THE STATE OF ERITREA
MINISTRY OF LAND, WATER AND ENVIRONMENT
DEPARTMENT OF ENVIRONMENT

ERITREA'S UPDATED NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (2026-2030)






ASMARA

November 2025

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LIST OF ACRONYMS

ABT	Aichi Biodiversity Targets
BDSTA	Bodiversity Stock Taking Assessment
CBOs	Community Based Organizations
CCA	Common Country Assessment
CLC	Crop and Livestock Corporation
COP	Convention of the Parties
CPB	Cartagena Protocol on Biosafety
DLGP	Dependabel Length of Growing Period
DoE	Department of Environment
DoL	Department of Land
ECMIB	Eritrea Coastal, Marine and Island Biodiversity
EIA	Environmental Impact Assessment
ENF	Eritrean Naval Force
FAO	Food and Agricultural Organization
FWA	Forestry and Wildlife Authority
GBF	Global Biodiversity Framework
GDP	Gross Domestic Product
GMOs	Genetically Modified Organisms
GoSE	Government of the State of Eritrea
HAC	Hamelmalo Agricultural College
HCFC	Hydro-Chloro-Fluoro-Carbons
IAS	Invasive Alien Species
ICAM	Integrated Coastal Area Management
IPBES	Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services
LDN	Land Degradation Neutrality
IUCN	World Conservation Union (International Union for the Conservation of Nature)
MEAs	Multilateral Environmental Agreements
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoEM	Ministry of Energy and Mines
MoFND	Ministry of Finance and National Development
MoI	Ministry of Information
MoJ	Ministry of Justice
MoLG	Ministry of Local Government
MoLWE	Ministry of Land, Water and Environment
MoMR	Ministry of Marine Resources
MoT	Ministry of Tourism
NFC	National Fisheries Corporation
NAP	National Action Programme
NAPA	National Adaptation Plan of Action

NARI	National Agricultural Research Institute
NBSAP	National Biodiversity Strategic Action Plan
NDC	Nationally Determined Contribution
NEMP-E	National Environmental Management Plan – Eritrea
NHERI	National Higher Education and Research Institute
NUEW	National Union of Eritrean Women
NUEYS	National Union of Eritrean Youth and Students
OECM	Other Effective area-based Conservation Measures
ODS	Ozone Depleting Substances
PET	Potential Evapotranspiration
SDGs	Sustainable Development Goals
SLM	Sustainable Land Management
TOR	Terms of Reference
UNCBD	United Nations Convention on Biodiversity
UNCCD	United Nations Convention to Combat Desertification
UNDAF	Unites Nations Development Assistance Framework
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VMS	Vessel Monitoring System
WoG	Whole-of-Government
WoS	Whole-of-Society
WRD	Water Resources Department

FOREWORD

Eritrea's natural environment, known for its fascinating terrestrial topography with distinct agro-ecological zones and marine ecology, provides a suitable habitat for important biodiversity resources that greatly contribute to the economy of the country and wellbeing of its population. However, these natural resources have been under acute stress since long, mainly due to climate change, unsustainable utilization, land use changes, as well as introduction and expansion of invasive alien species. To reverse this worrisome situation, Eritrea has been pursuing relevant policies and strategies and implementing plans of action which have resulted considerable and promising achievements.

Eritrea is party to many important international environmental conventions, protocols and agreements, including the Convention on Biological Diversity (CBD). As a party to this convention, the country communicated its first National Biodiversity Strategy and Action Plan (NBSAP) in 2000, following its initial Biodiversity Stocktaking Assessment report of 1999. The country's second NBSAP- 2015 has been revised to be followed by this updated third NBSAP (2026-2030).

The preparation of the third NBSAP, that Eritrea is communicating hereby, was conducted through a comprehensive approach that enabled a wider consultation process involving active engagement of various government ministries and institutions, Zoba Administrations, community-based organizations, representatives of communities and other stakeholders. The said NBSAP, based on the gaps, threats and trends that it identified by duly taking into account the country's real state of the environment, outlines 13 targets and 212 result-oriented priority actions.

In this regard, it is worth noting that this NBSAP has been designed for seamless integration into various sectoral plans, which makes its implementation easier within existing institutional mandates. The targets and priorities of action outlined in this NBSAP are in consonance with both Eritrea's environmental management and protection plan and the Kunming-Montreal Global Biodiversity Framework (KM-GBF), adopted during CBD - COP 15.

