVERSITY INSTITUTE**



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**Addis Ababa, Ethiopia**

**ACRONYMS**

AAU Addis Ababa University

ABS Access and Benefit Sharing

ADLI Agricultural Development Led-Industrialization

ATA Agricultural Transformation Agency

AWP Annual Work Plan

BMNP Bale Mountains National Park

BoA Bureau of Agriculture

BoEF Bureau of Environment and Forest

CBD Convention on Biological Diversity

CBOs Community Based Organisations

CHM Clearing House Mechanism

CoP Conference of Parties

CR Critically Endangered

CRGE Climate Resilient Green Economy

CSA Central Statistical Agency

CWR Crop Wild Relatives

DHL Deutsche Post Express Delivery Company

EBAs Endemic Bird Areas

EBF Ethiopian Biodiversity Forum

EBI Ethiopian Biodiversity Institute

ECXA Ethiopian Commodity Exchange Authority

EIA Environmental Impact Assessment

EIAR Ethiopian Institute of Agricultural Research

EIPO Ethiopian Intellectual Property Office

EN Endangered

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

EWPs Edible Wild Plants

FAO Food and Agriculture Organization of the United Nations

FDRE Federal Democratic Republic of Ethiopia

GDP Gross Domestic Product

GEF Global Environmental Facility

GTP Growth and Transformation Plan

HLIs Higher Learning Institutions

HoPR House of People’s Representatives

IBAs Important Bird Areas

IBC Institute of Biodiversity Conservation

IGAD Intergovernmental Authority on Development

IUCN International Union for Conservation of Nature

LDMPS Livestock Development Master Plan Study

MDTI Meat and Dairy Technology Institute

MoA Ministry of Agriculture

MoCT Ministry of Culture and Tourism

MoD Ministry of Defense

MoE Ministry of Education

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

NBSAP National Biodiversity Strategy and Action Plan

NBSAP-CO NBSAP Coordination Office

NBTF National Biodiversity Task Force

NFPAs National Forest Priority Areas

NGOs Non-governmental Organisations

NPC National Planning Commission

NPSC National Project Steering Committee

NRCHM CHM of the National Regional States

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

SCBD Secretariat of the Convention on Biological Diversity

SMNP Semien Mountains National Park

SNNPRS Southern Nations, Nationalities and Peoples Regional State

TT Technical Team

UNEP United Nations Environmental Programme

UNESCO United Nations Educational, Scientific and Cultural Organization

USAID United States Agency for International Development

USD United States Dollar

VU Vulnerable

**Executive Summary**

Ethiopia is a country of great geographic diversity, and macro- and micro-climatic variability. The altitudinal variation of the country ranges from 116 meters below sea level in the Danakil Depression to the highest peak of 4,620 masl at Mount RasDashen. These physio-geographic features are composed of high and rugged mountains, flat-topped plateaus, deep gorges, incised river valleys and rolling plains. As a result, Ethiopia is endowed with ten ecosystems, 18 major and 49 minor agro-ecological zones that are inhabited by amazingly great diversity of animal, plant, and microbial genetic resources that make the country one of the biodiversity hotspots of the world.

The country possesses an estimated number of 6000 species of higher plants of which 10% are endemic. There are 75 breeds of cattle, sheep, goat, and equines, six species of honey bees, 284 species of wild mammals, 861 species of birds, 201 species of reptiles, 200 species of fish, 63 species of amphibians and 1,225 species of arthropods. Of the wild faunal resources; 29 mammal, 18 bird, 10 reptile, 40 fish, 25 amphibian and seven arthropod species are endemic to the country. The country is also believed to harbour a wide diversity of microbial genetic resources.

In Ethiopia, biodiversity plays vital and diverse rolesin economic, ecological and social fabrics. Biodiversity and its ecosystem services are the bases for agriculture, where agriculture is the core driver of the country’s growth and long-term food security. Agriculture contributes 45% to the GDP and 90% for export earnings. Biodiversity is also a source of tourism, and is amajor input supplier to the manufacturing sector of the country.

Ethiopia is endowed with some of the world’s rarest animals and plants. However, they are facing multitudes of interlinked direct and indirect pressures resulting in severe deforestation, overutilization, soil erosion and desertification;and eventual loss of natural habitat, species and breeds.

The continuing loss of habitat with its associated biodiversity will have serious implications for the nation’s sustainable development. To reverse this loss, and increase the contribution of biodiversity to national development, ensuring conservation and sustainable utilization is of an utmost importance. This calls for dedicated involvement of all stakeholders, especially the local communities and strong support from policy makers. The Government of Ethiopia recognizes the importance of biodiversity and has put in place the required institutional and legal frameworks that govern conservation, sustainable use and the access and benefit sharing issues and has also ratified the CBD and acceded to the Nagoya Protocol.

In accordance with Article VI of the Convention on Biological Diversity and Decision X/2 of the Conference of Parties made at Nagoya UN Biodiversity Summit in October 2010, the Ethiopian Biodiversity Institute, together with the stakeholders, has prepared Ethiopia’s revised NBSAP. Revision of the Strategy was based on the existing realities of the country such as level of threats to biodiversity and ecosystems, government priorities, existing capacity, lessons from the hitherto implementation experiences and associated global provisions.

Revision of the NBSAP of Ethiopia was supported financially by the Global Environment Facility. It was implemented by United Nation Environmental Programme and executed by the Ethiopian Biodiversity Institute, the national focal point of Ethiopia. The process leading up to the preparation of the revised NBSAP has involved broad participation of stakeholders from governments, local communities, academic institutions, civil society and NGOs in activities ranging from accessing the required information to participation at two national workshops organized to review the draft strategy, targets, actions and implementation arrangement.

This Strategy has been prepared in accordance with the guideline for updating NBSAP and contains eight parts. **Chapter 1** introduces the country. It describes variable physio-geographic and climatic features, which are the bases for possessing diverse ecosystems and agro-ecological zones that are inhabited by a great diversity of animal, plant and microbial genetic resources. It also describes population and economy of the country. **Chapter 2** provides an overview of the biodiversity resource base of the country, namely: the ecosystems, plant, animal, microbial and cultural diversity. It also describes the protected area systems and presents summary of major factors affecting the biodiversity resource base of the country. **Chapter 3** assesses values of biodiversity and ecosystem services, where agricultural biodiversity, and forest and its ecosystem services are described as the core drivers of economic growth and long-term food security and poverty alleviation. It describes direct economic and indirect ecological values of the protected area systems. **Chapter 4** identifies direct and indirect causes of biodiversity loss; where habitat conversion, unsustainable utilization, invasive species, climate change, replacement of local varieties and breeds, and pollution are identified as direct causes; while demographic change, poverty, and lack of awareness and coordination are identified as indirect causes for biodiversity loss. **Chapter 5** outlines institutional and legal frameworks that govern conservation, sustainable use and access of genetic resources and associated community knowledge and sharing of benefits accrued from their use. **Chapters 6** describes lessons from the previous NBSAP and the process of revision of the NBSAP. **Chapter 7** provides vision, mission and principles of the revised NBSAP and outlines the National Biodiversity Targets of Ethiopia.

Strategic goal A deals with addressing the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society. To address this goal, Ethiopia has developed three targets, and corresponding seven indicators and 11 actions that are geared towards conducting awareness raising of public and decision makers on the values of biodiversity and ecosystem services. They also are designed to review and address gaps in the existing biodiversity related laws, regulations and strategies, and to communicate and integrate biodiversity values and ecosystem services into national and local development and poverty reduction strategies and plans.

Strategic goal B, which deals with reducing direct pressures on biodiversity and promoting sustainable use; is comprised of three targets, and corresponding six indicators and 11 actions. Targets of this strategic goal are aimed at reducing habitat conversion, reducing overexploitation of biodiversity and ecosystems and tackling invasive species.

Strategic goal C deals with improvement of the status of biodiversity by safeguarding ecosystems, species and genetic diversity. The goal is comprised of three targets, and corresponding nine indicators and 13 actions. These targets are designed to increase area coverage of ecologically representative and effectively managed protected areas; increasing *ex situ* conservation of agro-biodiversity, wild plants, animals and microbes and improving the standard of existing ones, and increasing *in situ* conservation sites/ecosystems and species/breeds and improving existing ones.

Strategic goal D deals with enhancing benefits for all from biodiversity and ecosystem services. It is comprised of four targets, and corresponding eight indicators and 13 actions. The targets are designed to be achieved through increasing coverage of forests and designated wetlands, doubling restoration of degrades areas; increasing access to genetic materials for research and development and the benefit accrued from them; improving women’s access to and control over biodiversity resources; and increasing benefits from biodiversity through value addition and crating market linkage.

Enhancement of implementation of the revised Strategy through participatory planning, knowledge management and capacity building is the essence of strategic goal E. This goal is comprised of five targets, and corresponding 11 indicators and 12 actions. Ethiopia has planned to achieve these targets through strengthening stakeholders’ integration, including participation of local communities in biodiversity conservation and sustainable utilization; strengthening national biodiversity database, devising information dissemination strategy, updating Clearing House Mechanism (CHM) and establishing national regional states CHM; working on knowledge generation in areas of biodiversity, documentation of community knowledge, innovations and practices of local communities related to biodiversity and integrating them into national development policies and strategies; and securing internal and external financial support required for the effective implementation of the Strategy.

Lead and collaborating agencies as well as the implementation timeframe have been proposed at actions levels.

Implementation arrangements for the revised NBSAP of Ethiopia are outlined in **Chapter 8.**

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**CHAPTER ONE**

**1 INTRODUCTION**

**1.1 Physio-geographic and Climatic Features**

Ethiopia is located in the horn of Africa, bordering Eritrea in the North, Djibouti and Somalia in the East, Kenya in the South, Sudan and South Sudan in the West. The country stretches from 3oN of the equator to latitude 15oN and from 33oE to 48oE longitude, and has an area of 1,127,127km2.

Ethiopia is a country of great geographic diversity. Erosion, volcanic eruptions, tectonic movements and subsidence have occurred for centuries in the country and still continue to occur accentuating the unevenness of the surface. As a result, Ethiopia is subjected to wide altitudinal and physio-geographic variations. The altitudinal variation of the country ranges from 116 meters below sea level in the Danakil Depression to the highest peak of 4,620 meters above sea level (masl) on Mount Ras Dashen. The physio-geographic features are composed of high and rugged mountains, flat-topped plateaus, deep gorges, incised river valleys and rolling plains. The Great Rift Valley runs from Northeast to Southwest of the country and separates the Western and Southeastern highlands. Extensive semi-arid lowlands in the East, South and West are extensions of these highlands.

Ethiopia has ten ecosystems, and 18 major and 49 minor agro-ecological zones. Macro- and micro-climatic conditions of the country are highly variable. The rainfall distribution is seasonal. The major rainy season lasts from June to September followed by 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 above 30oC. Because of the combined effects of the above factors, the country is endowed with diverse ecosystems that are inhabited by amazingly great diversity of animal, plant and microbial genetic resources, thus making the country one of the biodiversity hotspots of the world.

Ethiopia is comprised of nine regional states and two city administration (Figure 1). Over eighty distinct languages having about 200 dialects are spoken in the country. Amharic is the working language of the Federal Government. Official languages used in the regional states are those that are chosen by the respective states. English is used in academic and research institutions.



##### Figure 1 Regional States of the Federal Democratic Republic of Ethiopia

**1.2 Population**

Ethiopian harbors a population of over 80 million, and about 83% of the people live in rural areas. Only 17% of the Ethiopians live in urban centers, of which nearly half of them live in Addis Ababa. Today, Ethiopia is the second most populous country in Africa, next to Nigeria. With an annual population growth rate of more than 2%, Ethiopia will have more than 120 million people by 2030 (MoA, 2011).

**1.3 Economy**

Agriculture is the main stay of the Ethiopian economy employing about 83% of the total population. It contributes about 45% to the GDP, 90% to the total export earnings and 70% of the raw materials to the agro-industrial sector. The per capita income of the country is USD 380. Despite the challenges of being one of the world’s poorest countries, Ethiopia has good prospects for growth. Between 2005 and 2010, the country’s real GDP grew by 11% per annum, with the service sector accounting for the highest growth of 15% and agriculture for more than 8%. A 15% expansion of agricultural land and a 40% yield increase accounted for the growth in the agricultural sector over the last five years. The International Monetary Fund forecasts for Ethiopia a real gross domestic product growth of more than 8% per annum over the next five years. Major export items include coffee, sesame, leather, flowers, gold and live animals (MoA, 2011).

To support its growth, Ethiopia is attracting more foreign investment and it has increased from less than USD 820 million in 2007/08 to more than USD two billion in the first half of the 2010/11 fiscal year. Among other factors, this is the result of a comparably good investment atmosphere (MoA, 2011).

**CHAPTER TWO**

**2 BIODIVERSITY RESOURCE BASE**

**2.1 Ecosystem Diversity**

The diversity of ecosystems of Ethiopia has been described in a number of reports and publications (e.g. Tesfaye Awas et al., 2003; IBC, 2005; 2009). According to the recent reports, 10 distinct ecosystems are found in Ethiopia (Abebe Getahun and Eshete Dejen, 2012; IBC, 2009). Classification of these ecosystems is based on vegetation types, which describe dominant plant species composition of the respective ecosystems. These ecosystems are geographically located in different highlands, mid-altitudes and lowlands and harbor unique and diverse floral, faunal and microbial species composition. The variation in the species composition across the ecosystems might be attributed to variability in climatic, edaphic and other associated factors within the ecosystems.

**Afroalpine and Subafroalpine Ecosystem**

Afroalpine and Subafroalpine Ecosystem 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, Wattle Ibis, Thick-billed Raven, White-collared Pigeon, and many other rare and common birds (Tesfaye Awas et al., 2003; IBC, 2005).

**Status and trends:** Afroalpine and Subafroalpine Ecosystems are found under pressure of growing human and livestock population in the surrounding areas and subsequent expansion of agricultural and pasture lands. 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 are developed to implement effective protected area system. Other activities are also being conducted in BMNP and its surroundings to improve environmental management through regional ecosystem based management approach.

Semien Mountain National Park (SMNP) has been re-demarcated by increasing the previous size of the Park. Furthermore, community managed protected Afroalpine and Subafroalpine Ecosystem such as Guassa and Abune Yosef are demarcated and legalized as protected regional parks. Surveillances of Mount Choke and Guna have been completed for subsequent designation as parks, but the demarcation and legalization are not yet complete. As a result, the number of threatened and endemic mammals such as Walia Ibex (in SMNP) and the Ethiopian Wolf (in BMNPS and Guassa) are showing improvements over time. However, no data is available about those Afroalpine and Subafroalpine Ecosystems that are found in other parts of the country. Works are being conducted in Afroalpine areas with an emphasis on ecosystem and fauna research, monitoring and conservation, reducing the negative incidence of the interaction between humans and the critically endangered Afroalpine and Sub-Afroalpine wildlife, strengthening of traditional grassland management systems (in Menz), awareness raising campaigns to farmers, and feasibility studies in Wello in two national parks so as to assess their tourism potential. Activities aimed at alleviating poverty, developing and managing the environment and natural resources of the Park, through maintaining its world heritage status and by enhancing its income generation capacity for the local communities are also being conducted in Semien Mountain National Park.

**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 Harerge and Gojam, Southern and Northern highlands of Gonder and Wello; Eastern highlands of Tigrai, and highlands of Sidama and Gamo Gofa. 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 the endemics (IBC, 2009).

**Status and trends:** 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. As the result, it has experienced a considerable habitat and land degradation. The main threats to this ecosystem emanate from agricultural expansion, overgrazing and over harvesting of selected species. Currently, in Tigrai, 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.

**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 (Shewa, Arsi, Bale, Borena and Harerge), Amhara (Gojam, Wello and Gonder), Tigrai (East and West Tigrai) and SNNPRS (Sidama and Gamo Gofa) areas.

Characteristic trees and shrubs of 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 (*Yushania alpine)*. 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).

**Status and trends**: Dry Evergreen Montane Forests and Evergreen Scrub Ecosystem is under severe threat of habitat conversion caused by deforestation for wood products (especially fuel wood extraction), fire, agricultural expansion and overgrazing. However, the national regional governments are taking various measures to improve the management status of this 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 the participation and responsibilities of local communities in the management and conservation of natural resources, mainly forests. As a result, the status of the vegetation and associated fauna, in some areas, are under improved condition.

**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. The epiphytes such as *Canarina*, *Orchids*, *Scadoxus* and fern plants such as *Platycerium, Drynaria*, and mosses are found in the wettest parts of this ecosystem. Harena forest is one of the moist Montane forests, and is known for its high level of endemic plants such as *Solanecio harennensis*, and for its diversity of wild coffee.

The Montane Moist Forest Ecosystem is also 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).

**Status and trends:** Human activities such as timber extraction, commercial coffee and tea plantations, small-scale agricultural and grazing expansions and settlement are the major threats to Moist Montane Forest Ecosystem.

Despite the above pressures, regional governments are taking various measures to manage and maintain the Moist Montane Forest Ecosystem. Some moist Montane forest vegetation are also 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 to outside of the forest areas, 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.

**Acacia-Commiphora Woodland Ecosystem**

Acacia-Commiphora Woodland Ecosystem is found between 900 and 1,900 masl, and covers mainly 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 with 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. 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).

**Status and trends:** Expansion of small and large scale 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, expansion of indigenous and exotic invasive species such as *Prosopis juliflora* (especially in Eastern Ethiopia) have contributed to the loss of species diversity and habitat degradation of the ecosystem. Despite the threats, efforts are being made to slowdown or manage the invasion, especially to clear Prosopis from rangelands. Other efforts include designation of some areas as regional and federal parks. Re-demarcation activities such as of Awash and Abijata-Shalla National Parks are other activities that are being carried out to ensure effective management. The state of disturbance of these protected areas varies from low to moderate.

**Combretum-Terminalia Woodland Ecosystem**

Combretum-Terminalia Woodland Ecosystem occurs between 500 and 1,900 masl. It is found in Northwestern parts of Amhara, Tigrai, Benshangul Gumuz, Gambella, Oromia (in Dedessa Valley in Wellega), and SNNP (Sidamo, Omo valley, Gamo Gofa, Bench Maji) 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). 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, Oryx, Grant’s Gazelle, Greater and Lesser Kudus, Gerenuk, Lion, Leopard, Giraffe, Buffalo, Elephant and Cheetah are found in this ecosystem. Characteristic bird species of the ecosystem include Fox Kestrel, Red-throated Serin, Ostrich, Red-pate Cisticola, Green-backed Eremomela, Bush Petronia and Black-rumped Waxbill.

**Status and trends:** Encroachment and expansion of small and large scale agriculture for crops such as sugar cane, cotton, sesame, rice 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 and awareness raising in fire hazard protection 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.).

**Lowland Tropical Forest Ecosystem**

Lowland Tropical Forest Ecosystem is situated in the lowlands of the Eastern Gambella national regional state in Abobo-Gog wereda, and adjacent areas of Sudan border. Characteristic plant species of this forest ecosystem are *Baphia abyssinica* and *Tapura fischeri* (Tesfaye Awas et al., 2001). Other trees and shrubs of this ecosystem include *Alistonia boonei, Antiaris toxicaria,Celtis gomphophylla, Celtis toka, Celtiszenkeri*, *Diospyros abyssinica*, *Lecaniodiscus fraxinifolius, Malacantha alnifolia, Milicia excelsa*, *Trichilia prieureana, Vepris dainellii* and *Zanthoxylum lepreuri* (Tesfaye Awas et al, 2001; IBC, 2012a).

**Status and trends:** Lowland Tropical Forest Ecosystem is facing pressure emanating from encroachment. Furthermore, indiscriminate fire setting, shifting cultivation through land clearing which is commonly performed through slash and burn system have contributed to the shrinking of this ecosystem. Consequently, many wild animals including large mammals such as antelope are under threat. Conservation efforts that have so far been made include development of forest legislations and management, establishment of conservation areas and implementing PFM.

**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 otherspecies of *Boscia, Cadaba, Maerua, Grewia, Balanites* and *Ziziphus.* Grasses like *Dactyloctenium aegyptium* and *Panicum turgidum* 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 Kudus, 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.

**Status and trends:** 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 and large scale agriculture such as palm tree, sugar cane and cotton are major activities taking place in this ecosystem. Furthermore, widespread firewood collection and charcoal making have contributed to the deterioration of this ecosystem.

**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, feed, construction materials, water supply, water purification, climate regulation, flood regulation and eco-tourism. According to estimates by Forum for Environment (2009) Ethiopia has a wetland area of 22,600km2.

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.

**Status and trends:** Wetland Ecosystem is under pressure emanating from uncontrolled conversion of the ecosystem into agriculture, especially for rice production, over exploitation of wetland resources, deforestation, soil erosion and land degradation, siltation, settlement, climate change and pollution. The Fogera and Chefa wetlands in Amhara national regional state are, for example, highly affected by excessive use of swamps and flood plains for cultivation of rice and other horticultural crops. Ethiopia has painful experiences regarding total loss of Lake Haramaya. Boye-Kito wetland that is found around the town of Jimma and Lake Chelelaka found in Bishoftu town have shrunk due to agricultural expansion and urbanization. Efforts are being made in some regions such as Oromia, Amhara and SNNPR to tackle these threats. To manage Wichi wetland found in Illuababor zone (Oromia national regional state), for example, integrated watershed management, livelihood improvement, and family planning with the community are being conducted.

**Aquatic Ecosystem**

Ethiopian aquatic ecosystem includes rivers, reservoirs and lakes. This ecosystem harbors various species of mammals, birds, reptiles, amphibians, fishes and invertebrates. Similarly, several species of planktonic and benthic fauna have been reported from different rivers, lakes and reservoirs of the country. Moreover, many important microorganisms such as bacteria, fungi, algae and protozoa exist in aquatic ecosystems of Ethiopia. These aquatic habitats are also serving as feeding, breeding and brooding sites for a large number of resident and migrant birds, especially Flamingos, Ducks and Pelicans.

Status and trends: Aquatic Ecosystems are highly influenced by various anthropogenic activities such as pollution and over exploitation of fish stocks. Invasive species such as Water hyacinth are becoming another threat to Aquatic Ecosystem of the country. Damming and diversion of rivers, channelling and building water distribution facilities; and indirect influences such as the removal of riparian vegetation cover, mining and similar activities are playing various roles in changing or even destroying these habitats. Conservation efforts directed to the Aquatic Ecosystems of Ethiopia are minimal, and rift valley lakes in particular are in great danger. The current trend around Lake Abijata, for example, shows that the lake could dry up in the near future.

**2.2 Plant Biodiversity**

Ethiopian flora is estimated at 6000 species of higher plants of which 10% are endemic. Woody plants constitute about 1000 species (IBC, 2012a). The natural vegetation is classified into 12 major vegetation types (Friis et al., 2010). Out of these, six are categorized as forest vegetation (IBC, 2012a).

Attributed to its diverse agro-ecologies, farming systems, socio-economic conditions and cultures; Ethiopia is endowed with diverse crop genetic resources. Thus, the country is recognized as one of the Vavilovian centers of origin and diversity of crops (Vavilov, 1951). Ethiopia is a center of origin for tef (*Eragrostis tef*), noug (*Guizotia abyssinica*), Ethiopian mustard (*Brassica carinata*), enset (*Ensete ventricosum),* anchote (*Coccinia abyssinica*), coffee (*Coffea arabica*), Ethiopian potato (*Plectranthus edulis*), chat (*Catha edulis*), kebericho (*Echinops kebericho*), koseret (*Lippia adoensis* var. *koseret* Sebsebe) and Ethiopian cardamom (*Aframomum corrorima*). The country is also a center of diversity for wheat (*Triticum* sp.), barley (*Hordeum vulgare*), sorghum (*Sorghum bicolor*), pea (*Pisum sativum*), cowpea (*Vigna unguiculata)*, chickpea (*Cicer arietinum*), lentil (*Lens culinaris*), cotton (*Gossypium herbacieum*), castor bean (*Ricinus communis*), oats (*Avena abyssinica)* and clovers (Trifolium sp.).

**2.2.1 Cultivated plants and their wild relatives**

**Field crops**

Tef, sorghum, wheat, barley and maize are the major cereals grown in the country. Significant genetic diversity exists in tef (*Eragrostis tef*) which enables it to be adapted to various agro-ecological conditions. Many wild *Eragrostis* species including *Eragrsostis aethiopica*, *E. bicolor, E. cilianensis*, *E. curvula, E. minor*, *E. papposa* and *E. Mexicana* which are believed to be close relatives or progenitors of the cultivated tef exist in Ethiopia (Endashaw Bekele, 1978). In the case of sorghum (*Sorghum bicolor*), all the other morphological races (*bicolor, guinea, caudatum* and *durra*), except *kafir*, are grown in Ethiopia and there exists a diverse resource of sorghum germplasm adapted to a range of altitudes and rainfall conditions. Many of the intermediate forms as well as several of the wild and weedy forms such as S. *arundinaceum* and S. *aethiopicum* are also be found. Similarly, wide variation exist for wheat and barley germplasm and they are known for agronomically important traits mainly disease resistance (Zemede Asfaw, 2000; Worku and Ayele, 2012). The genus *Hordeum* contains about 32 species and within the species *Hordeum vulgare,* there are endemic varieties evolved in Ethiopia that couldn’t be found elsewhere. The presence of high level of variation in morphology and phenology among barley landraces grown by smallholder farmers is reported. Wide variation exists also for tetraploid wheat (*Triticum durum* subsp. *Abyssinicum, T. turgidum* subsp. Abyssinicum, *T. dicoccum, T. polonicum* and *T. compactum*) and the hexaploid wheat (*Triticum aestivum*)*.* There are also wild/weedy tetraploid oat species endemic to Ethiopia (*Avena abyssinica* and *Avena vaviloviana*). *A. Abyssinia* is cultivated in northern Ethiopia and is also a weed on the arable lands, particularly in barley fields. *Oryza barthii* and *O. longistaminata* that are found in the western plains and around Lake Tana, respectively are the wild relatives of rice.

Ethiopia is center of diversity for many pulse crops and the presence of high diversity in various traits is reported for faba bean, chickpea, lentil, grass pea, cowpea and field pea. For field pea, a unique subspecies known as *Pisum sativum* subsp. *abyssinicum* has developed in Ethiopia and wild and primitive forms of field pea are known to exist in the high elevations of the country. *Lathyrus pratensis* and *L. sphaericus,* wild relatives of grass pea, are found in upland grasslands of the country within altitudinal range of 3000 to 3200 and 1800 to 3000 masl, respectively. *Lablab purpureus* subsp. unciatus, the wild and also sometimes cultivated sub species of *Lablab purpureus,* and *Vigna vexillata* a relative of cowpea are found in many parts of the country. *Lens ervoides*, the wild relative of lentil, is found in Montane grassland and *Cicer cuneatum*, the wild relative to chickpea is found in Northern Ethiopia.

Ethiopian mustard (*Brassica carinata*), noug (*Guizotia abyssinica*), sesame (S*esamum indicum*) and linseed (*Linum usitatisimum*) are oil seed crops for which Ethiopia is considered as a center of origin or diversity, and they show considerable diversity. There are weedy forms of B*rassica* and *Guizotia scabra,* and noug has its wild relative.

There are indigenous cultivated and wild species of cotton. *Gossypium herbacium* var. acerifolium is believed to be domesticated in Ethiopia. The indigenous cultivated species *G. arboreum* and *G. herbaceum* are grown in home gardens and are important in traditional handicrafts. *G. anomalum* subsp. senarense, *G. somalense*, *G. bricchettii* and *G. benadirense* are wild relatives of cotton found in the country (Engels and Hawkes, 1991; IBC, 2012b).

There are also minor crops which are not widely grown by farmers. These include Finger millet (*Eleusine coracana*), Pearl millet (*Pennisetum glaucum*), Emmer wheat (*Triticum dicoccum*), Pigeon pea (*Cajanascajan*), Hyacinth bean (*Lablab purpureus*), Fenugreek (*Trigonella foenum-graecum*), Lupin (*Lupinus albus*) and Yam (*Dioscorea sp*.).

**Status and trends:** Though majority of the arable lands in Ethiopia are cropped with farmers' varieties, there is a decreasing trend in the number of local varieties maintained by farmers. In Tigrai national regional state, for example, farmers’ varieties of wheat (Shehan, Gerey and Gomad), barley (Demhay and Gunaza) and sorghum (Gedalit) are among the varieties reported to have been lost due to drought, diseases or are replaced by others due to their low productivity. Durum wheat is a seriously threatened crop from loss of diversity on farmers’ fields. Rare occurrence of durum wheat landraces during the main growing season is reported by a survey made in selected zones (West Shewa, Sidama and Arsi). The main reason for this is displacement by bread wheat varieties which took place gradually in a time of three decades (EOSA, 2007). Studies on sorghum in Northeastern Ethiopia have also shown that in 30 years’ time some important landraces have disappeared either locally or regionally, and many other landraces have become marginalized (Shewayrga et al., 2008).

The factors affecting the state of field crop genetic resources are displacement of local varieties by improved varieties, shift to market oriented crop production, disease and pests, frequent drought and unreliable rainfall. The later affects not only landraces but also improved varieties. Most of the crop wild relatives are found growing as weeds on marginal fields, traditionally managed agricultural lands and in disturbed habitats such as roadsides. The 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 through reducing suitable habitat and increasing the rate of habitat fragmentation.

In order to maintain field crops diversity of Ethiopia, Ethiopian Biodiversity Institute (EBI, formerly IBC) has conserved different field crops in cold room. The majority (about 97%) of plant species conserved in the genebank are field crops. To assist on-farm conservation activities, over 12 community seed banks have been established, out of which six are in good status. The community seed banks obtain technical support from EBI and Ethio-organic Seed Action (EOSA) to strengthen their capacity to ensure the continued cultivation of farmers' varieties. Recently, additional five on-farm conservation sites are being established in the SNNPRS. The community seed banks are intended to increase the access to diverse crop genetic resources.

**Horticultural crops**

Horticultural plant species grown in Ethiopia include root & tuber crops, fruits & vegetables, stimulant & beverage, and herbs and spices. The most important root and tuber crops of Ethiopia are enset (*Ensete venricosum),* anchote (*Coccinia abyssinica*), Ethiopian potato (*Plectranthus edulis*) and yams (*Dioscorea sp*.).

Anchote, enset and Ethiopian potato are found both in cultivated and wild states. There is tremendous variation among enset varieties in several morphological characters, disease resistance, product quality and use value. In Ethiopia, the genus *Plectranthus has* 32 species. Among these, *P. garckeanus* is endemic to the country. Out of the ten species of Coccinia that are found in Ethiopia, only *C. abyssinica* is cultivated for human consumption. Other root crops include taro (*Colocasia esculenta*), tannia (*Xanthosoma saqitiffolium*), Cassava *(Manihot esculenta*), potato *(Solanum tuberosum*) and sweet potato (*Ipomoea batatas*). Potato and sweet potato have very limited variability while taro and tannia are naturalized and diverse.

There are about 38 species of fruits currently cultivated in Ethiopia. Among these, pineapple (*Ananas comosus*), papaya (*Carica papaya*), sweet orange (*Citrus sinensis*), mango (*Mangifera indica*), banana (*Musa paradisca*) and avocado (*Persea americana*) are naturalized to the Ethiopian agro-ecologies and have many varieties (IBC, 2012b).

Widely cultivated vegetable species include pepper, garlic, shallot, tomato, cabbage, carrot, beetroot, pumpkin and okra. Okra (*Abelmoschus esculentus)* is believed to be domesticated in Ethiopia and has high diversity and its wild relative, *A. ficulneus,* is found in western Ethiopia. Cabbage tree (*Moringa stenopetala*) is another important vegetable indigenous to Ethiopia with multiple values such as food, feed, medicine and shade tree. However, the state of its diversity is not yet well documented.

The most important stimulant and beverage species that are found in Ethiopia are coffee (*Coffea arabica),* chat (*Catha edulis*), tea (*Camellia chinensis)* and Shiny-leaf Buckthorn *(Rhamnus prinoides).* The phenotypic diversity of Arabica coffee in Ethiopia is vast in both quantitative and qualitative characters. There is an extremely high variability in disease and pest resistance, liquoring quality, caffeine content and other traits. Reports by IBC (2012b), and Engels and Hawkes (1991) indicate that Ethiopia is either a center of origin or diversity for spices like Ethiopian cardamom *(Aframomum corrorima*), long pepper *(Piper longum),* black cumin (*Nigella sativ*a), cumin/bishop’s weed (*Carum copticum*), coriander (*Coriandrum sativum*), thyme (*Thymus schimperi*) and fenugreek *(Trigonella foenum-graecum*).

**Status and trends**: In Ethiopia, major threats to horticultural plant species are drought, pests, disease, replacement by food grains and deforestation. Deforestation mainly affects wild coffee and spices. The gene pool of *C. arabica* is highly endangered by increasing settlement and land-use pressure on the Montane rainforests. For enset, land shortage affects its expansion and the maturity time for obtaining quality yield. Family size increment and land shortage forces the household to consume enset at early stages, contributing to the loss of enset populations and diversity (Abraham Shumbulo et al., 2012). Imported varieties of horticultural crops are also becoming threats to local ones. Local Mango variety in Wellega has, for example, been replaced by Mango from Pakistan which is highly susceptible to white skin disease.

In order to maintain horticultural crops diversity of Ethiopia, EBI has established field gene banks in different agro-ecological zones of the country as part of the *ex situ* conservation programme to conserve horticultural crops. Over 6,000 accessions of coffee, spices, and root and tuber crops are being conserved in these field gene banks.

**2.2.2 Wild plants**

**Forest genetic resources**

Ethiopia has 12.3 million ha of forests comprising natural and planted forests, woodland, with a coverage of about 11% of the country. There are also huge areas that are covered by wooded grasslands. Apart from the natural and the planted forests, the forest genetic resources of the country include trees outside natural forests, which are mainly found in traditional agro-forestry system. Planted forests constitute over 972,000ha (Million Bekele, 2011). The area coverage of trees and shrubs that are found on farm lands is not clearly known.

The Ethiopian forests and woodlands are depositories and gene pools for several domesticated and/or important wild plants and wild relatives of domesticated plants. Species richness varied across forests, depending on environmental factors characterizing the forests. Woodlands and shrub lands of Ethiopia comprise different vegetation types with diverse tree and shrub species.

**Status and trends:** Forest resources of Ethiopia are seriously threatened by deforestation, habitat destruction and subsequent decline in regeneration, expansion of exotic and invasive species, agricultural encroachment, forest fires and vegetation clearance for farming and/or settlement. The most important threats to genetic diversity are results of deforestation and forest fragmentation, which can result in total loss of genetic information and disturbance in the genetic structure, respectively. A total of 103 tree and shrub species are considered as endangered species in the IUCN red list (Annex I).

Illegal logging, firewood collection and livestock grazing are threats to forests in all national regional states. Some of the forests such as the Borena woodland, known for gum and resin products, are deteriorating due to bush encroachments such as *Acacia drepanolobium, A. oerfota*and*A. mellifera*. *Prosopis juliflora*, invasive in such regions as Afar and Somali national regional states, is reducing the overall biodiversity of the areas it invades by forming a thick mono-specific scrub. Vegetation clearing for commercial farms is another threat to forest and other vegetation cover. In Benshangul Gumuz national regional state, for example, forest and other vegetation cover is reported to have declined from 80 to 50%, due to deforestation and other factors such as population pressure and large scale farming. *Boswellia papyrifera* and *Oxytenanthera abyssinica* (Yekola Bamboo) are among the highly threatened species in the region (MoA, 2011; IBC, 2012a,d).

In order to maintain forest resources of Ethiopia, EBI, has conserved a total of 468 accessions of 93 forest species at its gene bank. Forests are also being conserved in Protected Areas (PAs), National Forest Priority Areas (NFPA), and other *in situ* conservation sites such as area closures, church forests, sacred forests and community forests. Because of the increasing human and livestock pressure on the resource base, and lack of sustainable management; however, the status of PAs, including the NFPAs are deteriorating. In response, the forests in Yayu, Kafa and Sheka have been designated as Biosphere reserves by UNESCO. Six *in situ* site*s* established by EBI in Benshangul Gumuz, SNNP and Oromia national regional states are also shrinking from time to time in extent and degrading in species diversity and frequency.

National regional governments are taking various measures to improve the management status of some forests or vegetation types in their respective national regional states. In Amhara regional state, for example, area closure is playing an important role in increasing the natural bush land coverage of the region. In Oromia national regional state, forests are given on concession to be administered by joint management of regional government and community through benefit sharing arrangements, carbon trade and other incentive measures. Aimed at increasing the role and responsibilities of local communities in the management and conservation of their natural resources; mainly forests, local communities around the forests are organized into association and engaged in other income generating NTFPs activities.

**Medicinal plants**

Medicinal plants have significant roles in primary health care delivery in Ethiopia where more than 70% of human and 90% of livestock populations depend on traditional medicine. Of the total medicinal plant species, 2.7% are endemic to Ethiopia; and most are found in the wild (IBC, 2005). The Acacia-CommiphoraWoodland and the Montane Grassland Ecosystems contain 12.5% and 10.1%, respectively of medicinal plants. Most medicinal plants are herbs (Table 1).

Table 1. Distribution of medicinal plants by their growth forms

|  |  |  |
| --- | --- | --- |
| **Growth habit** | **No. of species** | **Percent** |
| Herbs | 271 | 30.5 |
| Shrubs | 168 | 19.0 |
| Trees | 110 | 12.4 |
| Climbers | 74 | 8.3 |
| Reed | 2 | 0.2 |
| Unidentified | 262 | 29.6 |

Source: Tesema et al., (2003)

The extent of species diversity and variability has been described and documented for some localities. From the total of 230 medicinal plant species identified by Ermias Lulekal (2007) from an assessment made in Mana Angetu wereda (Southeastern Ethiopia), for example, 78.70, 11.74 and 9.57% are used as human and livestock medicines, and for treating both human and livestock ailments, respectively. Similarly, 74 veterinary medicinal plant species that were distributed among 64 genera and 37 families were recorded in BMNP and adjacent areas (Yineger et al., 2007).

**Status and trends**: Majority of the medicinal plants utilized in Ethiopia are harvested from the wild. Therefore, most of the threats to the forest are also threats to medicinal plants. These include environmental degradation, agricultural expansion, loss of forests and woodlands, fire, cultivation of marginal lands. Moreover, uprooting and unsustainable utilization are the major threats to medicinal plants in Ethiopia. Traditional medicines such as *Taverniera abyssinica* is critically endangered due to overuse. Species such as *Hagenia abyssinica* and *Prunus africana* which are also harvested for non-medicinal values such as timber, fuel wood and other purposes are subjected to multiple pressures.

*Ex situ* conservation of medicinal plants are carried out by EBI at Wendogenet and Bale-Goba conservation sites.

**Pasture and forage genetic resources**

There is a wide range of pasture and forage resources that are adapted to different ecosystems in the country. Ethiopia is known to be a centre of diversity for a number of important forage herbaceous legume species in the genera *Trifolium, Vigna,* and *Dolichos*, among others. Out of the 26 indigenous species of Trifolium, eight are endemic to Ethiopia. Major forage species of the country include *Stylosanthes fruticosa*, *Neonotonia wightii*, and species of *Alysicarpus*, *Indigofera*, *Tephrosia*, *Acacia*, *Erythrina*, *Pennisetum*, *Rhynchosia*, *Trifolium*, *Medicago*, *Brachiaria*, and *Crotalaria*. There are 159 genera with 569 species of grasses, 108 genera with 358 species of legumes and 179 species of trees used by domestic animals for browse. Attributed to various factors, however, many of these palatable species are highly threatened (IBC, 2009).

**Status and trends:** Overgrazing and/or browsing, drought, invasive species and conversion of pasture lands to crop lands are main threats to pasture and forage species. Overgrazing and invasion by non-palatable indigenous species such as *Acacia mellifera* and *A. nubica*, and other invasive species such as *Prosopis juliflora* and *Parthenium hysterophorus* have resulted in the loss of high quality and palatable plants in the rangelands. Data and information obtained from bureaus of agriculture of the national regional states indicate that in Afar national regional state, *P. juliflora* covers about 51,000ha of rangelands; and in Oromia national regional state, most of the grass and bush lands of the region are invaded by *P. juliflora*. In Amhara national regional state, expansion of farmlands is reported to be a major threat to its rangelands and forage genetic resources. To ease the pressure on rangelands and forage resources, there are some efforts that are aimed at selecting productive forage species, multiplying forage species adaptable to a specific area, testing indigenous tree species suitable for feed, banning open grazing, and demarcating and enclosing rangelands.