Eritrea is among the countries most impacted by climate change, where biodiversity loss is gravely becoming part of a critical global concern. Cognizant of this and committed to shoulder its obligations under CBD, Eritrea will deploy all resources within its means towards the successful implementation of this NBSAP. However, in order to address the worrying environmental crisis, the dire need for international cooperation and partnership is so obvious to require emphasis. Based on the principles and spirit of CBD, on behalf of the government of the State of Eritrea and on behalf of myself, I would like to take this opportunity to call on all international partners to cooperate in the mobilization of the detailed financial resources necessary for the implementation and monitoring of the NBSAP.

In conclusion, I would like also to express my sincere appreciation to all stakeholders who diligently contributed to the preparation of this updated NBSAP document. Special appreciation also goes to UNEP and GEF for their financial and technical support.

Tesfai Ghebreselassie Sebhatu
Minister of Land Water and Environment

ACKNOWLEDGEMENT

The updated *National Biodiversity Strategy and Action Plan (NBSAP)* has been prepared through extensive consultations with a wide range of stakeholders, reflecting a truly collaborative approach. I wish to express my profound gratitude to the following institutions for their invaluable contributions in providing reliable data and information: the Ministries of Local Government, Finance and National Development, Agriculture, Marine Resources, the Department of Land and Water Resources of the Ministry of Land, Water and Environment, the Forestry and Wildlife Authority, Zoba Administrations, the National Union of Eritrean Women, the National Union of Eritrean Youth and Students, the National Confederation of Eritrean Workers, Hamelmalo Agriculture College, and Mainefhi College of Science.

My sincere appreciation goes to the National Higher Education and Research Institute for assigning dedicated professionals to undertake the consultancy task in support of the Ministry of Land, Water and Environment during the preparation of this updated Strategy and Action Plan. I also gratefully acknowledge the task team members drawn from diverse sectors who assisted the consultants in collecting data and information from their respective institutions, other relevant sectors, and zobas.

Special thanks are extended to all stakeholders for their remarkable participation in the consultation and validation workshops. Their constructive comments and valuable inputs are well reflected in the final version of the updated Strategy and Action Plan.

Finally, I wish to express my deep gratitude to the United Nations Environment Programme (UNEP), the Secretariat of the United Nations Convention on Biological Diversity (UNCBD), and the Global Environment Facility (GEF) for their financial and technical support, which greatly facilitated the successful review and update of the NBSAP.

Kibrom Asmerom
Acting Director General
Department of Environment

EXECUTIVE SUMMARY

The majority of Eritreans derive their sustenance from the direct exploitation of natural resources. Maintaining healthy ecosystems and the protection and wise use of biodiversity is thus imperative for the long-term sustainable development of the country. Cognizant of the importance of biodiversity and ecosystems for sustainable development, Eritrea prepared its first National Biodiversity Strategy and Action Plan (NBSAP) in 1999. However, despite concerted efforts by the people and Government of the State of Eritrea (GoSE) to protect biodiversity and restore degraded ecosystems, biodiversity in Eritrea has been declining due to various causes and drivers and the present status of plant and animal species is still of serious conservation concern.

The Updated NBSAP

The GoSE has prepared this document as its NBSAP for the period 2026-2030. This document is the result of the decision of the GoSE to align its biodiversity conservation strategy and actions plans with the Kunming-Montreal Global Biodiversity Framework (GBF) under its commitment to the Convention on Biological Diversity (CBD). The GoSE ratified the Convention on Biological Diversity (CBD) in 1996 and it is therefore committed to implementing the decisions of the CBD Conference of Parties (COP). The Convention requires that countries prepare a National Biodiversity Strategy and Action Plan (NBSAP), which is the principal instrument for achieving the objectives of the Convention at the national level. Eritrea prepared its first NBSAP in 1999 and its implementation started in 2000. NBSAP-2000 was further updated and revised in 2015 to make it compliant with the Aichi Targets. NBSAP (2026-2030) is an updated and revised version of Eritrea's NBSAP 2015. The present NBSAP provides strategic direction for the actions that Eritrea will undertake between 2026 and 2030 to halt loss of biodiversity and put the country on a path of biodiversity and ecosystem recovery.

There were several reasons for revising and updating the NBSAP-2015. Firstly, the NBSAP 2015 was too ambitious with 20 global and 18 national targets. This calls for the need of balancing actions with what is achievable in the NBSAP timeframe. Taking this aspect into consideration, the present NBSAP has tried to balance the targets and actions with i) the existing human, scientific and technical capacities, ii) what is doable and achievable in the NBSAP timeframe, and iii) inter-institutional coordination, cooperation and preparedness to incorporate NBSAP into institutional plans and programmes. Secondly, the NBSAP-2015 was not widely shared with stakeholders. Some of key actors like Zoba and Sub-Zoba administration, and even some departments within line ministries stated that they are not familiar with NBSAP-2015. Thirdly, there was no resource mobilization, monitoring and evaluation plan for NBSAP-2015. To overcome this shortcoming, the present NBSAP has a companion document of resource mobilization, monitoring and evaluation. Fourthly, Eritrea has to align its NBSAP with the Kunming-Montreal Global Biodiversity Framework.

The preparation of NBSAP entails a country-led, inclusive process. Hence, the NBSAP (2026-2030) adopted a whole-of-Government and Whole-of-Society approaches to overcome the shortcoings of NBSAP-2015. The NBSAP (2026-2030) endevours to promote the well-being of people by balancing the imperatives of development with the conservation and sustainable use of ecological resources. Care has been taken to ensure that the proposed actions can easily be mainstreamed into the plans and programmes of different sectors without creating additional burden on them.

NBSAP (2026-2030) is structured around nine chapters. The core focus however is on the 13 Targets and 212 corresponding priority actions, indicators, implementing agencies and budget for each action. The targets are derived from the Kunming-Montreal Global Biodiversity Framework, but contextualized to reflect Eritrean realities. Some of the targets are actually a combination of two or more of the Global Biodiversity Framework targets. Each target is supported by evidenc-based justification.

The Eritrean Biodiversity Context

Eritrea has rich biodiversity, but fragile ecosystems that are hilly/mountainous and arid/semiarid. The Eritrean biodiversity comprises of terrestrial, marine and agricultural biodiversity. Assessments conducted by the National Databse of Flora and Fauna indicate that the Eritrean biodiversity comprises of 2508 plant species, 84 terrestrial and 17 marine mammals, 516 terrestrial and 81 sea/shore birds, 101 reptiles and 5 marine turtles, 27 amphibians, 293 invertebrate species, 569 fish species, 208 seaweeds, 8 seagrass, 3 mangroves, 29 halophytes, 202 marine invertebrates, and 219 hard and 28 soft coral species. Eritrea shares endemic species with its neighbours.

Although most of the species have no conservation concerns, some of the species are categorized as critically endangered, endangered, vulnerable, threatned or near threatened. Seven plant, 6 bird, 1 mammal, 2 fish, 1 sea turtle species are critically endangered; 8 plant, 11 bird, 3 mammal, 7 fish, 3 marine invertebrate, 1 turtle species and 1 halophyte are endangered; 23 plant, 15 bird, 7 mammal, 18 fish, 16 coral, 4 marine invertebrate species are vulnerable; and 20 plant, 15 bird, 3 mammal, 3 reptile, 19 fish, and 20 coral species are near threatened.

Eritrea is part of N.I. Vavilov's Abyssinian Center of crop diversity and it is considered origin of 18 cutivated and wild crop species. The country has six agro-ecological zones that are suitable for the cultivation of various crops. Eritrean farmers cultivate variety of field crops with their landraces, horticultural, and forage crops. There are 51 sorghum, 12 maize, 16 barley, 10 taff, 17 pearl millet, 8 finger millet, 8 sesame, and 2 niger seed varieties. Moreover, 5 wild crop species and 15 wild vegetable species have been identified so far. Eritrea is also rich in livestock diversity. It hosts 5 breeds of cattle, 5 breeds of sheep, 6 breeds of goats, 4 breeds of camels, 3 breeds of donkeys, 2 breeds of horses, one breed of mule, 7 breeds of chicken and 2 sub-species of wild honeybee. Some of the crop varieties have concervation concerns. Four sorghum, 1 pearl millet, 2 wheat, and 1 barley varieties are extinct; 6 sorghum, 2 pearl millet, 3 wheat and 1 barley varieties are endangered; and 3 sorghum, 3 wheat and 2 barley varieties are near threatned.