**Edible wild plant genetic resources**

Edible wild plants (EWPs) have supplementary, and seasonal and emergency roles in the communities that use them for food; and some are also used as a source of income. Examples include *Berchemia discolor, Carissa spinarium, Amaranthus graecizans, Amorphophallus gallaensis, Dovyalis abyssinica* and *Mimusops kummel.* In Ethiopia, the state of intra-specific diversity of EWPs and crop wild relative is not yet well studied. A recent review documented 413 species of EWPs representing 224 genera and 77 families. Fabaceae is the most diverse family represented by 35 species of EWPs. Shrubs represented 31% of EWP species followed by trees (30%), herbs (29%) and 9% by climbers (Ermias Lulekal et al., 2011).

**Status and trends*:*** Studies on WEPs of Ethiopia cover only about 5% of the country. The contribution of EWP for food security is ignored and their ecosystems and corresponding local knowledge to sustain these resources is neglected. Factors that threaten forest resources are also the threats to EWPs and their natural ecosystems, resulting in a decrease in the diversity of EWPs from time to time.

**2.3 Animal Biodiversity**

**2.3.1 Farm animal genetic resources**

Ethiopia has served as a gateway to domestic animals from Asia to Africa and the country’s diverse ecology favored the diversification of these resources. In terms of livestock population, Ethiopia stands first in Africa and 10th in the world. The most common farm animals of the country can be categorized into mammalian, avian and honeybee species. Cattle, sheep, goats, camels, donkeys, horses and mules are the major farm animals that lie under the mammalian category. Under the avian category are chicken (poultry), ostrich and turkey. However, the latter two avian species are not widely used in the country.

According to IBC (2004; 2012c) and EBI (2014), 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 (Annex II). As a result of continuing breed characterization and identification works being conducted in the country, the number of breeds of cattle, sheep, goats, camel, Horse, and chicken shows some variations from former reports. There are also five geographical races of honeybees which are economically most important in the country. Other than honeybees, there are 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, 2004, 2012c). With regard to poultry breeds, about 3.6% of the total is reported to be either pure exotics or hybrids (CSA, 2012). Thus; several layer, broiler and dual-purpose exotic chicken breeds or hybrids introduced into the country are being used by small and large-scale commercial producers in urban and peri-urban areas. In addition, some of their crosses with indigenous chicken are used by rural smallholders for egg and meat production.

Out of the exotics, Holstein-Friesians and Jersey cattle, and their crosses with different indigenous breeds occupy the lion's share (IBC, 2012c). Crossbreeds used under medium input production system are those produced from crossings between exotic sires and five indigenous dam breeds, namely: Borena, Horro, Fogera, Arsi and Begait.

**Status and trends**: Populations of domestic animals of the country, except the non-sedentary population of three zones of Afar & six zones of Somali regions (no data is available for these nine zones), is estimated at 52.13 million cattle, 24.2 million sheep, 22.6 million goat, 0.99 million camel, 44.89 million chickens, 1.96 million horses, 0.37 million mules and 6.4 million donkeys (CSA, 2012). The trends in livestock population over the last five years showed an increase. In the census of 2012, however, most of the species of livestock except donkey have shown a decrease. In Ethiopia, donkeys are the overwhelming majority compared to the other draught animals. The trends in livestock population over the last five years are presented in Figures 2 and 3.

Figure 2. Change in population size of cattle, sheep, goats and chicken (CSA, 2006/2007 –2011/2012)

Figure 3. Change in population size of horses, donkeys, mules and camels (CSA 2006/2007-2011/2012)

Though increase in population size doesn’t necessarily show the status of the domestic animals diversity, given that the majority of the livestock populations (except poultry) are indigenous breeds, it appears that the resource is thriving well (IBC, 2009). The current status of chicken population in the country is increasing, and with regard to blood level composition, 96.46%, 0.57% and 2.97% of the total poultry were reported to be indigenous, hybrids and pure exotics, respectively (CSA, 2012).

Little work has so far been done on identification, characterization and development of the livestock resources of Ethiopia. As a result, there is no complete and up-to-date breed level statistics for most of the breeds. Therefore, there exists no complete information on the status and trend of the breeds. There are however, different indigenous breeds which are known to be 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 cattle breeds, resulting in the decline of the pure line. In addition, Begait, Irob, Ogaden, Afar and Borena cattle breeds; Sinnar donkey, and Afar, Menz and Gumuz sheep breeds are also facing various degrees of threats.

Ever increasing demand for export (both legal and illegal) market for cattle, goats, sheep and camels seems to threaten the resources 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).

The hitherto attempts for the conservation of the domestic animal diversity has been very limited. Ranches were established in different parts of the country, for the conservation and sustainable utilization of Begait, Borena, Horro and Fogera cattle breeds. Recently, the EBI is making a huge effort in the conservation and sustainable utilization of domestic animal genetic resources. Semen has been collected for cryo-conservation from Fogera, Begait, Sheko and Irob indigenous cattle breeds; while Sheko, Irob Begait, Afar and Begaria cattle; Afar, and Black Headed Somali sheep; Woito-Guji and Abergele goat; Kundudo horse breed as well as Mandura chicken have been conserved *in situ*.

In Ethiopia, major causes of threat to the farm animal genetic resources include feed shortage resulting from degradation of rangelands/grazing areas and resettlement of refugees in pastoral areas, overgrazing and overstocking; invasion of exotic weeds and shrubs; expansion of crop cultivation practices into both grazing lands in the highlands and marginal areas in the lowlands. Additional threats emanate from crossbreeding, interbreeding, and diseases and parasites. Trypanosomiasis is a major threat to cattle breeds. Indigenous chicken populations could be pictured as a pool of genes under pressure from many direction including replacement by pure exotics and their hybrids, diseases, predation, lack of feed and drinking water of good quality, and poor housing (IBC, 2012c,d).

Availability of diverse climate coupled with diverse flora, and huge water resources enable the country to sustain large numbers of bee colonies. Estimates by LDMSP (2007), indicate that there are more than seven million bee colonies in the country. There are also three types of beekeeping systems in use by the bee-keepers in Ethiopia, namely: the traditional, transitional & modern systems. However, more than 95% of bee-keepers use traditional system, with individual farmers owning an average of five hives that yield about 5kg of crude honey per hive annually, whereas the modern framed hives can produce more than 30kg/hive/year (IBC, 2012c).The main threat to honeybees emanate from diseases (Nosima and Amoeba), pests, predators, and pesticide and herbicides (IBC; 2004, 2005,2012d).

**2.3.2 Wild animal genetic resources**

Ethiopia encompasses a broad range of ecosystems with great varieties of habitats contributing to the occurrence of high faunal diversity. Data and information on the diversity of wild fauna resources as a whole is not yet complete. According to the existing data, the Ethiopian wild fauna is comprised of 284 mammal, 861 bird, 201 reptile, 200 fish, 63 amphibian and 1,225 arthropod (324 butterfly) species. Of these faunal resources, 29 mammal, 18 bird, 10 reptile, 40 fish, 25 amphibians and seven arthropods (most of them butterfly) species are endemic to the country (IBC, 2009; USAID/Africa 2008; Redeat Habteselassie, 2012). The variety of species and great proportion of endemicity within the group, especially in the highlands is the result of the isolation of the highland areas of the country from other highlands within and outside the country by the surrounding lowlands (IBC, 2005).

McKee (2007) described a number of charismatic flagship species of mammals in Ethiopia, most notably the Gelada (an endemic genus and the world’s only grazing primate), the Mountain Nyala (an Antelope endemic to the Afroalpine ecosystem), the Ethiopian Wolf and the Walia Ibex (species confined to areas in the Simien Mountains). There are also remnant populations of Elephant (an estimated 850, including 150 of *Loxodonta africana orleansi*), Lions (an estimated 1,000) and large ungulates. Spotted hyenas are abundant. There is at least one and a possible further two isolated populations of black rhino (cited in USAID/Africa 2008), but it is widely believed that it might even have gone extict.

Ethiopia has also a rich avifauna which is about 40% of Africa’s total. Of the total of 861 species of birds, at least 596 are resident and 224 are regular seasonal migrants, including 176 from the Palearctic; a further 13 are shared only with Eritrea. A remarkable 69 Important Bird Areas (IBAs) were defined by the Ethiopian Wildlife and Natural History Society. These cover 47,757 km2: equivalent to at least 4.3% of the land area of the country (Bird Life International, 2001).

Ethiopia’s arthropod fauna, including insects, is poorly known. Insects are dominant in aquatic and forest ecosystems, and occupy all conceivable habitats (IBC, 2005). Data and information on the amphibians of the country is very poor. Recent study on the Amphibian species composition of Lake Tana sub basin indicated that the sub basin comprises 17 species of amphibians belonging to nine Genera and five Families, with three endemic species. In the sub basin, 35 species from reptiles belonging to three orders, 11 families and 25 genera have so far been recorded, out of which two are endemic (Seyoum Mengistu et al., 2005).

There are about 30 major lakes, six major river basins and over 70 wetlands that are located in different ecological zones of Ethiopia. These ecosystems harbor 200 fish species, 91 benthic and aquatic insects and 141 zooplankton species (Redeat Habteselassie, 2012; Abebe Getahun and Eshete Dejene, 2012). The Ethiopian fish resources are much influenced by various threats.

Major threats to aquatic and wetland wild animals are habitat degradation, over-harvesting, unbalanced water utilization, change in water flow (flow modification), siltation, mining, draining of wetlands for other land use and pollution. These activities might cause extinction of fish and some other aquatic biota that couldn’t tolerate those pressures (Abebe Getahun and Eshete Dejene, 2012) and other natural factors. The fish diversity in Lake Abijata, for example, is highly threatened by the increasing water abstraction, high siltation and change in habitat with change in water chemistry and soil type from sandy to sandy clay and clay soil. Lake Awassa is also highly polluted by municipal waste and a nearby hospital, threatening the biodiversity therein. In addition, the share of tilapia from lakes Awassa and Ziway has greatly diminished, and the less popular Labeo and catfish have been increasing in the catch of the lakes (FAO, 2005). Efforts for the conservation of the aquatic ecosystems are very limited.

**Status and trends**: Information on the status and trends of wild fauna as whole is very limited. According to the International Union for the Conservation of Nature’s (IUCN, 2007) “red list”, 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 have very restricted distribution, including Walia Ibex, which is the most endangered mammalian species in the world (IBC, 2005, 2009). All wild mammals which occur in Ethiopia and rated as critically endangered (CR), endangered (EN) or vulnerable (VU) in the 2004 IUCN Red List of threatened animals are presented in Annex III.

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*and *Francolinus harwoodi*) and 14 are vulnerable to extinction (eg. Prince Ruspoli’s Turaco, Greater Spotted Eagle, Lesser Kestrel, Yellow throated Serin, Nechisar Nightjar and Wattled Crane). There are also 16 species which are nearly threatened (IBC, 2005, 2009; BirdLife 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 (BirdLife 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, python has been critically endangered in the Lake Tana sub basin due to habitat fragmentation and loss, and partly due to persecution by humans blamed for preying on domestic animals, especially shoats, and partly due to resentment from cultural taboos. Three species of reptiles, namely: the Nile crocodile, Water snake and Nile monitor that are found in the sub basin are assigned into the category of vulnerable (Seyoum Mengistu et al., 2005). There is possibility that some herps in Ethiopia are facing extinction due to habitat destruction, before their existence in the country has even been recognized (Largen and Spawls, 2006).

**Protected areas**

In order to conserve the wildlife genetic resources, Ethiopia has established protected areas (PAs). At present, the size of the PAs dedicated for protection of wildlife is estimated at 14% of the country’s area. The wildlife conservation areas are divided into different categories, namely: Principal Wildlife Conservation Areas, Sanctuaries, Reserves, Rescue Centers, Hunting Areas, Ranches, Botanical Gardens, National Forest Priority Areas and Biosphere Reserves. There are also other PAs which include lands protected by belief systems, Forest and Plant Scientific Research Projects and Colleges. Different PA systems of Ethiopia are presented in Table 2.

Of these PAs, only SMNP and Awash National Park have been officially gazetted at national level, while four other parks namely: Alatish, Omo, Maze and Chebera Churchura are gazetted at national regional states levels. All the important ecosystems in the country are not represented in the existing wildlife PAs. This is a major drawback for conservation of threatened endemic and unique species. Even the areas dedicated for wildlife protection are faced with many problems (IBC, 2005; Young, 2012).

Table 2. Protected area systems of Ethiopia

|  |  |
| --- | --- |
| **Types of protected area systems** | **Total (No.)** |
| National parks | 21 |
| Wildlife sanctuaries | 2 |
| Wildlife reserves | 3 |
| Controlled hunting areas | 20 |
| Community conservation areas | 6 |
| Wild life rescue centers | 2 |
| Community managed ecotourism and hunting areas | 2 |
| Open hunting areas | 6 |
| Commercial ranches | 3 |
| Botanical gardens and herbariums | 2 |
| Biosphere reserves | 4 |
| National priority forest areas | 80 |
| Municipal parks | 3 |
| Land occupied by research centers, governmental institutions | 36 |

Source: Young (2012)

In Ethiopia, PAs have suffered from inadequate security, staffing and facilities; leading to many cases where their status is a little more than nominal and providing no protection for their fauna and flora (USAID/Africa, 2008). Moreover, threats to PAs and their resource base can be broadly associated with the following categories: limited institutional, legal and financial capacities, population growth, deforestation, invasive species and open access to resources leading to degradation of habitats, conversion of natural habitat to agricultural lands and overgrazing by large livestock population. These threats are largely interrelated and self-reinforcing, and it is therefore, important not only to understand the individual threats but also to examine them holistically through recognizing their interrelation which can help to propose solutions (USAID/Africa, 2008; EWCA, 2009).

**2.4 Microbial Biodiversity**

Ethiopia is believed to harbour a wide diversity of microbial resources which, however, are hardly explored, collected, identified, characterized and conserved. Among the little known are those that are used in the fermentation processes in 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. Researches on microbes have been going on for the last four decades. They have been mainly driven to generate data on some outstanding agricultural and health problems and initiated with the aim of identifying and characterizing microbes with academic goals.

Considerable numbers of microbes have been identified by institutions working in the sector. Thus, 381 species of bacteria, fungi and microalgae have been conserved in national genebank.

**Status and trends:** There are no current estimates on the number of species of microbes in Ethiopia. Moreover, there is no exact data on the level of threats to microbial genetic resources of the country. However, all factors affecting ecosystem, plant and animal biodiversity are believed to affect directly or indirectly the microbial genetic resource base of the country. Therefore, collecting, identifying, conserving and knowing the status of microbial genetic resources of the country will clearly be a forthcoming major task.

**2.5 Cultural Diversity**

Ethiopia is a country of cultural mosaic. There exist over 80 different ethnic groups, languages, and dialects, which are associated with the existence of inter- and intra-ethnic cultural diversity. Associated with these diverse cultures, the country owns diverse community knowledge and innovations including that of conservation and use of biodiversity. 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 biodiversity through their community knowledge and innovations.

As in many other developing countries, over 75% of the rural populations of Ethiopia depend on community knowledge and practice for their healthcare delivery. Moreover, rural communities (farmers, herders, fishermen and wild food gatherers) of the country have diverse customary laws, which have been used or contributed to the management and sustainable use of natural resources. The Gada system rangeland management amongst the Oromo people, particularly Borena, the Gereb herding and grazing arrangements between the Afar pastoralists and the Tigraian farmers, the Qero system traditional grassland management systems used by Menz people in the Amhara national regional state, and Konso cultural landscape management and the Kobo System of Sheka forest management in SNNPRS are the most common traditional institutions employed in biodiversity management. This; to a large extent, reflects the correlation between biological and cultural diversities.

**Status and trends:** Various studies have reported that community knowledge associated with the use of biodiversity particularly knowledge of traditional medicine is eroding due to various factors. Loss of plant and animal species and decline of traditional practices are some of the major factors contributing to the loss. Furthermore, traditional institutions are weakened or undermined by their respective community, particularly by younger generations. Attempts are being made to study and document community knowledge, particularly those related to traditional medicine and EWPs. In Ethiopia, some works are being conducted to transfer community knowledge related to environment and natural resources conservation to the young generation.

**CHAPTER THREE**

**3 VALUES OF BIODIVERSITY AND ECOSYSTEM SERVICES**

Agriculture is the core driver for Ethiopia’s growth and long-term food security. Its contribution to the GDP and export earnings is 45% and 90%, respectively (MoA, 2011).

**3.1 Values of Agricultural Diversity**

**3.1.1 Crop genetic resources**

Crops have vital roles in agricultural production as a driver for economic growth and food security. 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 accounts for approximately 15% of protein intake. Pulses have significant role in Ethiopia’s economy generating an export earning of USD 129 million per annum (MoFED, 2010). Earnings from coffee contribute 4-5% of the GDP, about 20% of the government revenue and 60% of the total foreign exchange. Ethiopia is also one of the major producers of natural gums. In the year 2009/10, for example, the country earned USD 12.68 million from the export of gums and incense (MoFED, 2010). Revenue obtained from various agricultural products exported in 2009/10 is summarized in Table 3.

Though the values of genetic diversity are widely recognized, monetary valuation has been made only for few of the resources. The economic value of the wild coffee genetic resources for the world coffee industry in breeding programmes for disease resistance, low caffeine contents and increased yields is estimated to lie in ranges between 0.5 and 1.5 million USD/year. Over a 30 year period of time this value would go up as high as USD 1.45 billion (Hein and Gatzweiler, 2006; Gatzweiler, et al., 2007).

Table 3. Values of some agricultural products in 2009/10

|  |  |
| --- | --- |
| **Items** | **Value (million USD)** |
| Coffee | 528.0 |
| Oil seed | 358.0 |
| Pulse | 129.86 |
| Flower | 170.0 |
| Vegetables herbs and fruits | 31.7 |
| Spices | 18.57 |

Source: MoFED (2010)

Table 4. Economic value of Ethiopian coffee genetic resources

|  |  |  |
| --- | --- | --- |
| **Purposes** | **Net present value (USD million) at discount rate of:** | |
| **5%** | **10%** |
| Disease resistance | 617 | 169 |
| * Coffee berry disease | 60 | 11 |
| * Meloidogyne sp. | 232 | 65 |
| * Coffee rust | 323 | 94 |
| Decaffeinated coffee | 576 | 175 |
| Yield increases | 266 | 75 |
| Total value | 1458 | 420 |

Source: Gatzweiler, et al. (2007)

**3.1.2 Farm animal genetic resources**

Livestock play important roles in providing 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), the contribution of livestock to the GDP, excluding ploughing services is 25%. If the value of their ploughing services is included, however, their contribution to the GDP will rise to up to 45% (IGAD, 2011), increasing the overall role of agriculture to the national GDP. Livestock also have economic functions serving as savings and assets which are insurances to mitigate risks. 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. At present, the total value of livestock and their products stands at about 20% of all national exports (IGAD, 2011, IBC 2012c). In 2008/09, household expenditure on livestock products was estimated at 1.086 billion USD, and the livestock sector exports helped to earn more than 0.229 billion USD (IGAD, 2011). The economic contribution of livestock and fish sector exports in the year 2011 is summarized in Table 5.

In Ethiopia, beekeeping is traditional activity, and about one in 10 smallholders keep bees. National annual production of honey and beeswax is estimated at 40,700 and 4,200 tones, respectively (MoARD, 2007). Similarly, the total annual catches of fish from lakes and reservoirs have production potentials of about 50,000 tonnes/year. However, only about 15,000 tonnes are being exploited (FAO, 2005). High populations of crocodiles are found in protected areas in most of their distribution ranges, in addition to Arbaminch Crocodile Ranch, and generate 1,605,000 USD per annum (Seyoum Mengistu et al., 2005). There is also one newly established private crocodile farm located near Lake Chamo. Many insects are of great use to human kind since they are the primary agents of pollination and in most communities they occupy intermediate positions along the food chain (IBC, 2005).