At present the Eritrean biodiversity and ecosystems face various threats and risks of extinction. Some wildlife such as giraffe (*Giraffa camelopardalis*), that existed in Eritrea before, do not exist today; others like the Nubian wild ass (*Equus africanus africanus*) and Tora hartebeest (*Alecelaphus buselaphus*) and have not been observed for many years. Others like the Nubian ibex (C*apra ibex nubiana*), the African wild ass (*Equus africanus somaliensis*), Eritrean Gazelle (*Eudorcas tilonura*) and the African bush elephant (*Loxodonta Africana*) exist in small herds. Similarly, the five sea turtles found in the Eritrean seacoasts, dugong (*Dugong dugon*), some whale and some fish species are highly threatened. Many crop landraces have also disappeared and others face risk of extinction. The major threats include habitat loss and/or fragmentation, ecosystem degradation, overexploitation, climate change, invasive alien species, pollution, ocean acidification, global warming and coral bleaching, infrastructure development (road, dams, etc.),

inappropriate fishing practices such trawling, inappropriate farming practices, wide spread use of exotic (improved) crop varieties, uncontrolled cross-breeding, and diseases and pests.

Biodiversity Targets

The targets, objectives, and actions of NBSAP (2026-2030) have been carefully identified to tackle the threats and ensure effective management and conservation of biodiversity, as well as the restoration of degraded ecosystems. The principal components of the NBSAP (2026-2030), including the vision, mission, guiding principles, targets, objectives and actions, were identified in consultation with relevant stakeholders. A draft of the targets, along with their justifications, was shared with the stakeholders to ensure their relevance, importance, effectiveness and implementability. The targets represent the priority biodiversity issues that the NBSAP aims to address. They are fully aligned with the GBF targets, SDGs and national development policies and programmes. Anchored on the overall vision "Eritrea's biodiversity is valued, protected, managed, restored and sustainably used to ensure equitable benefits to the people of Eritrea, now and in the future", each target comprises a set of objectives, and each objective has a set of time-bound actions, indicators, implementing agencies, and the resources required for implementation. The objectives, actions, timeframe, indicators, implementing agencies, and resource required for the implementation of each action are presented in a table for each target. The targets, in abridged form, are:

1) Restoration or rehabilitation of degraded terrestrial, coastal and marine ecosystems
2) Conservation of selected biodiversity hotspots through area-based conservation methods, including protected areas
3) Prevention of extinction of known threatened or near threatened flora, fauna, crop landraces and livestock breeds
4) Ensuring sustainable use, harvesting and trade of wild species
5) Prevention of introduction, establishment and spread of invasive alien species
6) Prevention of pollution from excess nutrients, pesticides and herbicides
7) Reduction of impact climate change and ocean acidification on biodiversity
8) Ensuring fair and equitable access and benefits sharing arising from the utilization of genetic resources and traditional knowledge; digital sequence facilitated
9) Mobilization of financial resources for the effective implementation of the NBSAP (2026-2030)
10) Strengthening the capacity of institutions dealing with biodiversity and enhancing science based and traditional knowledge of biodiversity
11) Raising awareness of the population of Eritrea of the values, importance and conservation of biodiversity
12) Promotion of involvemenet of local communities, women, girls and disabled persons in the management of agricultural, terrestrial and marine biodiversity
13) Strengthen the capacity of biosafety and biotechnology techniques and minimize negative impacts of living modified organisms (LMOs)

Implementation Framework

The NBSAP (2026-2030) is a national document. It belongs to all relevant stakeholders and institutions, and they must share the responsibility to implement it effectively and timely. The NBSAP (2026-2030) must be mainstreamed and integrated into the strategic plans and progarmmes of all relevant sector ministries, Zoba and Sub-Zoba administrations, local

communities and CBOs. This will require commitment, collective action, cooperation and coordination among the relevant actors. Since the policy and legislative framework in Eritrea is still developing, this provides an important opportunity to integrate the actions for biodiversity conservation and sustainable use into the relevant sectors.

To ensure that actions plans are properly mainstreamed to the strategic programmes and activities of the relevant institutions, a mechanism should be put in place. To that end, an implementation framework has been suggested.

The implementation framework entails the establishment of a National Steering Committee under the Ministry of Land, Water and Environment, with members drawn from the relevant ministries, authorities and CBOs. The main task of the National Steering Committee will be to oversee and monitor the overall implementation of the NBSAP within the timeframe specified. The National Steering Committee will reach out to the key stakeholders for the actions plans, establish a platform for consultation and communication among them, design a working relationship among them, plan public awareness and sensitization programmes, plan and organize trainings, and ensure that NBSAP (2026-2030) is adequately mainstreamed into the programmes of the relevant institutions. A Biodiversity Coordinator and a Scientific and Research Team will support the National Steering Committee. The National Biodiversity Coordinator will follow and coordinate the day-to-day activities relating to the implementation of NBSAP. The Scientific and Research Team will conduct research on terrestrial, marine and agro-biodiversity to improve understanding and knowledge of Eritrean biodiversity and update data and information on status, threats and trends of biodiversity of the country. The information generated will feed continually into the NBSAP (2026-2030). The Zoba and Sub-Zoba Administrations will monitor the implementation of NBSAP in their respective administrative areas.

Implementation of the NBSAP (2026-2030) will require internal and external financial resources. The total amount required for the 2026-2030 period is USD 48.1 million, of which 67% is expected to be mobilized from external sources. This implies that the relevant line ministries and other main stakeholder institutions must broaden and strengthen their relations with resource providers and enhance their efforts proactively to mobilize the resources required for the implementation of the NBSAP. Moreover, in order to ensure that the implementation of the NBSAP stays on track, and reaches its fullest potential, it will also require regular monitoring and periodic evaluations. In view of this, the Department of Environment, Ministry of Land, Water and Environment, which is the focal institution for CBD, has developed a companion document on Resource Mobilization, Monitoring and Evaluation Plan (RMMEP) to guide resource mobilization efforts and monitor implementation progress. The Resource Mobilization Plan enables the Department of Environmrnt and its collaborating stakeholders to follow a clear and structured approach to mobilizing (soliciting, acquiring, utilization, monitoring and managing of financial inflows) adequate resources from internal and external resource partners. The Monitoring and Evaluation Plan aims at assessing and documenting the successes and shortcomings of the implementation of NBSAP (2026-2030) and the Resource Mobilization Plan by tracking the resource mobilization strategies and actions as well as the indicators relating to the implementation of each of the targets and their corresponding strategic actions.

1. INTRODUCTION

It is now widely realised that humans cannot survive without biodiversity. Biodiversity represents the variety of plant and animal life at the ecosystem, community or species level (UNEP, 2002). The Convention on Biodiversity (Article 2 of the Convention), defined biodiversity as "… the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and among ecosystems".

Ecosystem, a term first used by ecologist Arthur G. Tansley in 1935, is understood as a web that functionally links biotic communities (plants, animals, insects, microbes) with their physical environment (soil, water, air, sunshine, etc.) (Ochola, 2010). Ecosystems provide many goods and services that are vital for the functioning of the biosphere, and provide the basis for the delivery of tangible benefits to human beings. According to Schröter (2009), ecosystems provide four major services: provisioning services (e.g. food, freshwater, fodder, fuel wood, biochemical); supporting services (e.g. soil formation, primary production, nutrient recycling); regulating services (e.g. climate regulation, carbon sequestration, disease and pest regulation, pollination, water and air purification), and cultural services, (e.g. spiritual, aesthetic and recreational values).

The Government of the State of Eritrea (GoSE) recognizes that the ecosystem services and biodiversity are of strategic importance for sustainable socioeconomic development. Indeed, the majority of Eritreans earn their livelihoods by directly using ecological, i.e. plants and animals, resources. Thus, Eritrea has been striving to maintain the vitality and diversity of its environmental resources by adopting adaptive environmental management plans that are in balance with its development imperatives.

Unfortunately, humanity now faces high rate of loss of biodiversity. In spite of the policies and plans formulated and actions taken by governments, loss and decline of biodiversity continues, mainly due to habitat destruction, overexploitation of ecological resources, drought, spread of invasive alien species, genetic erosion of indigenous species, spread of settlements, infrastructure development, etc. The Red List Index, which measures trends in the overall extinction risk of sets of species, shows that, overall species are declining in population and distribution and, hence, moving faster towards extinction. If the present trends are to be reversed or halted, urgent and decisive actions have to be taken now to conserve and maintain genes, species and ecosystems.

The conservation of biodiversity has thus become a global concern, requiring urgent actions. Needless to say, the sustainable management and use of biological resources requires effective national action and international cooperation. To that end, the United Nations Convention on Biological Diversity was finalized in Nairobi in May 1992 and opened for signature at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro on 5 June 1992. It entered into force on 29 December 1993 with the objectives of the "…conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding" (Article 1 of the UNCBD). The UNCBD has been signed by 196 countries (parties); it is supplemented by two

agreements: the Cartagena Protocol on Biosafety (CPB) and the Nagoya Protocol on Access and Benefit Sharing (ABS). Eritrea officially acceded to the UNCBD on 21 March 1996, to CPA on 10 March 2005, and to Nagoya Protocol on 11 June 2019.