Table 5. Proportion of livestock sector export in 2011

|  |  |  |
| --- | --- | --- |
| **Livestock products** | **Annual value in million USD** | **Proportion (%)** |
| Live animals | 14.97 | 13.4 |
| Meat and meat products | 72.72 | 63 |
| Hides and skins | 23.2 | 20 |
| Honey | 2.3 | 2 |
| Beeswax | 1.5 | 1.4 |
| Fish | 0.22 | 0.19 |
| Total | 114.91 | 100 |

Source: Custom and Revenue Authority (2011)

**3.2 Forest and its Ecosystem Services**

Forest resources of Ethiopia serve for economic, ecological and social purposes. Their biodiversity play vital and diverse roles to ensure food security, and sustainable livelihoods for millions of households throughout Ethiopia. Forests contribute an estimated 4% to GDP through the production of honey, forest coffee, 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. The value of wild coffee is estimated at 130 million USD/annum (Mulugeta Lemenih, 2009). Ecosystem services provided by the forest biodiversity include provisioning, regulating, supporting and cultural services. Some estimates of economic, ecological and social values are indicated in Tables 6, 7 and 8.

Although no monetary values have been estimated, other NTFPs such as forages from forest largely serve as the feed sources of livestock in the country. Fodder driving from forests provides 10% and 60% of the livestock feed in the wet and dry season, respectively. Similarly, many edible wild plants have supplementary, seasonal and emergency roles for a significant number of rural populations.

Table 6. Gross annual values of major non-wood forest products of Ethiopia

|  |  |
| --- | --- |
| **Types of product** | **Estimated annual turnover value (’000 USD)** |
| Wild coffee | 130,590 |
| Gums and incense | 3,700, |
| Honey and beeswax | 86,510 |
| Herbal medicine | 216,367 |
| Ecotourism | 15,400 |
| Bamboo | 10,556 |
| Spices | 2,700 |
| Civet | 183 |
| Total | 462,306 |

Source: Mulugeta Lemenih (2009)

In Benshangul Gumuz national regional state, for example, edible wild plants contribute 30 to 40% to food security in normal and at times of food shortage. Services provided by other ecosystems of the country are described in the respective sections (Chapter 2). However, monetary values of these services have not thus far been quantified.

Table 7. Annual production of wood products and their respective values

|  |  |  |
| --- | --- | --- |
| **Product type** | **Production (1000 m3 )** | **Value (‘000 USD)** |
| Sawn wood | 60 | 15, 167 |
| Wood based panels | 10 | 2,617 |
| Industrial round wood | 2459 | 38,251 |
| Fuel wood | 84134.6 | 420,673 |
| Round wood, poles, posts, construction wood | 84,532 | 1,047,999 |
| Wood pulp | 9 | 7,470 |
| Other fiber pulp | 9.4 | 2,350 |
| Total | 171,214 | 1,519,360 |

Source: Mulugeta Lemenih (2009)

Table 8. Estimates of annual economic values of some forest ecosystem services

|  |  |  |
| --- | --- | --- |
| **No.** | **Forest service type** | **Values of Ethiopia’s forest Ecosystems (million USD)** |
| 1 | Climate regulation | 892 |
| 2 | Water regulation | 24 |
| 3 | Water supply | 32 |
| 4 | Erosion control and sediment retention | 980 |
| 5 | Soil formation | 40 |
| 6 | Genetic resources | 164 |
| 7 | Recreation | 448 |
| 8 | Cultural | 8 |
| 9 | Nutrient recycling | 3,670,000 |
|  | Total | 6,280,000 |

Source: Adapted from Forum for Environent (2009)

**3.3 Protected Areas**

Protected areas have both direct and indirect values. Direct values include generating foreign currency, recreation, 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. These benefits contribute indirectly to the national economy. The annual economic value of PAs is estimated at 1.5 billion USD (Table 9).

Table 9 Estimates of values of different services of PAs in EWCA managed areas

|  |  |
| --- | --- |
| **Services type** | **Values (million USD)** |
| Biodiversity | 112 |
| Watershed | 432 |
| Carbon sequestration | 938 |
| Total | 1,482 |

Sources: Adapted from EWCA (2009)

**3.4 Microbial Genetic Resources**

The benefits of microbial genetic resource can be grouped into direct and indirect economic values. The direct economic benefits of microbes include their use for food production and preservation, production of antibiotics, pharmaceutics and manufacture of vaccines, management of pests and pathogens, generating bio-fuels, production of microbial metabolites, assaying of chemicals and serving as tools for medical research. The indirect values of microbial genetic resource comprise transformation of inorganic carbon into biomass by primary producers, nutrient regeneration and cycling, conversion of organic matter including humus that would otherwise be lost from the food web into living biomass, regulation of biogeochemical cycles and consequently the climate.

In Ethiopia; although there is no quantified data on value of microbial genetic resources, there are evidences for their significant contribution in national economy. They play pivotal roles in preparation of traditional foods and local drinks both in the rural and urban areas of the country. Traditional foods such as Injera, Kocho, Bulla and Cheese, and local drinks such as Tella, Tej, Borde, Cheka and Areke are the means of livelihood and sources of income for millions of rural and urban Ethiopians. In many part of the country, several species of mushroom 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, contribution of microbial genetic resources to national economy will be increasingly enormous. Furthermore, the value of microbes in the health sector such as vaccine development, pharmaceutics and quality control is increasing from time to time.

By its nature, increase in agricultural production and productivity is determined by several interdependent biotic and abiotic factors, among which microbes are major elements. For instance, nitrogen fixing bacteria are the natural factories that convert atmospheric nitrogen into nitrate. Although, there is no quantified data, they increase yield of associated pulse crops and available soil nitrogen for plants for the succeeding farming season. Similarly, roles of microbes in biochemical processes that contribute to improved plant nutrient availability such as mineralization, phosphate solubilization, siderophores production, plant growth regulation and induced resistance have been reported for different farming systems, including Ethiopian *Coffea arabica* and traditional agro-forestry system (Diriba Muleta, 2007). Furthermore, microbes produce simple organic molecules for plant uptake, polysaccharides to improve soil aggregation, carbon and nutrient recycling, and producing of oxygen. They also maintain health of plants and animals; serve as biological controls, and detoxification of wastes. Thus, the benefits of microbes in national economy by increasing agricultural productivity and production, particularly crop production is enormous.

**CHAPTER FOUR**

**4 CAUSES AND CONSEQUENCES OF BIODIVERSITY LOSS**

**4.1 Direct Causes and Consequences**

**4.1.1 Habitat conversion**

Conversion of natural forests, grazing lands, woodlands, and wetlands into agriculture land and settlement are some of the threats to biodiversity of Ethiopia. Land use change results in the loss of nearly all species of fauna and flora on-site, and leads to increasing fragmentation of the remaining ecosystems. The growth achieved in the agricultural sector in the country between years 2005 and 2010 was due to 40% yield increment and 15% agricultural land expansion. As a result of this, significant portions of forests, woodlands, rangelands and wetlands have been converted into commercial agricultural crop lands such as tea, rice, sugarcane, bio-fuel, feedstock, coffee and rubber tree. 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).

Attributed to high population growth, demand for arable land by small scale farmers has also increased from time to time. As the result, the gene pool of *Coffea arabica* is, for example, highly endangered by increasing encroachment and land-use pressure on the Montane rainforests. Furthermore, ever increasing encroachment into Bale Mountains, Awash, Semien Mountains, and Abijata Shalla National Parks is affecting the ecosystems of these parks. The combined mid- and long term negative impacts of land use change include degradation and shrinkage of natural ecosystems, loss of biodiversity and eventual loss of ecosystem services.

**4.1.2 Unsustainable utilization**

Unsustainable utilization (over grazing/browsing, harvesting, hunting) of biological resources is a major threat to biodiversity and ecosystems in Ethiopia. For example, unregulated and uncontrolled fishing, along with other factors such as erosion and water resource developments have threatened Labeobarbus fish in Lake Tana. Similarly, over harvesting threatens timber tree species such as *Hagenia abyssinica* and medicinal plants species such as *Taverniera abyssinica*. Overgrazing/browsing by livestock in many ecosystems, including rangelands has also contributed to the degradation (decreased soil cover, increased erosion, decreased quality and productivity of range resources, reduction or elimination of the natural regeneration of woody species and preferred forage species) of rangelands and forest ecosystems. The consequence of these impacts includes ecological disturbance, loss of species and ecosystem services; thereby affecting livelihoods of the 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 for Lake Haramaya. The increase in population in Harar town and in the lake watershed demanded high municipal water supply over the years that has never considered any water budget scheme. Besides, farmers in the watershed of the lake were pumping water mainly to irrigate a commercial crop -chat (*Catha edulis*). These resulted in the eventual disappearance of the lake, severely affecting the local communities whose livelihoods were based on the lake resources (Brook Lemma, 2011).

**4.1.3 Invasive species**

Invasive species cause biodiversity loss by competing with native species for feed and habitat and altering the physical environment in ways that exclude native species. So far, close to 35 invasive weed species are identified in Ethiopia, and they are posing negative impacts on native biodiversity, agricultural lands, rangelands, national parks, water ways, lakes, rivers, power dams, road sides and urban green spaces with huge economic as well as social consequences. Among these species: mesquites (*Prosopis juliflora*), parthenium weed (*Parthenium hysterophorus*), water hyacinth (*Eichhornia crassipes*), lantana weed (*Lantana camara)*, *Acacia* sp., and other weeds such as *Orobanche* and *Cuscuta* sp. are identified as major plant invaders. Recent surveys found also emerging plant invaders such *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 Valley, and Western and Eastern Harerge zones, Afar and Somali national regional states; thus driving out more nutritive browsing vegetation, reducing the overall biodiversity of the areas it invades by forming a thick mono specific scrub. Information from the Agricultural bureau of the Afar national regional state indicated that the total coverage of *P. juliflora* on agricultural and pasture lands was 87,198ha in 2012 and this was causing reduction in stocking rates, increased incidence of crop pests and damage to eyes and hooves of both domestic and wild animals, eventually leading to deaths.

*Parthenium hysterophorus* is spreading rapidly in many rangeland areas and farmlands of Afar, Somali, Oromia, Amhara and Gambella national regional states, causing enormous reduction in forage production. Yield losses due to Parthenium weed in sorghum reached 46-97%, depending on the location and year. Manual control of Parthenium by farmers resulted in developing skin allergies, itching, fever, and asthma in some of the farmers who involved in such weed control practices. Annual social cost of Parthenium weed in Ethiopia measured in terms of monetary value was estimated at USD 4,365,057 (Rezene Fessehaie, et al. 2012; IBC, 2012d).

*Eichhornia crassipes* is also becoming serious threat in the Awash River system (Wonji and Koka reservoir areas) and Lake Tana obstructing irrigation, affecting productivity and biodiversity of the 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 and border and central drains revealed that the weed inflicted excess loss that is estimated in ranges from 393,660 to 2,945,160m3of water, restricting water flow, 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 aiding the spread of other crop pests. Some areas in Borena wood lands, which are known for gum and resin products, are deteriorating due to encroachment by such bushes as *Acacia drepanolobium, A. oerfota* and*A. mellifera*.

Carmine cochineal (*Dactylopius coccus costa*), an insect that was introduced into the country in 2001 for production of cochineal dye (Tesfaye Belay and **Zimmermann, 2006),** reportedly causing heavy damage on cactus species (*Opuntia ficus-indica*) in northern Ethiopia.

**4.1.4 Climate change**

Over the last 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 (Keller, 2009).

Climate change has caused adverse ecological, economic and social impacts in the country. One of the impacts is reduction in the length of growing seasons that has resulted in the loss of many long duration varieties as well as force large areas of marginal agriculture out of production. Information obtained from the bureau of agriculture of Benshangul Gumuz national regional state indicates that Kuncho, an improved variety of tef, is affected by late rain. Climate change will fundamentally alter the underlying agro-ecosystems through elevated temperatures and CO2 levels, leading to changes in crops pests and disease activity and population levels. Additionally, climactic variables influence the spread of vector-borne diseases through determining the distribution and growth rate of vectors and shortening the life cycle (Holly and David, 2001).

Climate change also causes shortage of livestock feeds, disease outbreak, change in disease distribution and shrinkage of rangelands. Furthermore, it causes desertification, forest fire, high evapo-transpiration, and drought. For example, prolonged drought that occurred for consecutive years in Borena zone of Oromia and Somali national regional states has, reportedly, resulted in loss of animals, especially cattle. During this time, rangelands were degraded and there were shortages of water and feed. In some places, climate change favored bush encroachment such as *Acacia drepanolobium* to invade the rangelands. Other effects of climate change include loss of traditional institutions and associated knowledge/practices.

**4.1.5 Replacement of local varieties and breeds**

Agricultural biodiversity offers essential raw materials for improving the productivity and quality of crops, livestock, fish and other resources. Loss of landraces, both plants and animals, occur due to displacement by improved varieties. Wide spread use of improved varieties of wheat, tef, barley and maize has displaced many landraces. According to the information from the Bureau of Agriculture in Tigrai national regional state, farmers’ varieties of wheat (Shehan, Gerey and Gomad), barley (Demhay and Gunaza) and sorghum (Gedalit) are among the varieties that have been lost due to various factors, including wide spread use of improved varieties. Durum wheat is a seriously threatened crop on farmers’ fields. In Eastern Shewa, for example, about 77% of durum wheat landraces have been replaced by improved ones. The main reason for this is the displacement by bread wheat varieties which took place gradually in a time of three decades (EOSA, 2007).

Sheko cattle appear 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 highly affected by severe replacement pressure from the exotics and their crosses. Generally, loss of agricultural biodiversity results in loss of ecological, economic, nutritional and cultural benefits, and increases vulnerability to climate change and food insecurity.

**4.1.6 Pollution**

Improper management of solid and liquid wastes is one of the main causes of environmental pollution and degradation in many places. Many of these places lack solid and liquid waste disposal regulations and proper disposal facilities, including for harmful wastes. Such wastes may be infectious, toxic or radioactive. Poor waste management poses a great challenge to the biodiversity, due to the potential of the waste to pollute water, land, air and vegetation. Potential effects of pollutants on ecosystems and its biodiversity include changes in the abundance of species, kill of species, modification of habitats, reduction in soil, water and air quality, and changes to the stability and resilience of ecosystems. In rural areas, irrigation, run-off from farming activities containing insecticides, fertilizers and herbicides that have been applied to crops are affecting aquatic and wetland organisms. Excessive draining of nitrogen and phosphorous from agricultural fields to fresh water systems can cause excessive plant and algae growth due to eutrophication that leads to depletion of oxygen as well as to other environmental problems, which in turn will cause loss of species in that particular site.

Major causes of pollution to aquatic and wetland ecosystems in Ethiopia are large and small scale factories which have unregulated waste disposal. They are causing major damage to the nearby aquatic and wetland ecosystems through deposition of heavy metals as is the case in Akaki River, and Abasamuel and Koka reservoirs. Major large-scale human activities producing dangerous pollutants in Ethiopia include garages, petrol stations, tanneries, slaughter houses, market centres, breweries; textile, chemical, tobacco, thread and garment, and paint factories; hospitals, oil and flour mills, metal works and car washing.

**4.2 Indirect Causes**

**4.2.1 Demographic change**

Population growth is directly correlated with increase in resource consumption. Uncontrolled population growth puts undue pressures on all natural resources of the country. At present, Ethiopia’s population has reached to 83.4 million. It has increased steadily over the last three decades, from 42.6 million in 1984 to 53.5 million in 1994 and 73.8 million in 2007, and is expected to reach 130 million by 2020 (CSA and ICF International, 2011). The population increase 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 the result, it is putting undue pressures on all ecosystems and biodiversity of the country.

**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. Poverty prevents people and nations from assuming long-term economic and environmental attitudes. There exists a vicious circle of poverty, resource degradation and further impoverishment in Ethiopia. Poor farmers, fishermen, pastoralists and other users extract whatever they can from the environment to support their families. According to recent data from CSA (2012b), the national poverty head count indices and inequality has reached 29.6%, this together with low level of literacy rate of 36% and high unemployment rate of 17.5% in cities, are creating huge pressure on the country’s ecosystems and biodiversity.

**4.2.3 Lack of awareness and coordination**

Contribution of biodiversity and ecosystem services from PAs, forest reserves and wetlands are undervalued, resulting in using the resources in ways that undermine or degrade 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, and there is a lack of continuous information and communication programmes to raise awareness on biodiversity and its values. Biodiversity issues are also not well mainstreamed into the formal education system. Promotion and appreciation for community knowledge on biodiversity, its local uses and management which can also be used as an informal education and awareness means need to be strengthened.

In addition, though there are several stakeholders (institutions, researchers, policy makers and public) working on biodiversity conservation and sustainable utilization, they fail to make tangible impact on minimizing biodiversity loss as a result of low level of interaction and coordination among them. Summary of biodiversity threats and their root cause is presented in Table 10.

Table 10. Threats to Ethiopia’s biodiversity and 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 * Overgrazing/browsing | Due to rising human population:   * increasing demand for wood products such as firewood, charcoal and harvesting for construction materials, and for NTFPs 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 |
| * 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 INSTITUTIONAL AND LEGAL FRAMEWORKS**

**5.1 Institutional Frameworks**

Ethiopian Biodiversity Institute is mandated for the conservation and sustainable utilization of all forms of biological resources of Ethiopia, namely: plants, animals and microbial genetic resources and their respective ecosystems as well as associated community knowledge and equitable sharing of benefits accrued from the access of the country’s biological resources. Other major actors engaged in such activities are Ministry of Agriculture, Ethiopian Institute of Agricultural Research, Ethiopian Wildlife Conservation Authority, Ministry Environment and Forest (the then EPA), Higher Learning Institutions, Ministry of Culture and Tourism, Regional Bureaus of Agriculture, Environment and Forest as well as Forest and Wildlife, and Pastoral Agencies of the national regional states. The activities of these are financed by the budgets allocated from the federal and regional governments. Besides, there are several international, regional and local NGOs that are involved in biodiversity related activities in Ethiopia.

**5.2 Legal Frameworks**

Ethiopia is 54th signatory to the CBD and ratified the convention in 1994 (Negarit Gazetta, 98/1994). The following are major legal frameworks that govern the conservation, sustainable use and access and sharing of benefits arising from the use of the country’s biodiversity and associated community knowledge.

**Constitution of the Federal Democratic Republic of Ethiopia**

The Constitution has been addressed in this report as it is the supreme law of the land and all laws in Ethiopia, and international agreements should not contravene the constitution (Negarit Gazetta, 1/1995). On the other hand, the Constitution has integrated environmental laws which directly address conservation and sustainable development that are relevant to the Convention.

**Ethiopian Climate Resilient Green Economy Strategy (2011)**

As set forth in the Growth and Transformation Plan, reaching the planned middle income status before 2025 will require Ethiopia to boost its agricultural productivity, strengthening the industrial base, and fostering export growth. Ethiopia is also aware of the important role that developing countries play in fighting climate change, and has consequently taken on a constructive role in international climate negotiations. Ethiopia’s ambition to become a “green economy front-runner” is an expression of its potential for and belief in a sustainable model of growth. If Ethiopia were to pursue a conventional economic development path to achieve its ambitious targets, the resulting negative environmental impacts of, *inter alia*, greenhouse gas emission would follow the patterns observed all around the globe. Therefore, Ethiopia has devised a strategy for Climate Resilient Green Economy (CRGE) that will allow a green growth path and fosters development and sustainability. The CRGE initiative follows a sectoral approach, and as part of the strategy, the government has selected four initiatives, namely: exploiting the vast hydropower potential; large-scale promotion of advanced rural cooking technologies; efficiency improvements to the livestock value chain; and Reducing Emissions from Deforestation and Forest Degradation (REDD) as the best chances of promoting growth immediately, capturing large abatement potentials, and attracting climate finance for their implementation.

**Growth and Transformation Plan (2010)**

The Growth and Transformation Plan (GTP) is based on a previous plan, namely, a Plan for Accelerated and Sustained Development to End Poverty (PASDEP), the guiding plan for 2005/06-2009/10 strategic framework and was built up on Sustainable Development and Poverty Reduction Programme (SDPRP). GTP is a five year plan (2010/11-2014/15) and is directed towards achieving Ethiopia’s long term vision and sustaining the rapid and broad based economic growth anchored on the experiences that has been drawn from implementing development policies and strategies and undertaking policy measures for the challenges that has been surfaced in the course of implementation. The overriding development agenda of GTP is to sustain rapid and broad-based growth path witnessed during the past several years and eventually end poverty.

Ethiopia’s strategy for sustaining the rapid and broad-based growth path hinges on seven pillars, namely: sustaining faster and equitable economic growth, maintaining agriculture as a major source of economic growth, creating favorable conditions for the industry to play key role in the economy, enhancing expansion and quality of infrastructure development, enhancing expansion and quality of social development, building capacity and deepen good governance, and promoting women and youth empowerment and equitable benefit. The objectives and activities of GTP are, *inter alia,* linked to environmental issues in Ethiopia National legal frameworks.

**National Economic Development Strategy (1993)**

The guiding strategy under the National Economic Development is known as the ‘Agricultural Development led-Industrialization’ (ADLI). This strategy further developed into sectoral strategies that include Agriculture, Industry, Mining, Population growth, technological progress, Economic and Social infrastructure, etc. The following are the core elements of the agro-industrial development strategy component of ADLI (MoFED, 1993).

**The Conservation Strategy of Ethiopia (1997)**

The Conservation Strategy of Ethiopia (CSE), approved by the Council of Ministers in 1996, provides a comprehensive and rational approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross sectoral policies, action plans and programmes as well as providing the basis for development of appropriate institutional and legal frameworks for the implementation. It also deals with providing a strategic framework for integrating environmental planning into a new and existing policies and projects. It mainly recognizes the importance of incorporating environmental factors into development activities from the beginning so that planners may take into account environmental protection as an essential component of economic, social and cultural development.

**Environmental Policy (1997)**

The Environmental Policy of Ethiopia has an overall goal to improve the health and quality of the life of all Ethiopians, and promote sustainable social and economic development by adopting environmental management principles. The policy includes important requirements for EIA such as recognition of the need for EIA to address social, socio-economic, political and cultural impacts, in addition to physical and biological impacts; incorporation of impact containment measures within the design process, and for mitigation measures and contingency plans to be incorporated within environmental impact statements (EISs); creation of a legal framework for the EIA process, including a coordinated institutional framework for the execution and approval of EIAs and environmental audits; development of detailed technical sectoral guidelines for EIA and environmental auditing; and EIA and auditing capacity and capabilities within the EPA, sectoral ministries and agencies, as well as in the regions.

**Proclamation on Environmental Impact Assessment (No. 299/2002)**

This proclamation makes EIA mandatory for specified categories of activities undertaken either by the public or private sectors. The EIA must be prepared by the proponent, and reviewed by either the Federal EPA or the regional environmental agency, depending on the situation, which approves or rejects it. The EIA guidelines prepared by the EPA put the projects into three categories, namely: projects that may have significant environmental impacts and therefore require detailed field investigation and a full EIA Schedule 1), projects whose type, scale or other relevant characteristics have potential to cause some significant environmental impacts but are not likely to warrant full environmental impact study and those projects which generally do not require environmental analysis because they have negligible or minimal direct disturbance on the environment.

According to the EPA 2000 Environmental Study Procedural Guidelines, Schedule 1 projects include construction of dams and manmade lakes with surface area of 250ha or more, surface water fed irrigation projects covering more than 100ha and groundwater fed irrigation projects more than 100ha.

**Proclamation on Environmental Pollution Control (No. 300/2002)**

This proclamation provides the basis for the development of relevant environmental standards and to make violation of these standards a punishable act based on the polluter pays principle. Environmental Inspectors are to be assigned by the EPA or regional environment offices and thresholds have been set for industrial, agricultural and domestic wastes (EPA, 2003).

**Industrial Pollution Regulation (No. 159/2008)**

The Council of Ministers approved Regulation No. 159/2008 to prevent industrial pollution in accordance with Article 20 of the Environmental Pollution Control Proclamation No. 300/2002. The Regulation provides a gestation period of five years for existing industries during which they are expected to reduce the strength of their effluents to lie within the industrial standards (EPA, 2003).

**Rural Land Administration and Use (Proclamation No. 456/2005)**

This law defines the state ownership of rural land and the tenure rights of the land occupant including rights to ‘property produced on his land’, rights of inter-generational tenure transfer, and rights to exchange land and limited leasing rights. Provisions are made for the registration and certification of tenure rights. The rural land administration and land use laws are being implemented by the regional states.

**Development Conservation and Utilization of Wildlife (Proclamation No. 541/2007)**

In Ethiopia, unplanned and inappropriate utilization of wildlife has resulted in their depletion and endangered existence. The conservation of wildlife undertaken so far is not productive. Thus, allowing local communities residing around conservation areas and private investors to actively participate in wildlife development, conservation and utilization has significant value. The proclamations, regulations and directives issued previously and still in force are not in line with the existing objective reality and the present state structure. Therefore, it is appropriate to enhance the contribution of the wildlife sector towards poverty reduction strategy by maximizing the economic and social benefit to be derived from the wildlife resource. The major objectives of the Proclamation are to conserve, manage, develop and properly utilize the wildlife resources of Ethiopia; to create conditions necessary for discharging government obligations assumed under treaties regarding the conservation, development, and utilization of wildlife, and to promote wildlife-based tourism and to encourage private investment.

**National Policy on Biodiversity Conservation and Research (1998)**

The mandate of then Institute of Biodiversity conservation and Research (now Ethiopian Biodiversity Institute) is to undertake conservation and promote development and sustainable utilization of the country’s biological resources, namely: plants, animals and microbial genetic resources as well as associated community knowledge and the ecosystems. On the basis of national legislation, the institute has the responsibility and duty to implement international conventions, agreements and obligations on biodiversity to which Ethiopia is a party.

**National Biodiversity Strategy and Action Plan (IBC, 2005)**

The National Biodiversity Conservation and Research Policy (1998) provides guidelines for conservation, development and sustainable use of biodiversity. The policy objectives are ensuring that genetic resources and essential ecosystems of the country are conserved, developed and sustainably used, asserting national sovereignty over genetic resources, enriching the country’s biological resources through restoration, integrating biodiversity conservation with sectoral and cross-sectoral strategies and programmes, recognizing and protecting community knowledge, ensuring that the local communities share benefits arising from the use of genetic resources and community knowledge and promoting regional and international cooperation.

**Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation (No. 482/2006) and Regulation (169/2009)**

After ratifying the Convention on Biological Diversity (CBD) and International Treaty on Plant Genetic Resources for Food and Agriculture, as well as adopting international model laws and guidelines, Ethiopia has issued Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation (No. 482/2006) and Regulation (169/2009). Recently, the country has ratified the Nagoya Protocol, which will enhance the implementation of the national ABS laws.

**Plant Breeders Right (Proclamation No. 481/2006)**

Plant Breeders Right was one of the significant developments for the conservation and sustainable utilization of the country’s plant genetic resources that was issued by the People’s House of Representatives of the Federal Democratic Republic of Ethiopia in 2006. The proclamation deals*, inter alia*, with the protection of their community knowledge that is relevant to the plant genetic resources, obtaining an equitable share of benefits from the use of plant genetic resources, exchanging and selling farm-saved seed or propagating material of the farmers' varieties; as well as the new plant varieties protecting under breeders' rights, and to collectively save, use, multiply and process farm-saved seed of protected varieties.

Ethiopian Water Resources Management Policy (1998)

The Federal Government of the Democratic Republic of Ethiopia issued a comprehensive & integrated water resources management policy in 1998. The policy document outlines the several policy objectives of which conserving, protecting and enhancing water resources and the overall aquatic environment on sustainable basis are considered as the major ones.

A water Supply and Sanitation Master Plan framework was completed in 2003, which, among other aspects reviewed the targets of the Water Sector Development Programme and developed strategies for prioritization based on analysis of opportunities and constraints in physical, financial and institutional aspects.

**Ministry of Culture and Tourism**

The Ethiopian Ministry of Culture and Tourism is responsible for developing and promoting the country's tourist products both locally and internationally. The main duties and responsibilities of the ministry are causing the study and preservation of history, cultural heritages and values of the nations, nationalities and peoples of Ethiopia; causing the study of the languages of the nations, nationalities and peoples of Ethiopia and advancement and promotion of their literatures; undertaking activates to bring about changes in those cultural attitudes, beliefs and practices hindering social progress; promoting the contribution of culture to development; expanding cultural institutions to institutionalize public participation in the development of culture; promoting creativity in artistic works and fine arts; create conductive environment for the development of the country’s film industry and theatrical arts; promoting widely the country’s tourist attractions and its positive image on the world tourism market, and encourage domestic tourism; ensuring that the county’s tourist attractions are identified, properly developed and organized, tourist facilities are expanded, and that local communities share the benefits derived from tourism; facilitating the studying and preservation of the country’s natural heritages and the development and utilization of them as tourist attractions; insuring the proper management of wildlife conservation areas designated to be administered by the federal government; setting and supervising the enforcement of standards for tourist facilities; serving as a focal point for forums established to facilitate the coordination of the multi-sectoral efforts required for the provision of quality tourist services and for ensuring the well-being of tourists; building the capacity of the tourist sector through the provision of human resources training and consultancy supports, and collecting, compiling and disseminating information on culture and tourism.

**Federal Forest Policy**

The government of Ethiopia has formulated forest development, conservation and utilization policy and passed legislation in 2007. The objective of the policy is to meet public demand in forest products and foster the contribution of forests in enhancing the economy of the country through appropriately conserving and developing forest resources. The policy provisions are designed, among others, to encourage the development of forests by individuals, organizations and government and the designation of protected forests and productive forests to be administered in accordance with laws to be enacted for each. The policy further establishes that forestry research is to be expanded focusing on growing native tree species and their utilization as well as identifying useful exotic species and growing seedlings of such trees for wide dissemination.

**Forest Legislations**

The Federal Proclamation (542/2007) recognizes two types of forest ownerships: state and private. According to this law, state forests are any protected or productive forests owned by the federal or a regional state. Private forests are forests other than state forests that are developed by any private person and include forests developed by members of a peasant association or by any association organized by private individuals, investors, and governmental and NGOs.

Furthermore, Regional States have issued their own provisions to fill existing gaps in forestry sector. In Oromia, Proclamation that establishes Forest and Wildlife Enterprise was issued in 2009. This proclamation is geared towards conservation, production and sustainable utilization of forest and wildlife of the national regional state. In the SNNPRS, draft forest development, conservation and utilization proclamation is finalized and submitted to regional council for approval. Similarly, in Benshangul Gumuz Regional State, a draft proclamation on forest development, conservation proclamation and a forest fire management guideline have been prepared. In Amhara Region, establishment of forestry agency, which is responsible for managing forest resource, is in place recently. Furthermore, most of the regions have issued their own land administration and environmental protection proclamations. All these regional legal documents in one way or the other support the conservation, development and sustainable use of forest resources.

**Fisheries Development and Utilization (Proclamation No.315/2003)**

Ethiopia has immense fisheries potential which could serve as important source of food and economic benefits. Therefore, there is a need for rational utilization and development of the resource base through, *inter alia*, enacting fisheries development and utilization law. The objectives of the Proclamation are to conserve fish biodiversity and its environment as well as to prevent and control overexploitation of the fisheries resource, to increase supply of safe and good quality fish and to ensure a sustainable contribution of the fisheries towards the food security and to expand aquaculture.

**National Aquaculture Development Strategy of Ethiopia (2009)**

Aquaculture, particularly rural integrated fish farming, is getting recognition as one of the strategic areas of intervention to address the problem of food insecurity and poverty in the rural areas and is considered as an important economic activity supporting diversification, integration, and improvement in the rural livelihoods. Its development is best suited and integrated with the continued effort of water harvesting programmes and livestock-crop production systems. The overall objective of National Aquaculture Development Strategy of Ethiopia is to define a regulatory framework and build a strong basis for the development of aquaculture in the country. The strategy seeks to integrate the aquaculture industry into the agricultural sector and to facilitate development of viable aquaculture plans. It also aims to provide a framework in which the aquaculture industry can be developed in an economically, socially and environmentally sustainable manner. Aquaculture development is to be targeted as an activity to ensure food security, alleviate poverty of rural farmers and to provide fish for domestic consumption and industry. Aquaculture development is to be planned and executed as a business or commercial activity on a scale that contributes to profitability and market oriented.

**Proclamation on Biosafety (No. 655/2009)**

The environmental rights provided under Articles 44 and 92 of the Constitution of the Federal Democratic Republic of Ethiopia require that human and animal health, environmental wellbeing and, in general, the socio-economic conditions of the country be protected from risks that may arise from modified organisms. The objective of this Proclamation is to protect human and animal health, biological diversity and in general, the environment, local communities and the country at large by preventing or at least managing down to levels of insignificance the adverse effects of modified organisms.

**Nagoya Protocol on Access to Genetic Resources**

Ethiopia has acceded to the Nagoya Protocol, and this will eventually enhance implementation of the National ABS Law by creating conducive conditions 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. To widen the operation, it is being translated into different local languages, namely: Amharic, Afan Oromo and Tigrigna.

**Re-establishment and Restructuring of Ethiopian Biodiversity Institute (Regulation 291/2013)**

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.

**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.

**CHAPTER SIX**

**6 LESSONS FROM PREVIOUS NBSAP AND PROCESS OF REVISING**

**6.1 Lessons from Previous NBSAP**

The first generation of the Ethiopian NBSAP (IBC, 2005) was devised to serve as a roadmap to enhance the contribution of biodiversity to overall development of the country. To that end, it outlined status of biodiversity and the environment at large, and of the root causes of biodiversity loss and the adverse consequences upon social and economic developments. Review of the implementation status of its action plans indicate that at federal and regional levels, particularly in the areas of PAs, enclosures, afforestation, germplasm collection, policy and legislation as well as raising awareness of general public; efforts have been made to enhance biodiversity conservation and sustainable use. Attributed to combination factors, the level of implementation has not been satisfactory.

It is understood that the actions planned to be implemented within the plan period were unrealistically too many to be achieved, and most of these actions were planned with the hope that they would be implemented by the fund that would be obtained from the external sources. However, the document did not put in place any mechanism or a system that would realize timely mobilization expected resources from both internal and external sources. The document also lacked clarity on the mechanism of coordination of the implementation. Lacks of binding instruments for implementation and agreed upon monitoring and evaluation and reporting mechanisms as well as very limited efforts for grass root level familiarization were other factors that affected implementation.

There was also no NBSAP Implementation Coordination Office that would follow up implementation of the planned actions. Similarly, the Focal point Institute did not put in place a mechanism to follow up on whether the stakeholder institutions were using the document as a roadmap.

Major lessons learnt from previous NBSAP implementation to the revised NBSAP are: the assumptions the previous planning process had undergone, and their implications on the implementation. The present planning process considers those priority issues identified by the stakeholders as critically important. Selection of targets from the priority issues has been based on their ability to align with the top government priorities so that the actions can easily be mainstreamed into the forthcoming five year federal and regional plans of various ministries, institutions and bureaus. The actions included in the revised NBSAP have not be entirely based on the assumption that they will be implemented by the fund from the external sources that will be secured in the unknown future, but most of the actions are assumed to be mainstreamed into the government budget sources, though external funding is required for the effective and meaningful implementation of all the actions outlined in the revised NBSAP.

Actions outlined within the revised NBSAP have been discussed with the stakeholders at two consecutive national stakeholder workshops. Lead institutions have agreed on the actions to which they will be responsible for their implementation, and legally binding provision as well as follow up mechanism, agreed upon by National Biodiversity Task Force ( a task force wherein all the lead institutions are members) have been put in place before the commencement of implementation. Moreover, it has been agreed that the Focal Institute will take full responsibility to mainstream the revised NBSAP at all political and grass root levels, not only to implement actions to which it is a lead, but also for implementations of the overall actions outlined within the revised document. To realize the above, the Focal Institute will establish the NBSAP Implementation Coordination Office. Duties and responsibilities of the Office as well as of other bodies which will play important roles in the implementation of actions of the revised NBSAP have been outlined under “Implementation Arrangements” (Chapter 8).

**6.2 The Process of Revising NBSAP**

Developments of NBSAPs are provision in Article VI of the CBD and the need for its revision has been based on Decision X/2 of Conference of the Parties (CoP) made at Nagoya UN Biodiversity Summit in October 2010, an agreement referred to as Strategic Plan 2011-2020. The Plan calls for effective implementation of the Convention through strategic approach comprising of a shared vision, mission, goals and head line biodiversity targets that are referred to as Aichi Biodiversity Targets.

Based on the above, Ethiopia requested the Secretariat of the CBD (SCBD) to revise its NBSAP revision which was to be realized through its Focal Institute, Ethiopian Biodiversity Institute. These phase based activities include nomination of National Coordinator and making the Coordinator to participate in consecutive regional Capacity Building Workshops that were conducted in 2012 through 2014. Similarly, Ethiopia has fulfilled other requirements from the Implementing Agency (UNEP), Project Funding Mechanism (the Global Environmental Facility: the GEF) and the government overseeing body (Ministry of Finance and Economic Development-Ethiopia), official requirements to take-off the process.

Parallel to the above, the Focal Institute organized the *ad hoc* committee which was coordinated by the National Coordinator so as to develop Annual Work Plans (AWP) for the NBSAP revision period, based on tentative plans suggested by Implementing Agency and proposed compositions of National Project Steering Committee (NPSC), a committee responsible to oversee overall activities of the NBSAP revision, and technical team (TT), a team which will be involved in stocktaking and synthesizing stocktaking report, drafting national targets, developing the actions, the action plan and formulating implementation arrangements to the revised NBSAP. Accordingly, the NPSC members from 10 critical stakeholder institutions conducted their first meeting on 22nd June 2012 and approved the AWP, and institutional and technical composition of the TT members.

Accordingly, a total of twenty four TT members from seven stakeholder institutions were approved by the NPSC to involve in the above tasks of NBSAP revision. Before the takeoff, the TT members were trained on the whole NBSAP revision process, developing stocktaking questionnaire formats and pretesting, stocktaking, synthesizing stocktaking report and drafting national targets with milestones. After the training, the TT was divided into three groups and took a stock relevant for the NBSAP revision from all the relevant data sources found at national regional states and federal levels which were identified jointly during the training period. Then, the TT compiled three group reports into one as a national stocktaking report and prepared draft National Biodiversity Strategy. The draft National Biodiversity Strategy which contained 16 Ethiopia’s National Biodiversity Targets was presented to stakeholders at First National Stakeholders Workshop, and the TT finalized the strategy document by incorporating the feed backs, including two additional targets that have been proposed by the stakeholders. Afterwards, the TT proposed indicators and actions for the targets. It also suggested lead and collaborating implementing agencies, period of implementation required for each action and implementation arrangements. The Draft revised NBSAP so prepared was presented at the Second National Stakeholders Workshop. After incorporating the feedback, the final revised NBSAP of Ethiopia containing 18 targets, 41 indicators and 59 actions was produced. The revised National Biodiversity Strategy and Action Plan of Ethiopia was subject to technical and language edition. Finally, it was endorsed by the government and sent to the SCBD by the Focal Institute.

**CHAPTER SEVEN**

**7 NATIONAL BIODIVERSITY STRATEGY**

**7.1 Vision**

The vision of the revised Ethiopia’s NBSAP is to conserve, restore and value biodiversity and ecosystems of the country, maintaining rich biodiversity and ecosystems delivering essential benefits for all the people of Ethiopia.

**7.2 Mission**

The mission of the revised Ethiopia’s NBSAP is Conserving and ensuring, sustainable use and development of biodiversity, and ensuring equitable sharing of benefits accrued from the use of the country’s genetic resources and community knowledge of Ethiopians.

**7.3 Principles**

The following are basic principles underling Ethiopia’s revised NBSAP.

* We work hard to live in harmony with our nature
* We acknowledge and respect the culture, values, innovations, practices and knowledge of local communities
* We work towards putting in place effective policies and strategies that ensure conservation, sustainable use and development of our biodiversity and equitable sharing of benefits accrued from the use of our genetic resources
* We remain alert to control the spread and introduction of invasive species
* We pay due attention to gender equity in our endeavors of conservation and sustainable utilization of our biodiversity
* We adapt to and mitigate climate change through proper conservation, development and utilization of our biodiversity
* We acknowledge active participation of local communities for effective conservation, sustainable use and development of our biodiversity
* We promote research based biodiversity conservation

**7.4 National Biodiversity Targets**

Development of Ethiopia’s National Biodiversity Targets and actions have been based on the analysis of the existing realities of the country such as level of threats, government priorities, existing capacity, lessons from the hitherto implementation experiences on the three pillars of the CBD, and associated global provisions of the Strategic Plan 2011-2020. Accordingly, Ethiopia has developed the following 18 Ethiopia’s National Biodiversity Targets that will be implemented in years 2015 through 2020. These are outlined under the five Strategic Goals of the Global Strategic Plan. Indicators and actions of the Ethiopian Biodiversity Targets are presented in Table 11. Relations of Ethiopia’s National Biodiversity Targets to the Aichi Biodiversity Targets have been presented in Table 12.