The UNCBD requires that each party to the Convention must prepare and adopt a NBSAP to achieve the objectives of the Convention (Article 6). Eritrea has complied with the requirements of the Convention. Ever since its accession, the country has taken important steps to conserve its biodiversity resources and maintain ecosystem integrity and services. In compliance with its commitment to the UNCBD, Eritrea developed and endorsed a NBSAP through a broad-based national consultation process in 2000.

At the tenth Conference of Parties of the UNCBD held in 2010, Nagoya, Japan, the Parties adopted the UNCBD's Strategic Plan for Biodiversity, known as the Aichi Biodiversity Targets, for 2011-2020, and they agreed to revise and update their national biodiversity strategies and action plans based on the strategic plan. Accordingly, Eritrea revised its first NBSAP in 2015.

After recognizing the lack of progress made in achieving the Aichi Biodiversity Targets, the fifteenth meeting of the Parties, COP 15, in decision 15/6, requested the Parties to revise and update their national biodiversity strategies and action plans, by aligning them with the Kunming-Montreal Global Biodiversity Framework (GBF) and its goals and targets. In compliance with the COP 15 decision, Eritrea decided to revise and update its NBSAP-2015. Accordingly, the MoLWE, with the support of NHERI and a task team of technical assistants/experts drawn from relevant institutions produced this updated and revised NBSAP (2026-2030).

2. COUNTRY CONTEXT

Eritrea is located in North Eastern Africa. It extends from 12°22'N to 18^0 02' N and 36^0 26'E to 43^0 13' E. The sovereign territory of the country consists of a land area of 124,320 km^2 and territorial waters of more than 55,000 Km^2; the country can also claim much larger (more than 120,000 km^2) exclusive economic zone in the Red Sea, over which it could exercise exclusive use right. Eritrea enjoys a total coastline of 3300 km, of which the mainland coastline is 1350 km, while the 354 islands and islets have a combined coastline of 1950 km (Ministry of Fisheries, 2007). The population was estimated at 3.7 million in 2024, with a natural growth rate of 2.4% (MoFND, 2024) and it is expected to reach 4.7 million in 2035. Life expectancy stands at 66.6 years. About two-third of the population lives in rural areas. The country is divided into six administrative regions, commonly referred to as Zobas (zones), namely Anseba, Debub, Gash Barka, Maekel, Seminawi Keih Bahri, and Debubawi Keih Bahri. The Zobas are further divided into Nues Zobas (Sub-Zones) and Kebabi Memehedar (Local Administrations) (See Table 2 for more information).