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

**Target 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**

**Technical rationale**

In Ethiopia, local communities and most decision makers are well aware of direct uses of biodiversity, but not values of most ecosystem services. Therefore, policy makers are occupied with poverty reduction and development issues that may have short term gains, but will harm biodiversity in the long term. Similarly, some of the investment activities have been concentrated around profit, regardless of their impacts on biodiversity, and are one of the sources of biodiversity loss and pollution. Ethiopia has been undertaking various actions in areas related to education and public awareness on biodiversity conservation and management. Further efforts are, however, required to increase overall awareness of communities, policy makers and the private sector on the diverse values of biodiversity to underpin the ability and willingness of the target groups to make positive changes and to create more political will of the government for effective realization of the three pillars of the Convention on Biological Diversity.

**Implementation strategy**

A strategy for the implementation of this target will rely, mainly on, organizing National Biodiversity Days and workshops, use of mass media (radio, TV, print), biodiversity forums at selected schools, universities and community, visits to target groups to selected PAs, and organizing events to local communities to exchange experiences and share information.

**Milestones**

* By 2015, national baseline surveys are carried out and comprehensive national strategies to promote awareness on the values of biodiversity are prepared and adopted
* By 2015, basic public awareness campaigns about biodiversity and the steps people can take to protect it are initiated
* By 2016, relevant educational curricula have been revised and implemented
* By 2016, awareness creation is integrated into the extension and adult education
* By 2020, level of awareness has been evaluated, and level of implementation is reported

**Target 2. By 2020, the existing biodiversity related laws, regulations and strategies, including those associated with incentives are reviewed and gaps are addressed**

**Technical rationale**

Lack of harmonization of laws, regulations and strategies, perverse incentives and absence of regulations in some areas of biodiversity have resulted in loss of the same. Therefore, there is a need to review and fill the gaps of the existing laws, regulations and strategies, and formulate new ones when required. Moreover, there is a need for capacity building that will enable the enforcement of the existing ones.

**Implementation strategy**

Strategy for the implementation of this target will be based on identifying and filling the gaps in the existing laws, legislations and strategies, including those associated with the incentives. The need for harmonization of ABS proclamation and regulation and the Nagoya Protocol is one of issues for the implantation of this target. There is also a need to reduce/eliminate perverse incentives and encourage the positive ones. Mainstreaming of the revised and/or formulated laws, regulations and strategies is another crucially important part of the strategy for the realization of this target.

**Milestones**

* By 2015, laws, regulations and strategies related to biodiversity conservation, use, development and sharing of benefits accrued from their use are reviewed and gaps are identified
* By 2017,drafted/harmonized laws, regulations and strategies are approved by policy makers
* By 2020, approved laws, regulations and strategies are mainstreamed and implemented

**Target 3. By 2020, biodiversity values and ecosystem services are communicated and integrated into national and local development and poverty reduction strategies and plans**

**Technical rationale**

Like in many other developing countries, values of biodiversity, especially of ecosystem services are not widely reflected in decision making process in Ethiopia, resulting from the absence of reliable and comprehensive data on economic values of biodiversity and the ecosystem services it underpins. Therefore, the objective of this target is to ensure that the diverse values of biodiversity and opportunities derived from its conservation and sustainable use are recognized and reflected in all relevant public and private decision-making such as national and local development and poverty reduction strategies.

**Implementation strategy**

In Ethiopia; ensuring the recognition of diverse values of biodiversity and opportunities derived from its conservation and sustainable use, and making them reflected in all relevant public and private decision-making processes such as the national and local development and poverty reduction strategies and planning requires, *inter alia*, capacity building. Therefore, implementation of this target will start with reviewing the outcomes of biodiversity and ecosystem services valuation studies that have so far been conducted in the country as well as the outcomes from the relevant targets of the revised NBSAP. This will be followed by devising a strategy for communicating and integrating the values into national and local development and poverty reduction strategies.

**Milestones**

* By 2015, results of the hitherto studies on valuation of biodiversity and ecosystem services are reviewed
* By 2020, values of biodiversity and ecosystem services are communicated and integrated into local and national development and poverty reduction strategies and plans

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

**Target 4. By 2020, habitat conversion from the existing of about 10% per year, through expansion for agricultural land, is halved**

**Technical rationale**

Habitat conversion is one of the major factors of biodiversity loss in Ethiopia. Rising demand for food and other agricultural products, among others, has resulted in clearing of natural habitats to make space for agricultural land; and economic, demographic and social pressures are likely to put further pressure on habitats. Therefore, there is an urgent need to decrease and gradually cease such expansion into forest and other ecosystems. Projections indicate, for example, that unless appropriate actions are taken to change the traditional development path, an area of 9 million ha might be deforested between 2010 and 2030. Over the same period, annual fuel wood consumption will rise by 65%, leading to forest degradation of more than 22 million tonnes of woody biomass. Moreover, both federal and regional national government policies and laws are silent regarding wetland protection. As a result, many ecosystems such as wetlands have been converted to farmlands, and there is a need to prevent the loss of high-biodiversity value habitats such as primary forests and wetland areas.

**Implementation strategy**

Habitat loss can be addressed through conservation of currently viable habitat and restoration of damaged ones. Though restoration activities can restore many of the attributes of primary ecosystems, they cannot be restored completely in the short to medium term. So, the emphasis of this target will rely on preventing the loss of high-biodiversity value habitats, such as primary forest and wetland areas. Reduction in the rate of loss and degradation of natural habitats can be achieved by adopting technologies and innovations that increase productivity of small holder farmers. This will help in increasing yields and value of crops per unit input which will result in a decrease in requirements for new agricultural lands. The other scheme is creating alternative source of livelihoods for local communities to drive off pressure from the natural habitats.

**Milestones**

* By 2020, technologies and innovations for increasing productivity of smallholder farmers and pastoralists are adopted
* By 2020, provisions of alternative livelihoods, including jobs and alternative energy sources and use of energy efficient technologies for local communities are improved

**Target 5. By 2020, over exploitation of biodiversity and ecosystems are reduced**

**Technical rationale**

Over-utilization of biological resources is one of the major threats to biodiversity in Ethiopia, contributing to degradation of rangelands, forest ecosystems, wetlands and aquatic ecosystems. Therefore, sustainable management is required to biodiversity conservation and to derive benefits in such forms as soil fertility, erosion control, the well-being and sustainable livelihoods of local communities engaged in the management of local natural resources.

**Implementation strategy**

Criteria for sustainable management of resources have been adopted by the forest sector and there are many efforts by the government, local communities and NGOs that are geared towards promoting good practices and applying law and governance mechanisms. Sustainable rangeland management practices, which include keeping the carrying capacities and looking for alternative feeds, can help to reduce the impacts of overgrazing. The same sustainable use techniques are also required for other ecosystems. To achieve this target, there is a need to develop and implement regulations and guidelines to control open access over resources on grazing lands, aquatic, wetland and community forests. Experiences of NGOs that have practiced in developing bylaws to control access and use of local biological resources may require evaluation and consequent up-scaling help in this regard.

**Milestones**

* By 2017, regulation and guidelines to control open access over resources on grazing lands, aquatic, wetland and other communal lands are developed and implemented
* By 2020, productivity of forage and rangelands is improved
* By 2020 aquaculture is expanded, afforestation is conducted, use of non-wood forest products is promoted
* By 2020, sustainable management, including the use of traditional resources management system to ecosystems under pressure, including hotspot areas is applied

**Target 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**

**Technical rationale**

Invasive species are threats to biodiversity and ecosystem services. In Ethiopia, invasive species are spreading rapidly in many farm and rangelands causing a reduction in crop and forage yields. They are also affecting productivity and biodiversity of aquatic ecosystems. They are displacing indigenous species of natural ecosystems. Though the extent of the damage is not well established, they are threats to food security, livelihoods and health. Hence, they need to be controlled and eventually eradicated.

**Implementation strategy**

Different species are identified as invasive in different national regional states in Ethiopia. It is necessary to prioritize control and eradication efforts to those species and pathways which will have the greatest impact on biodiversity. Therefore, it is important to search for most resource effective ways that would address invasive species related constraints specific to national regional states. When taking actions to meet this target, it is worth taking into account the achievements made by other projects such as “Removing Barriers to Invasive Plants Management in Africa/Ethiopia (EIAR)”, which have experiences in developing methods of control for invasive species and management plans. It is also crucial to put systems in place to monitor invasiveness of newly introduced species.

**Milestones**

* By 2015, status, trends and impacts of major invasive species are reviewed and control strategies are revised
* By 2016, implementation of the revised control strategies on major invasive species is commenced
* By 2017, a system to monitor invasiveness of newly introduced species is put in place
* By 2020, area covered by the invasive species is reduced by 75%

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

**Target 7. By 2020, area coverage of ecologically representative and effectively managed PAs is increased from 14% to 20%**

**Technical rationale**

Well governed and effectively managed PAs are proven methods for safeguarding both habitats and populations of species and for delivering important ecosystem services. Though about 14% of the country’s area is designated as PA, most of them do not have legal status, and are inadequately protected and this is more prominent on wetlands and water bodies. There is a need to increase in the coverage of PAs, with due attention to their ecosystem representativeness, connectivity as well as effectiveness in terms of management. Lack of law enforcement, poor coordination, lack of network between PAs, lack of facility and infrastructure, absence of wild life corridors, weak capacity and low awareness at different levels are among the problems that need to be addressed in this target. There are encouraging efforts being made by EWCA, some Regional Wildlife Authorities and Regional Bureaus of Agriculture to expand the number of local PAs. Absence of economic valuations of PAs is another obstacle to their conservation and sustainable use.

**Implementation strategy**

To realize this target, some of the selected PAs will require re-demarcation and new management plans. It also requires establishment of additional PAs. The PAs have to be managed in close collaboration with, and through equitable processes that recognize and respect the rights of local communities. These communities should be fully engaged in governing and managing PAs and should share equitably the benefits arising from them. IUCN Guidelines for applying PA management categories recognizes four broad types of governance of PAs, any of which can be associated with any management objective. These are governance by government, shared governance, private governance, and governance by local communities. Carrying-out economic valuation of selected PAs is also important to give greater visibility amongst policy makers and integrate benefits from PAs into poverty alleviation and development plans so as to ensure sustainability.

**Milestones**

* By 2016, benefits from PAs are integrated into poverty alleviation and overall national development plans
* By 2017, existing PAs are re-demarcated and management plans are developed
* By 2020, additional ecologically representative PAs are established
* By 2020, economic valuation for seven PAs is conducted

**Target 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**

**Technical rationale**

In Ethiopia, diversity of crop and their wild relatives, animals and microbial genetic resources are rapidly dwindling due to direct and indirect pressures. In the face of climate change and outbreaks of new disease and pests, maintaining these resources provides future food production options for the country. Efforts made so far to maintain these resources and reduce rate of their loss are not adequate. The *ex situ* conservation activities are faced with severe management problems. Thus, strengthening the conservation and sustainable uses will contribute to the maintenance of the resources bases of Ethiopia.

**Implementation strategy**

Actions that strengthen conservation and sustainable use of agro-biodiversity, wild plants and animals, and microbes particularly; endemic, endangered, economically or ecologically important species need to be undertaken to meet the objective of the proposed target. These include assessment of crops and wild plants, domestic and wild animals, and microbes and subsequent collection of germplasm, herbarium and animal specimen; improving management conditions of the existing and establishment of new *ex situ* conservation sites with full participation of local communities.

**Milestones**

* By 2017, conservation priorities to species of biodiversity with special emphasis on; endemic, endangered, economic or ecological importance are identified and are set
* By 2019, Natural History Museum is established
* By 2020, *ex situ* collections and number of botanical gardens are increased

**Target 9. By 2020, *in situ* conservation sites/ecosystems and species/breeds are increased and the standard of the existing *in situ* conservation is improved**

**Technical rationale**

In Ethiopia, diversity of crop and their wild relatives, animals and microbial genetic resources as well as their ecosystems are rapidly dwindling due to direct and indirect pressures. In the face of climate change and outbreaks of new disease and pests, maintaining these resources helps to ensure the continuation of existing evolutionary processes, provides future food production options for the country, Efforts made so far to maintain these resources and reduce rate of their loss are not adequate. The *in situ* conservation activities are faced with severe management problems. Thus, strengthening the conservation and sustainable uses will contribute to the maintenance of the resources bases of Ethiopia.

**Implementation strategy**

Actions that strengthen conservation and sustainable use of agro-biodiversity, wild plants and animals, and microbes particularly; endemic, endangered, economically or ecologically important species need to be undertaken to meet the objective of the proposed target. These include assessment of crops and wild plants, domestic and wild animals, and microbes; improving management conditions of the existing and establishment of new *in situ* conservation sites with full participation of local communities.

**Milestones**

* By 2017, threatened species of agro biodiversity, wild plants, animals and microbial genetic resources are identified and conservation priorities are set
* By 2020, *in situ* conservation sites are increased and management plans are developed

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

**Target 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**

**Technical rationale**

Conservation, restoration and sustainable management of forests, woodlands, wetlands and other ecosystems are proven and available means to sequester carbon dioxide and prevent the release of the other greenhouse gases. Therefore, maintaining ecosystems helps to ensure the continuation of existing ecosystem services, including carbon sequestration. Restored ecosystems can improve resilience including their adaptive capacity, and can contribute to climate change adaptation and generate additional benefits for the people, in particular local communities.

**Implementation strategy**

There are huge efforts of forest ecosystem restoration through area enclosures and massive tree plantings in Ethiopia. Increasing forest cover, designation of wetlands and restoration of degraded areas are the major activities required to realize this target. Participatory Forest Management which is underway in different parts of the country will be strengthened through 2020. Moreover, climate change mitigation activities such as REDD+ and CRGE strategy will be widely implemented.

**Milestones**

* By 2020, areas under forest cover, designated wetlands and restored degraded areas are increased by 2%, 100% and 100%; respectively
* By 2020, incentives for the local communities through REDD+ from high forests, woodlands and traditional agro-forestry are generated.

**Target 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**

**Technical rationale**

Access and Benefit Sharing (ABS) concept emerged during the negotiations on the Convention on Biological Diversity. Due to limited capacity and lack of effective enforcement and follow up mechanisms of the ABS, Ethiopia and local communities are not adequately benefiting from accessing their genetic resources. This has contributed to the degradation of the country’s biodiversity. Therefore, concerted efforts are required to maximize access of potential genetic materials and sharing benefits accrued from their use equitably.

**Implementation strategy**

Implementation of this target will require identification of potential genetic resources for access (bio-prospecting), market promotion of bio-prospected species, capacity building and awareness raising on ABS at various levels and implementing the ABS rules and regulations to ensure equitable sharing of benefits arising from the access. Moreover, bio-piracy control activities will be conducted under this target.

**Milestones**

* By 2020, genetic materials accessed for research and development and benefit sharing are increased by 35 and 39%, respectively
* By 2020, number of bio-prospected species/products and associated community knowledge are increased by 250% and 200%, respectively

**Target 12. By 2020, women’s access to and control over biodiversity resources and ecosystem services are improved**

**Technical rationale**

The government of Ethiopia doesn’t discriminate on the basis of gender, but in practice gender imbalance exists in biodiversity conservation and sustainable use. Biodiversity conservation cannot be sustained without the involvement of different sectors of societies. Women are the primary savers and promoters of biodiversity. However, they don’t have equal right with their men counterparts to use what they have saved. There is also lack of clear guideline that helps to mainstream gender into biodiversity conservation and management.

**Implementation strategy**

Recognizing and supporting gender aggregation, and focusing on women and their contribution to conservation and sustainable use of biodiversity are the main activities required to ensure women’s access to and control over biodiversity resources of the country. This will, *inter alia*, require establishing and strengthening of networks to promote gender mainstreaming within biodiversity conservation and sustainable use. Therefore, preparation of clear guidelines and regulations, and their implementation to promote gender awareness and involvement in all biodiversity programmes and projects are the major activities that will help to realize this target.

**Milestones**

* By 2015, baseline data on the level of Women’s access to and control over biodiversity resources and ecosystem services are generated
* By 2020, national gender mainstreaming guideline on biodiversity resources and ecosystem services are developed and implemented
* By 2020, the level of improvement of women’s access and control over biodiversity resources and ecosystem services is evaluated

**Target 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**

**Technical rationale**

Smallholders and pastoralists are custodians of biodiversity. Nevertheless, biodiversity is in danger of disappearing. Finding niche markets for selected species and their products is one possible way of ensuring the survival of biodiversity, and enabling people who keep them to earn more. These can be achieved through searching local, national and international markets and enhancing information on the marketing channels to increase the value of genetic resources. Although value addition and finding niche markets have been initiated for some biodiversity products, most conservators have not yet been benefited. Thus, value addition and finding niche market will be strengthened.

**Implementation strategy**

Implementation of this target will require identification of selected species and their products, focusing on local varieties, breeds and NTFPs with high market potential and those that are of a priority for conservation. Improving production, processing, organizing and value addition, and studying value chain, organic product certification, developing and promoting nutritious products and developing niche markets are the most important activities pursued to achieve the target.

**Milestones**

* By 2018, value additions are conducted for at least 12 agricultural products and their value chains are studied
* By 2020, niche markets for value added agricultural products and for at least five medicinal plants are created

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

**Target 14. By 2020, stakeholders’ integration, including the participation of local communities in biodiversity conservation and sustainable utilization, is strengthened**

**Technical rationale**

It is widely accepted that stakeholders working in the areas of biodiversity conservation and sustainable utilization in Ethiopia lack smooth integration and collaboration in their activities. There is also lack of interest by many stakeholders to invite local communities to deliver real participation, apart from sporadic consultation at project/programme initiation phases. These, together with the poor institutional set ups, make efforts in the sector inefficient and uncoordinated, and thus are failing to halt the loss of biodiversity and its ecosystem services.

**Implementation strategy**

There are many governmental institutions, NGOs, business people and individuals who are making huge efforts towards conservation, sustainable utilization and climate change mitigation. Implementation of this target will need to integrate activities and support collaboration of all the stakeholders through facilitation of dialogue among them. Moreover, making local communities to fully participate in the community-based sustainable management plans and implementation will have more impact to achieve the target. To materialize these efforts, establishing Biodiversity Units at national regional state levels, including Dire Dawa City Council and Biodiversity Centers at ecologically representative areas of the country, establishing National NBSAP Coordination Office at federal level, and National Biodiversity Council and Federal Biodiversity Task Force are indispensable.

**Milestones**

* By 2015, effective governance structure for follow-up of the implementation of the NBSAP is put in place
* By 2015, National Biodiversity Council and National Biodiversity Task Force are in place
* By 2020, 10 Biodiversity Units at national regional states and seven Centers at representative areas of the country are established and strengthened

**Target 15. By 2017, national biodiversity database is strengthened, information dissemination strategy is devised and Clearing House Mechanism is updated**

**Technical rationale**

Weak information exchange mechanism and strategy among the national stakeholders is affecting the efforts to conserve, monitor and sustainably utilize biodiversity of Ethiopia. Thus, ensuring availability of information and knowledge for action, including through updating of Clearing House Mechanism (CHM) can help to strengthen information exchange and integration of biodiversity issues to the broader national strategies.

**Implementation strategy**

Participatory stakeholder involvement throughout the design, planning and implementation of NBSAP is essential to ensure that the plans will be effectively communicated and implemented at the grassroots levels. Thus, updating of the existing CHM, creating a strong national data base, and effective national and regional CHM (NRCHM) strategies and national ABS-CHM are the key instruments to strengthen information exchange and reach major stakeholders both at national and international levels.

**Milestones**

* By 2020, national biodiversity database and information dissemination strategy is strengthened, CHM is updated and NRCHM is established

**Target 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**

**Technical rationale**

There is no sufficient information on values, functioning, status and trends and the consequences of loss of biodiversity in Ethiopia. Therefore, there is an urgent need to generate new knowledge and compilation of exiting information which will help to identify threats to biodiversity and determine priorities based on status, trends and values for conservation and sustainable use. Achieving this target will also benefit the other targets of the Strategic Plan by encouraging new research, the development of new technologies and improved monitoring. Effective implementation of the target will also strengthen the policy-science integration through information access.

**Implementation strategy**

Implementation of this target will require generation and compilation of biodiversity related knowledge and information on the values of biodiversity and ecosystem services, functioning, status and trends, and the consequences of loss of biodiversity. This requires more investment in research, including modeling and participatory research approaches. Improvements are also needed in the policy development, based on scientific research.

**Milestones**

* By 2020, valuation studies on at least two species and three ecosystems are conducted
* By 2020,information on status, threats, trends and uses of biodiversity and its conservation status, and ABS related issues are generated and are applied for development and further research

**Target 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**

**Technical rationale**

Ethiopia is a country with highly diverse population containing more than 84 ethnic groups. These diverse ethnic groups and languages resulted in diversified society inhabiting different agro-ecological zones. Through their interaction with diversified biophysical environments such as various terrains, micro-climate and corresponding weather patterns, soil characteristics and natural vegetation; these societies have developed their own coping strategies. For instance, selection and use of medicinal plants to treat diseases, use of edible wild plants during drought, selection of land races for early maturity and ‘’Belg’’ season, selection of plant species for traditional agro-forestry and traditional land management systems are some of the few documented practices and innovations that have developed by knowledge of local communities. But very few of the knowledge of these societies have been documented and used in national development and poverty alleviation strategies. Therefore, further efforts are required to document the knowledge, innovations and practices of local communities of the country that are relevant for conservation, sustainable utilization and development of biodiversity, and their customary use of biological resources. Moreover, integrating these community knowledge, innovation and practice into the national development and poverty alleviation strategies, with the full and effective participation of local communities, is required for effective conservation, sustainable utilization and development of the country’s biodiversity.

**Implementation strategy**

In Ethiopia, documented community knowledge, innovations and practice of local communities, relevant for conservation and sustainable utilization of biodiversity are very few and are fragmented. Therefore, implementation of this target will start with reviewing the existing, but fragmented, documents and working further on documenting the undocumented ones. This will be followed by devising strategy for communicating and integrating into the national development and poverty alleviation strategies, with the full and effective participation of local communities.

**Milestones**

* By 2018, existing knowledge, innovations and practices of local communities relevant to conservation and sustainable utilization of biodiversity are reviewed, documented and communicated
* By 2020, knowledge, innovations and practices of local communities relevant to conservation and sustainable utilization biodiversity are integrated into national and local development and poverty alleviation strategies

**Target 18. By 2019, internal and external financial resources required for the effective implementation of the Strategy are secured**

**Technical rationale**

One of the major obstacles for the implementation of the previous NBSAP was limited capacity, both in terms of financial and human resources. Therefore, external funding is critically required to fully implement the actions outlined in the strategy of the revised NBSAP. International financing for biodiversity conservation is increasing from year to year. There are also additional resources which are expected to become available through mechanisms such as “REDD+”, and schemes related to ecosystem based adaptation to climate change and payment for ecosystem services that should be taped through fulfilling the required formalities.

**Implementation strategy**

NBSAP should be initiated and implemented through full support and willingness of the stakeholders and the government. However, financing will be required from both domestic and international sources. Thus, NBSAP Coordination Office should, among other activities, involve in seeking internal and external funds that will be used for the effective implementation and in developing a disbursement strategy for the funds secured.

**Milestones**

* By 2015, development of country environmental profile and competent proposals for funding are initiated
* By 2016, disbursement strategy for funds secured for the implementation of the strategy is devised

**Table 11. Strategic goals, targets, actions, implementing agencies and period of implementation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| [**Strategic Goal A**](http://www.cbd.int/sp/targets/#GoalA)**: 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 is sustainably 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. Conduct national baseline survey on the level of awareness of public and decision makers on biodiversity | EBI | CSA, RBUs, MoA | 2015 |
| * 1. Conduct awareness raising activities on biodiversity for public and decision makers | EBI | RBUs, Ethiopian EBF, EWNHS, Media, EWCA, MoA, concerned NGOs, HoPR | 2015-2020 |
| * 1. Revise educational curricula relevant to biodiversity | MoE | EBI, HLIs, regional bureaus of education including Addis Ababa and Dire Dawa City Councils, EWCA, MoA, MoEF | 2015-2016 |
| * 1. Start implementation of the revised educational curricula | MoE | HLIs, regional bureaus of education including Addis Ababa, Dire Dawa City Councils | 2016 |
| * 1. Make awareness creation part of the extension and adult education programmes | MoA | MoE, MoH, EBI, BoA/  Pastoral/Agropastoral Bureaus | 2016 |
| * 1. Evaluate the level of awareness of public and decision makers on biodiversity | EBI | CSA, RBUs, MoA | 2020 |

**Table 11.Strategic goals, targets, actions, …**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| 1. 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 | * 1. Review laws, regulations and strategies related to biodiversity, including those associated with incentives | EBI | MoA, MoEF, EIPO, EWCA, Investment Agency, EBF, MoJ | 2015 |
| * 1. Draft/harmonize laws, regulations and strategies related to biodiversity | EBI | HoPR, MoA, ATA, MoEF, EIPO, EWCA, Investment Agency, EBF, MoJ, Council of Ministers, national regional governments, MoI | 2016-2017 |
| * 1. Approve and mainstream laws, regulations and strategies | EBI | MoA, MoEF, BoA/  Pastoral/Agropastoral Bureaus, BoEF, EIPO, EWCA, Investment Agency, EBF, ATA | 2017-2020 |
| 1. 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 | * 1. Review studies on valuation of biodiversity and ecosystem services | EBI | MoA, MoEF, EWCA, HLIs, EIPO | 2015 |
| * 1. Communicate and integrate values of biodiversity and ecosystem services into local and national development and poverty reduction strategies and plans | NPC | MoA, HoPR, MoEF, EBI, EWCA | 2016-2020 |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| [**Strategic Goal B**](http://www.cbd.int/sp/targets/#GoalB)**: Reduce the direct pressures on biodiversity and promote sustainable use** | | | | | |
| 1. 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 | * 1. Create alternative jobs for local communities | MoI | MoA, MoCT, MoT, MoM, national regional governments | 2015-2020 |
| * 1. Increase alternative energy sources and use of energy efficient technologies | MoWIE | MoA, MoT, MoI, MoM, MoST, national regional governments, concerned NGOs | 2015-2020 |
| * 1. Adopt technologies and innovations for increased productivity of smallholder farmers and pastoralists | MoA | EIAR, RARIs, EBI, RBUs, MoST, BoA/Pastoral/ Agropastoral Bureaus, NAIC, HLIs dealing with agriculture, ATA | 2015-2020 |
| 1. By 2020, over exploitation of biodiversity and ecosystems are reduced | * Number of ecosystems and species/breeds managed sustainably * Number of ecosystems restored | * 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 bureaus, BoEF, Forest Enterprises, Oromia Pastoral Commission | 2015-2017 |
| * 1. Improve productivities of forage, grazing and rangelands | MoA | EIAR, RARI, BoA/Pastoral/  Agro-pastoral Bureaus, HLIs | 2015-2020 |
| * 1. 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 |
|  |  | * 1. Promote afforestation and use of non-wood forest products | MoEF | MoA, EBF, concerned NGOs, BoA/Pastoral/Agropastoral Bureaus, BoEF, Forest Enterprises | 2015-2020 |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | | **Actions** | **Implementing Agency** | | | **Implementation period** |
| **Lead** | **Collaborators** | |
| 1. By 2020, area invaded by 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 * Trends in expansion of invasive species * Mechanisms for monitoring invasiveness of newly introduced species put in place | | * 1. Conduct study on the status, trends and impacts of major invasive species (prosopis, parthenium weed, water hyacinth, lantana weed, Cochineal insect and others), and revise their control strategy | EIAR | MoEF, MoA, EBI, HLIs, BoA/Pastoral/Agropastoral Bureaus, BoEF | | 2015 |
| * 1. Implement the revised control strategies on major invasive species | MoA | EIAR, MoEF, MoA, RBUs, BoA/Pastoral/Agropastoral Bureaus, BoEF, RARI ,EBI, national regional governments, Dire Dawa City Council | | 2015-2020 |
| * 1. Put in place a system to monitor invasiveness of newly introduced species | MoA | EIAR, MoEF, EIAR, EBI, HLIs | | 2017 |
| [**Strategic Goal C**](http://www.cbd.int/sp/targets/#GoalC)**: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity** | | | | | | | |
| 1. 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 | * 1. Identify 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 national regional states, RBUs where PAs are located | 2015 | |
| * 1. 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,Tigrai, Dire Dawa City Council, RBUs | 2016-2020 | |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
|  |  | * 1. 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 national regional states where PAs are located, RBUs | 2015-2017 |
| * 1. Conduct economic valuation for seven PAs | EWCA | EBI, MoEF, MoA, HLI, Ethiopian Economic Association | 2015-2020 |
| * 1. Integrate benefits arising from PAs into poverty alleviation and overall national development plans | NPC | EWCA, MoA, MoEF, MoFED, HoPR | 2016 |
| 1. 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 | * 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, RARIs | 2015-2017 |
| * 1. Establish Natural History Museum | EBI | AAU, EWCA | 2017-2019 |
| * 1. Increase *ex situ* collections 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, RARIs, HLIs | 2015-2020 |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
|  |  | * 1. 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, Bureaus | 2015-2020 |
| * 1. Identify gaps in and improve the standards of *ex situ* conservation | EBI | EWCA, HLIs, RBUs, EIAR, RARIs | 2015-2018 |
| 1. 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 | * 1. Identify threatened species and sites/ecosystems and set priority for *in situ* conservation | EBI | RBUs, EWCA, MoEF, MoA, HLIs | 2015-2017 |
| * 1. 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 Bureaus, BoEF, concerned NGOs | 2015-2020 |
| * 1. Develop management plans for *in situ* conservation sites | EBI | EWCA, RBUs, BoA/Pastoral/Agropastoral Bureaus, BoEF, concerned NGOs | 2016-2020 |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| [**Strategic Goal D**](http://www.cbd.int/sp/targets/#GoalD)**: Enhance the benefits to all from biodiversity and ecosystem services** | | | | | |
| 1. 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 in designated wetlands   + Percent increase in restored areas | * 1. Increase area under forest cover by 2% through afforestation and re-forestation | MoEF | MoA, EBI, RBUs, BoA, BoEF, Forest and Wildlife Enterprises, concerned NGOs | 2015-2020 |
| * 1. Double area of designated wetlands | MoEF | MoA, EBI, RBUs, EWCA, BoA, BoEF, Forest and Wildlife Enterprises, concerned NGOs | 2015-2020 |
| * 1. Increase restored area of degraded land from 10 to 20 million hectares | MoA | MoEF, EBI, RBUs, BoA, BoEF, Forest Enterprises, concerned NGOs | 2015-2020 |
| * 1. Generate incentives for the local communities through REDD+ from high forests, woodlands and traditional agro-forestry | MoEF | MoA, RBUs, EWCA, BoA, and BoEF, Forest and Wildlife Enterprises, concerned NGOs | 2015-2020 |
| 1. 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 | * 1. Build material and human capacity for bio-prospecting and negotiation | EBI | MoA, MoFED, HLIs, EIAR | 2015-2020 |
| * 1. 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, RARIs, HLIs, EIPO, Media, MoJ, RBUs | 2015-2020 |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
|  |  | * 1. Control unauthorized movement of genetic resources | EBI | Customs and Revenue Authority, Civil Aviation, National Post Office, DHL, RBUs, MoD, Police | 2015-2020 |
| * 1. Increase number of bio-prospecting from: * four to 14 species/products * four to 12 community knowledge, and conduct market promotion | EBI | EIAR, RBUs, HLIs, RARIs, MoA | 2015-2020 |
| 1. 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 | * 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 |
| * 1. Develop and implement national gender mainstreaming guideline on biodiversity resources and ecosystem services | EBI | MoA, MoWCYA, MoEF, concerned NGOs | 2016-2020 |
| * 1. Evaluate the level of improvement of women’s access and control over biodiversity resources and ecosystem services | MoWCYA | EBI, MoA, MoEF, CSA, RBUs | 2020 |

**Table 11.Strategic goals, targets, actions, …**

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| 1. 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 | * 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 origins | MoA | Ethiopian Standards Authority, MoI, EBI, MMDTI, ECXA, Cooperative Agency, private sector, ATA, concerned NGOs, cooperatives/associations EIAR, RARIs, HLIs | 2015-2018 |
| * 1. 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, Withania somnifera, 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**](http://www.cbd.int/sp/targets/#GoalE)**: Enhance implementation through participatory planning, knowledge management and capacity building** | | | | | |
| 1. 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 | * 1. Establish and strengthen 10 Biodiversity Units at national regional states and seven Centers at representative areas of the country | EBI | MoA, MoEF, regional governments, Dire Dawa City Council | 2015-2020 |
| * 1. Put in place effective governance structure for follow-up of the implementation of the NBSAP | EBI | HoPR, MoA, MoEF, EWCA, EIAR, MoFED, MoE | 2015 |

Table 11. Strategic goals, targets, actions, …

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| 1. 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 and NRCHM | * 1. Establish and strengthen national biodiversity database and dissemination strategy | EBI | MoA, MoEF, EWCA, EIPO, HLIs, EIAR, RARI, concerned NGOs BoA/Pastoral/Agropastoral Bureaus, MoEF, BoEF | 2015-2020 |
| * 1. Update Clearing House Mechanism and network to national regional states | EBI | MoA, MoEF, EWCA, EIPO, HLIs, EIAR, RARI, BoA/Pastoral/  Agropastoral Bureaus, MoEF, BoEF, concerned NGOs | 2015-2020 |
| * 1. Establish NRCHM and ABS Clearing House Mechanism | EBI | MoA, MoEF, EWCA, EIPO, HLIs, EIAR, RARI, CBOs, concerned NGOs | 2016 |
| 1. 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 | * 1. Conduct research on status, trends, threats and uses of biodiversity, and its conservation status, and ABS related issues | EBI | EIAR, RARI, MoST, HLIs, EWCA RBUs, EIPO, concerned NGOs | 2015-2020 |
| * 1. 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 |
| * 1. Apply generated knowledge and innovations for development and further research | NPC | EBI, MoFED, EIAR, HLIs, MoEF, MoA, EWCA, MoWIE, MoM, MoI, HoPR | 2016-2020 |

Table 11. Strategic goals, targets, actions, …

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| --- | --- | --- | --- | --- | --- |
| **Ethiopian targets by goals** | **Indictors** | **Actions** | **Implementing Agency** | | **Implementation period** |
| **Lead** | **Collaborators** |
| 1. 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 | * 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 |
| * 1. 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 |
| 1. 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 | * 1. Develop country environmental profile and invite competent project proposals for seeking funds | EBI | MoA, MoE, EWCA, MoEF, MoFED | 2015-2019 |
| * 1. Devise disbursement strategy for funds secured from different sources to support the implementation of the NBSAP | EBI | MoA, MoE, EWCA, MoEF, MoFED | 2016 |

**12. Relationships between Ethiopia’s National Biodiversity Targets and the Aichi Targets**

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| --- | --- |
| **Ethiopia’s National Biodiversity Targets by Strategic Goals** | **Aichi Targets (No.)** |
| **Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society** | |
| Target 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 is sustainably improved  Target 2. By 2020, the existing biodiversity related laws, regulations and strategies, including those associated with incentives are reviewed and gaps are addressed  Target 3. By 2020, biodiversity values and ecosystem services are communicated and integrated into national and local development and poverty reduction strategies and plans | 1,2,4,19  3  1,2,19 |
| [**Goal B**](http://www.cbd.int/sp/targets/#GoalB)***: Reduce the direct pressures on biodiversity and promote sustainable use*** | |
| Target 4. By 2020, habitat conversion from the existing of about 10% per year, through expansion for agricultural land, is halved  Target 5. By 2020, over exploitation of biodiversity and ecosystems are reduced  Target 6. By 2020, area invaded by invasive species is reduced by 75% and measures are in place to monitor invasiveness of newly introduced species | 5,7  6,7,8  9 |
| [**Goal C**](http://www.cbd.int/sp/targets/#GoalC)**: To improve the status of biodiversity by safeguarding ecosystems, species an d Genetic diversity** | |
| Target 7. By 2020, area coverage of ecologically representative and effectively managed PAs is increased from 14% to 20%  Target 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  Target 9. By 2020, *in situ* conservation sites/ecosystems and species/breeds are increased and the standards of the existing *in situ* conservation is improved | 11  12,13  12,13 |
| [**Goal D**](http://www.cbd.int/sp/targets/#GoalD)**: Enhance the benefits to all from biodiversity and ecosystem services** | |
| Target 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  Target 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  Target 12. By 2020, Women’s access to and control over biodiversity resources and ecosystem services are improved | 12,14,15  16  14 |
| Target 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 | 16,19 |

**12 Relationships between Ethiopia’s, …**

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| --- | --- |
| **Ethiopia’s National Biodiversity Targets by Strategic Goals** | **Aichi Targets (No.)** |
| [**Goal E**](http://www.cbd.int/sp/targets/#GoalE)**: Enhance implementation through participatory planning, knowledge management and capacity building** | |
| Target 14. By 2020, stakeholders’ integration, including the participation of local communities in biodiversity conservation and sustainable utilization, is strengthened  Target 15. By 2017, national biodiversity database is strengthened, information dissemination strategy is devised and Clearing House Mechanism is updated  Target 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  Target 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  Target 18. By 2019, internal and external financial resources required for the effective implementation of the Strategy are secured | 14,18  2,18,19  19  18,19  20 |

**CHAPTER EIGHT**

**8 IMPLEMENTATION ARRANGEMENTS**

**8.1 Coordination**

Ethiopian Biodiversity Institute is the lead technical institution responsible for conservation and sustainable utilization of biodiversity, and ensuring equitable sharing of benefits accrued from the use of biological resources of Ethiopia. It is also the Focal Institute to the CBD. Therefore, the Institute will take overall responsibility of coordinating implementation of the agreed upon actions by all the stakeholders that have been outlined in Table 11.

One of the major challenges faced during the implementation of previous NBSAP of Ethiopia was absence of binding mechanism that would enforce the implementation by responsible agencies. To effectively implement the revised NBSAP, therefore, Ethiopian Biodiversity Institute shall formulate binding mechanism that should be agreed upon by the concerned lead and collaborating organizations. Moreover, the Institute shall take the overall responsibility to coordinate familiarization of the revised NBSAP at all levels, with special emphasis to policy makers that are found at various government tiers of the country and at the grass-root levels to the general public. These responsibilities of coordination vested upon the Institute will smoothly be discharged through the NBSAP Implementation Coordination Office (section 8.2.2).

**8.2 Monitoring and Evaluation**

Effectiveness of the follow up of implementation will be based on designing clear monitoring and evaluation (M &E) strategies and conducting monitoring and evaluation at a time agreed upon by the National Biodiversity Task Force (NBTF). The M and E shall be conducted by a group of experts from different disciplines set by NBTF and its outcomes shall be reported to the Task Force, stakeholders and National Biodiversity Council (NBC) in a step by step manner (section 8.2.2), based on the agreed format and work plan in a way that it could guide direction for rectification of the observed challenges.

The NBTF may propose ground-truthing on the level of implementation of actions by a group that shall be elected from the Task Force, when necessary.

The M &E, and reporting formats will be proposed by the Technical Team (TT) of the NBSAP revision process. The formats so proposed will be evaluated and approved by the NBTF at its first meeting. The formats will be developed based, mainly, on the corresponding indicators set for the targets of the revised NBSAP.

**8.2.1 Physical resources**

Success of implementation of the revised NBSAP will be based on sets of provisions of physical and human resources. Physical provisions so required include clear and simple monitoring and evaluation (M & E) formats, financial resources and material provisions such as offices, office equipment and vehicles required to carry-out day to day coordination activities of the implementation both at office and field levels, ground-truthing, and to run the NBSAP Implementation Coordination Office.