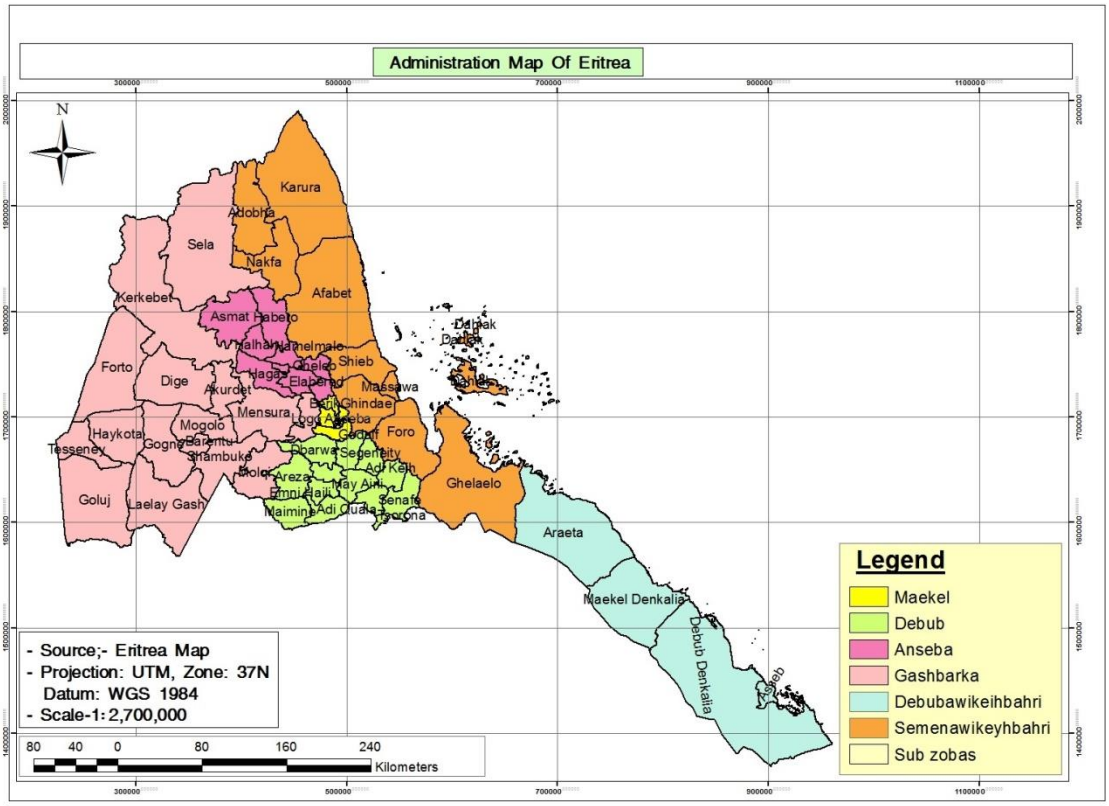

Figure 1: Administrative Regions

The Eritrean economy is dominantly agrarian, particularly in terms of employment; over 60% of the population earn their income from subsistence crop farming and livestock rearing, but the sector contributes only about 20% to the national GDP (MoA, 2017).

Eritrea occupies a harsh environment in the Eastern end of the Sahel, and it is at the frontline of environmental problems. The Sahel is experiencing the fastest rate of land degradation. Millions of hectares of land have been degraded beyond rehabilitation, and large parts are vulnerable to desertification. Eritrea has two fragile ecosystems: mountainous / hilly and arid / semiarid, which are vulnerable to the processes of land degradation, loss of biodiversity and threats of desertification.

2.1. Geology and Physiography

The geology and topographic features of Eritrea are the results of its tectonic, volcanic and denudational history. The greater part of the country is covered by the Precambrian Basement Complex, the oldest rocks in the country consisting of mainly schist, gneiss, and granite. Hardened lateritic materials from the Paleozoic Era, commonly referred to as fossil rocks, have restricted surface coverage and they are mainly found in the Central Plateau around Asmara where they form reddish hills, overlying the Precambrian formations. Sedimentary rocks from the Mesozoic Era, are mainly found in few places in Danakil and the south eastern highlands, where they form the highest parts of the country, representing the greatest thrust of uplifting during the Cenozoic Era. Trappean lava from the Palaeogenic, mainly composed of basalt and trachyte, cover parts of the Central Plateau south of Asmara, the entire Southern Plateau, and parts of the South Eastern Highlands around Senafe. The Neogenic formations are found in the Eastern Lowlands, mainly in the Danakil area, where evaporates and rock salt are also found. Neogenic alluviums are also found mainly in the lowlands and inter-montane depressions.