**8.2.2 Human resources**

Human resources required to effectively monitor and evaluate the implementation processes of actions set in the revised NBSAP and communicating the findings on time are mainly grouped into three categories. These are the staff of the NBSAP implementation Coordination Office (NBSAP-CO), members of the National Biodiversity Task Force (NBTF) and National Biodiversity Council (NBC).

**NBSAP Implementation Coordination Office**

The main role of the NBSAP Implementation Coordination Office (NBSAP-CO) will be spearheading implementation and awareness raising activities and networking of all actors involved in the implementation, based on the annual work plan (AWP) agreed upon by the NBTF. It will work with all sectors of the public, especially with the actors involved in the implementation and Regional Biodiversity Units (RBUs).

The Office will also facilitate and coordinate activities that are required for successful and timely implementation of the proposed actions such as resources mobilization activities, including securing funds from internal and external sources and their equitable and timely release to implementing bodies. When certain lag in the levels of progress of implementation by specific implementing institutions is observed, the Office will report to the chairperson of the NBTF so that emergency meeting of the NBTF shall be convened and the situation rectified. In collaboration with the Information and Communication Directorate of the EBI, the Office shall also conduct the clearing house mechanism (CHM) and the related activities (section 8.4).

The Office will organize annual national stakeholder workshops and will present summary of the findings from both of the earlier two meetings of the NBTF. The stakeholder workshop shall be organized at the end of every fiscal year.

The office of the NBSAP-CO will be located within the premises of the EBI and Coordinator of the Office shall be assigned by the Director General of the EBI, and operate under the leadership and guidance of the same. It will report to the Director General of the EBI on the overall progress of the implementation, based on the AWP and other implementation related issues. The Office will be staffed with critical manpower and equipped with necessary facilities.

**National Biodiversity Task Force**

Heads of Regional Biodiversity Units of all national regional states, as the member of NBTF, are responsible to closely follow up progresses of implementation of actions that have been planned to be carried out in their respective regions. Moreover, they shall present their biannual reports at the forthcoming NBTF meetings that shall be conducted twice a year, in first weeks of December and June. The objective of the meeting is to evaluate progresses of implementations. Modalities of presentation on the progress of the implementation of the strategic plan of each fiscal year will be determined at its first NBTF meeting. At second and fourth quarters, the RBUs shall submit their reports to NBSAP-CO a week before the NBTF meeting. At the end of both NBTF meetings, the NBSAP-CO will summarize and compile the progress report and submit to the coordinating Institute.

Immediately after the June meeting, the NBSAP-CO will present its annual progress report to the stakeholders at the annual stakeholder meeting that shall be conducted in the second week of June each year, and it will present the overall findings of the year to the National Biodiversity Council (NBC) at its annual meeting that will be conducted in the last week before the end of each fiscal year.

Upon the call by its secretary, the NBTF may convene urgent meeting or meetings, as the case may be, in addition to their planned biannual meetings. The Chairperson of the NBTF will be the Director General of the Coordinating Institute and the Coordinator of the NBSAP-CO shall serve as the secretary of the Task Force.

The NBTF shall also perform M &E related activities that have been outlined in section 8.2 and others, when directed by the NBC.

The NBTF shall be comprised of representatives of heads of RBUs of all national regional states of Ethiopia, including Addis Ababa and Dire Dawa City Councils as well representatives from all lead agencies of the implementation and EBF.

**National Biodiversity Council**

National Biodiversity Council (NBC) is a highest body that oversees the implementation of the revised NBSAP. The NBC shall meet once a year, in the last week before the end of each fiscal year. Based on the summary of the findings from both NBTS meetings and annual stakeholder workshop presented by the BBSAP-CO, the NBC will provide strategic and policy directions to the lead Institutions, including direction to revisit the plan, if necessary. Upon the call through its secretary, the NBC may convene its urgent meeting or meetings within a given year, in addition to its annual one.

The chairperson of the NBC will be a designate from the House of Representatives of the FDRE. The vice chair and secretary of the NBC will be ------ and -------, respectively. Members of the NBC will be representatives from -------, --------, -------, ------, ------------ (4-6; representatives from GOs, NGOs and Private)

**8.3 Resource Mobilization**

The targets and their corresponding actions of the revised NBSAP of Ethiopia emanated from direct and indirect pressures that are affecting the country’s biodiversity and ecosystems. They were crafted carefully to align with the government policies and strategies that deal with poverty reduction, overall development and climate change issues. They were also planned realistically, taking into account existing physical and technical capabilities of the country. Because of these, it is hoped that most of the actions set in the revised NBSAP can easily be mainstreamed into different sectoral plans and will be implemented with government budgets allocated to those sectors. To fully and meaningfully accomplish the actions and fulfill implementation of all the targets outlined in the revised NBSAP, however, tangible support from all internal and external funding sources is crucial.

To secure both internal and international funds, a separate portfolio of funding strategy will be developed by the TT. The strategy will contain the disbursement component to release funds secured from different sources for the implementing agencies. It will be presented to NBTF at its first meeting for evaluation and finalization. The agreed upon funding strategy will be submitted to the Coordinating Institute and then will serve as the operational national standing document for funding mechanism for the implementation period of 2015 through 2020.

Based on the funding strategic document, the NBSAP-CO will invite concerned stakeholders to develop competent project proposals for funding, and the proposals will be evaluated by the NBTF at its next meeting. The proposals so commented will be finalized by the NBSAP-CO and then will be submitted to appropriate funding organizations found at national and international levels through the Ethiopian Biodiversity Institute to secure the required financial resources. The funds so secured will be disbursed to implement the planned actions, based on the disbursement strategy.

**8.4 Plans for Clearing House Mechanism**

One of the most important drawbacks of the previous NBSAP of Ethiopia was lack of responsible national coordinating system resulting in poor information exchange. The Clearing House Mechanism (CHM), which was previously established by the CBD worldwide for the purposes of availing information to interested parties and partners, is one of the crucial tools to fill such gaps and this should be supported by a National-Regional Clearing House Mechanism (NRCHM) and ABS-CHM that shall be established at the beginning of the implementation period.

The main purpose of establishing the NRCHM, which will serve as a central node, is to assist regional institutions to effectively and efficiently implement the actions of the NBSAP addressed to each institution. ABS-CHM shall facilitate communication among stakeholders on the ABS related issues. EBI, through its Information and Communication Directorate and the NBSAP-CO, shall maintain the quality of NRCHM and ABS-CHM websites and enhance availing information in different local languages. The Information and Communication Directorate of the EBI shall strengthen the existing database in a way that it can serve the interest of the CHM. The NBSAP-CO provides the Directorate CHM related data and information to feed into the database and network relevant institutions. The NRCHM is, *inter alia*, meant to facilitate capacity building activities to the network of experts on data collection and reporting. Such networking will ease analysis and disseminating of information as well as best practices on ongoing activities that support, facilitate or promote transfer of knowledge, technology and technical cooperation.

**8.5 Reporting**

Institutions designated as lead agencies to coordinate accomplishments of the agreed upon actions are required to submit their respective implementation reports on biannual basis to the coordinating Institute. As members of the NBTF, they shall also present levels of implementations of the revised NBSAP at their respective national regional states at the biannual NBTF meetings. Based on these reports and the findings of annual stakeholder workshop as well as strategic and policy direction provided by the NBC, NBSAP-Co shall synthesize annual report and submit it to the Director General of the coordinating Institute, by means of which the latter will communicate the level of implementation of the country with the concerned national and international bodies such as the SCBD.

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**10 ANNEXES**

**Annex I The red list of endemic trees and shrubs of Ethiopia**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of the Species | Status | Distribution in Ethiopian Floristic Region (s)\* |
| 1 | *Acacia bricchettiana* | CR | HA |
| 2 | *Acacia negrii* | VU | GD, WU, GJ, HA, SD |
| 3 | *Acacia prasinata* | CR | AF, SU |
| 4 | *Acalypha marissima* | CR | WG |
| 5 | *Acanthus sennii* | NT | GD, GJ, WG, SU, HA, AR, BA, KF, GG, SD |
| 6 | *Argyrolobium schimperianum* | EN | TU, GD, GJ, SU |
| 7 | *Barleria longissima* | CR | SD |
| 8 | *Becium formosum* | VU | BA |
| 9 | *Blepharis cuspidate* | CR | SD |
| 10 | *Blepharispermum obovatum* | CR | BA |
| 11 | *Boswellia ogadensis* | CR | HA |
| 12 | *Boswellia pirottae* | VU | GD, GJ, WU, SU, KF |
| 13 | *Cadaba divericata* | VU | SD, HA |
| 14 | *Cladostigma nigistiae* | EN | SD |
| 15 | *Commiphora monoica* | CR | BA |
| 16 | *Crotalaria agatiflora* | NT | SU, HA, IL, AR, GG |
| 17 | *Crotalaria exaltata* | EN | SU, BA, KF, SD |
| 18 | *Crotalaria intonsa* | VU | GD, SU, KF, SD |
| 19 | *Crotalaria rosenii* | NT | SU, AR, BA, KF, SD |
| 20 | *Crotalaria sacculata* | CR | SD |
| 21 | *Cussonia ostinii* | NT | WU, GD, GJ, WG, IL, AR, KF, GG |
| 22 | *Delosperma abyssinica* | CR | TU |
| 23 | *Delosperma schimperi* | EN | TU, WU |
| 24 | *Dombeya kefaensis* | EN | KF |
| 25 | *Dombeya longebracteolata* | VU | KF, GG, SD |
| 26 | *Echinops ellenbeckii* | EN | SU, AR, HA |
| 27 | *Erythrina burana* | VU | HA, BA? |
| 28 | *Erythrococca uniflora* | EN | SD |
| 29 | *Euphorbia burger* | CR | HA |
| 30 | *Euphorbia dalettiensis* | EN | SD, HA |
| 31 | *Euphorbia doloensis* | CR | SD |
| 32 | *Euphorbia ellenbeckii* | EN | SD |
| 33 | *Erythrophysa septentrionalis* | EN | HA |
| 34 | *Euphorbia baleensis* | CR | BA |
| 35 | *Euphorbia betulicortex* | CR | SD |
| 36 | *Euphorbia fissispina* | EN | SD |
| 37 | *Euphorbia makallensis* | CR | TU |
| 38 | *Euphorbia nigrispinioides* | VU | SU, HA? |

**Annex I The red list of, …**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of the Species | Status | Distribution in Ethiopian Floristic Region (s)\* |
| 39 | *Euphorbia ogadenensis* | CR | BA, HA |
| 40 | *Euphorbia somalensis* | CR | HA |
| 41 | *Euphorbia tetracantha* | CR | BA |
| 42 | *Euphorbia uniglans* | EN | SD |
| 43 | *Euryops pinifolius* | VU | WU, GJ, SU |
| 44 | *Hildebrandtia aloysii* | VU | HA, BA |
| 45 | *Hildebrandtia diredawaensis* | EN | HA |
| 46 | *Hybanthus puberulus* | CR | SD |
| 47 | *Ficus ruspolii* | VU | SD, KF |
| 48 | *Helichrysum elephantium* | VU | BA, GG, SD |
| 49 | *Helichrysum horridum* | EN | GD, SD |
| 50 | *Hybanthus puberulus* | CR | SD |
| 51 | *Hypericum gnidiifolium* | VU | TU, SU |
| 52 | *Indigofera curvirostrata* | CR | SD |
| 53 | *Indigofera ellebenbeckii* | CR | HA |
| 54 | *Hibiscus boranensis* | VU | SD |
| 55 | *Indigofera kelleri* | CR | HA |
| 56 | *Indigofera rothii* | EN | SU, HA |
| 57 | *Inula arbuscula* | CR | GD |
| 58 | *Inula confertiflora* | NT | WU, SU, HA, BA, AR |
| 59 | *Kanahia carlsbergiana* | EN | AR, BA |
| 60 | *Lantana kisi* | EN | TU |
| 61 | *Lindenbergia awashensis* | EN | AF, SU |
| 62 | *Maerua boranensis* | CR | SD |
| 63 | *Maytenus addat* | NT | SU, AR, SD, GG |
| 64 | *Kirkia burger* | VU | SD, BA, HA |
| 65 | *Kleinia gypsophila* | CR | HA |
| 66 | *Kleinia negrii* | EN | WU, HA, SD |
| 67 | *Kotschya recurvifolia* | VU | BA, HA, KF, SD |
| 68 | *Maytenus cortii* | CR | GD |
| 69 | *Maytenus harenensis* | CR | BA |
| 70 | *Monadenium shebeliensis* | CR | HA |
| 71 | *Moringa rivae* subsp. *longisiliqua* | VU | SD, BA, HA |
| 72 | *Phyllanthus dewildiorum* | EN | WG, KF |
| 73 | *Phyllanthus limmuensis* | VU | GD, GJ, WG, IL, KF |
| 74 | *Polyscias farinose* | VU | TU, GD, GJ, SU, KF |
| 75 | *Polysphaeria aethiopica* | EN | SD, BA |
| 76 | *Otostegia tomentosa* subsp. *steudneri* | VU | GD, WU |
| 77 | *Phyllanthus borenensis* | CR | SD |
| 78 | *Pseudoblepharispermum bremeri* | CR | HA |

**Annex I. The red list of, …**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Name of the Species | Status | Distribution in Ethiopian Floristic Region (s)\* |
| 79 | *Rhynchosia erlangeri* | EN | HA |
| 80 | *Rhynchosia splendens* | CR | GD |
| 81 | *Rinorea friisii* | EN | IL, KF |
| 82 | *Rubus aethiopicus* | EN | SU, GD |
| 83 | *Rubus erlangeri* | EN | BA, SD |
| 84 | *Sparmannia macrocarpa* | NT | GD, GJ, WU, SU, AR, WG, KF, GG, HA |
| 85 | *Stomatanthes meyeri* | CR | KF |
| 86 | *Tacazzea venosa* | EN | TU, GD, GJ |
| 87 | *Taverniera abyssinica* | CR | TU, SU |
| 88 | *Ruellia boranica* | EN | SD |
| 89 | *Satureja unguentaria* | EN | GD |
| 90 | *Sesbania melanocaulis* | EN | KF, WG |
| 91 | *Tephrosia dichroocarpa* | EN | TU, GD, GJ |
| 92 | *Terminalia hararensis* | DD | BA, HA |
| 93 | *Terminalia hecistocarpa* | DD | BA |
| 94 | *Tragia abortive* | VU | GG |
| 95 | *Tragia negeliensis* | VU | SD, BA |
| 96 | *Verbascum arbusculum* | CR | SU |
| 97 | *Wellstedia filtuensis* | CR | SD |
| 98 | *Wendlandia arabica* subsp. *aethipica* | EN | SU |
| 99 | *Verbascum arbusculum* | CR | SU |
| 100 | *Vernonia cylindrical* | VU | TU, GD, GJ, WG |
| 101 | *Vernonia dalettiensis* | CR | HA |
| 102 | *Vernonia tewoldei* | EN | KF, BA |
| 103 | *Vernonia thulinii* | CR | WG |

* + - Distribution in Ethiopian Floeristic Region(s): BA (Bale), GD (Gonder), GG (Gamo Gofa), GJ (Gojam), HA (Harerge), IL (Iluababor), KF (Kafa), SD (Sidamo), SU (Shewa), TU (Tigrai), WG (Walesa) and WU (Well).

Source: Jose L., Ensermu Kelbessa and Sebsebe Demissew (2005)

**Annex II Indigenous and exotic breeds’ diversity in each farm animal species of Ethiopia**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Species | Breeds names and number | | | |
|  | **Indigenous breed names** | **No** | **Exotic** | **No** |
| Cattle | Arsi, Begait, Ogaden, Borena, Goffa, Arado, Nuer, Gurage, Jidu, Karayu, Afar, Harar, Horro, Simada, Fogera, Mursi, Raya-Azebo, Adwa, Jem-Jem, Sheko, Ambo, Jijiga, Bale, Hammer, Medenece, Irob, Abergelle and Begaria | 28 | Holstein-Friesian, Jersey, Brown Swiss, Hereford, Brahman, Angus and Simmental | 7 |
| Sheep | Simien,Short-fat-tailed, Washera, Horro, Arsi-Bale, Bonga, Afar, Black head Somali, Gumz | 9 | Awassi, Hampshire, Blue-demain,  Merino, Romney,  Corriedale and Dorper | 7 |
| Goat | Arsi-Bale, Gumuz, Keffa, Woyto-Guji, Abergelle, Afar, Highland Goats and the Somali Goats. | 8 | Anglo-Nubian, Toggenberg and Boer goats’ | 3 |
| Camel | Jijiga, Geleb, Shinile, Amibara, Mile, Hur and Liben | 7 | **---** |  |
| Donkey | Abyssinian, Afar, Haraghe, Omo/Hamer, Ogaden and Sinnar | 6 | **---** |  |
| Horse | Abyssinia, Bale (pony), Borena, Horro, Keffa-Sheka (giant), Kundudo, Ogaden/Aware/Wilwal and Selale/Oromo | 8 | **---** |  |
| Mule | Sinnar and Wollo | 2 | **---** |  |
| Chicken | Horro, Jarso, Tililli/Mandura, Tepi/Sheko, Konso and Cheffe,Farta | 7 | Rhode Island Red, White  Leghorn**,** Lawman Brown,  Cobb-500, Fayoumi, Bovans  Brown, Arob Acre, Bubcocks,  Potcheftsroom Koekoek,  Dominant Brown D102,  Lahhman Silver, Hubbard  Classic, Hubbard JV and ISA  Brown | 14 |
| Honey bee species | A. m. monticola, A.m. jemenitica, A. m. bandasii, A. m. scutellata and A. m. woyi-gambela, Meliponini (stingless bees) | 6 | **---** |  |

Source.(EBI, 2014; IBC, 2012c& 2004)

**Annex III Wild mammals of Ethiopia rated as critically endangered, endagered or**

**vulnerable**

|  |  |  |
| --- | --- | --- |
| **Critically Endangered** | **Endangered** | **Vulnerable** |
| African Wild Ass (*Equus africanus*) | Grevy's Zebra (*Equus grevyi*) | African Elephant (*Loxodonta africana*). |
| Bilen Gerbil (*Gerbillus bilensis*)\* | Mountain Nyala (*Tragelaphus buxtoni*)\* | Ammodile (Gerbil Family) (*Ammodillus imbellis*) |
| Black Rhinoceros (*Diceros bicornis*) | Nubian Ibex (*Capra nubiana*) | Bailey's Shrew (*Crocidura baileyi*)\* |
| Ethiopian Wolf (Simien Jackal) (*Canis simensis*)\* | Wild Dog (*Lycaon pictus* | Bale Shrew (*Crocidura bottegoides*) \* |
| Guramba Shrew (*Crocidura phaeura*)\* |  | Beira Antelope (*Dorcatragus megalotis*) |
| Harenna Shrew (*Crocidura harenna*)\* | Cheetah (*Acinonyx jubatus*) |
| MacMillan's Shrew (*Crocidura macmillani*) \* | Dibatag (*Ammodorcas clarkei*) |
| Walia Ibex (*Capra walie*) \* | Dorcas Gazelle(*Gazella dorcas*) |
|  | Glass's Shrew(*Crocidura glassi*) \* |
| Large-eared Free-tailed Bat(*Otomops martiensseni*) |
| Lesser Horseshoe Bat(*Rhinolophus hipposideros*) |
| Lion(*Panthera leo*) |
| Moorland Shrew(*Crocidura lucina*) \* |
| Morris's Bat(*Myotis morrisi*) |
| Mouse-tailed Bat Species(*Rhinopoma macinnesi*) |
| Natal Free-tailed Bat(*Mormopterus acetabulosus*) |
| Nikolaus's Mouse(*Megadendromus nikolausi*) \* |
| Patrizi's Trident Leaf-nosed Bat(*Asellia patrizii*) |
| Red-fronted Gazelle(*Gazella rufifrons*) |
| Rupp's Mouse(*Myomys ruppi*)\* |
| Scott's Mouse-eared Bat(*Myotis scotti*) |
| Soemmerring's Gazelle(*Gazella soemmerringii*) |
| Speke's Gazelle(*Gazella spekei*) |
| Spotted-necked Otter(*Lutra maculicollis*) |
| Stripe-backed Mouse(*Muriculus imberbis* \* |

\* Endemic to Ethiopia; Source: IUCN (2004)

**Annex IV 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. |