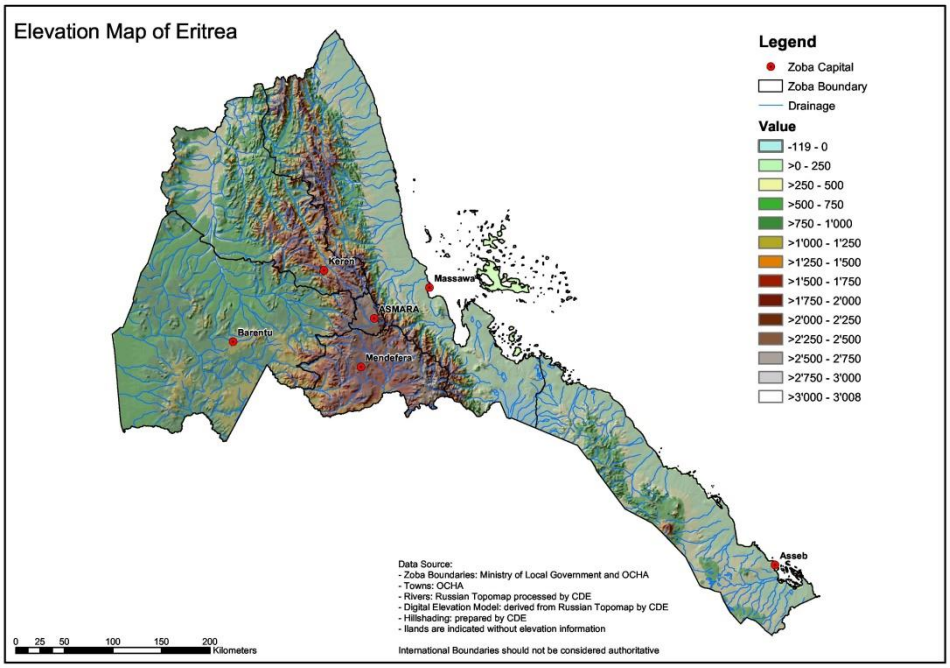

Figure 2: Elevation Map

With altitudinal ranges of about 100 meters below sea level in the Danakil depression to over 3000 meters above mean sea level in the Eastern Plateau, Eritrea is a land of extremes in terms of its topographic conditions. The country is divided into three broad physiographic regions: the Highland-Plateau Zone, the Lowland Zone and the Escarpment Zone. The Highland Zone, which is made up of undulating plateaus, hills, mountain ranges and inter-montane basins occupies a

narrow strip in the middle parts of the country and extend from the Rora Highlands in the north to the basalt and sandstone plateaus of the south and southeast respectively. Most of the Highland Zone lies between 2000 and 2400 meters above mean sea level but some mountain peaks have higher altitudes with the highest summit at Emba Soira reaching 3018 meters. The Highlands are flanked by extensive lowlands in the east and west. Most of the Eastern Lowlands lie below 700 meter above mean sea level and merge with coastal plaints to form extensive lowlands parallel to the Red Sea. The Western Lowlands occupy the western and south western parts of the country, and lie below 600 meters above mean sea level, although isolated peaks may reach over 1500 meters. The Escarpments separate the Highlands from the Lowlands. The Eastern Escarpment, which forms the western side of the Great East African Rift Valley, is a spectacular landscape where the terrain descends in a very precipitous manner from 2340 meters in Asmara to sea level over a distance of less than 100 km. The Western Escarpment is less precipitous and the terrain descends gently from the Highlands to the Western Lowlands.

2.2. Climate:

Eritrea's climate is the result of its location, topography and air pressure systems in the inter-tropical and subtropical zones. The amount and distribution patterns of rainfall, temperature and potential evapotranspiration (PET) are the results of the direction of moisture bearing winds and topographic variations. The direction of moisture bearing winds in turn is primarily controlled by the pressure systems in inter-tropical and subtropical zones, the north-south shifts of these systems following the apparent movement of the sun, and the corresponding north-south oscillation of the inter-tropical convergence zone (ITCZ), which often follows the sun with a lag of about two months.

Located in the Sahelian rainfall zone, Eritrea's climate is dominantly hot and arid; only 10.7% of the area has mild and cool climate. Rainfall in Eritrea is not only unpredictable in its onset, cessation and amount, but also characterized by high inter-annual and intra-seasonal variability as well as spatial variability over short distances. Average annual rainfall is about 380 mm, varying from less than 50 mm in the southern parts of the coastal areas to over 1000 mm in a small part of the Eastern Escarpment. The annual rainfall ranges from 450 mm per annum to 600 mm per annum in the Central, Southern and Eastern highlands but decreases to less than 350 mm in the Northern Highlands (FAO, 2005). Most of the country gets its main rainfall during summer (June to September), but the Eastern Lowlands and parts of the Eastern Escarpment get their rainfall in winter (October to March). Some parts of the country get rainfall during spring and show a bimodal distribution, but this rainfall regime is highly unpredictable both in its occurrence and amount. Due to rugged topography of the highlands, thin soil formations and a completely deforested terrain, most of the rainfall received is lost as runoff, which at times turns into violent flash floods (FAO, 2005). About 70% of the country gets annual rainfall of less than 400mm, of which 32.5% gets annual rainfall of less than 200mm; 8% gets 400-500mm; 14% 500-600mm; 7% 600-700mm while 1.5% gets more than 700mm, of which only 0.5% gets more than 800 mm (T. Consult, 1998 quoting MoA, Sector Review, 1994). However, FAO (2005) country report shows that over 90 percent of the total area receives less than 450 mm and only one percent receives more than 650 mm of annual rainfall (Figure 3). Similarly, the Third National Communucation (DoE, 2021) shows that 65% of the country gets less than 350mm of rain a year.

Average temperatures are moderate in the Highlands (18-22°C), but high in the Western and Eastern Lowlands and Coastal Plains (30°C); maximum temperatures could go over 40°C in the Coastal Plains and over 35°C in the Western Lowlands. Diurnal ranges are low, but the lowlands have relatively high annual ranges of temperature.

PET is very high throughout the country, ranging from an average of about 1800 mm per annum in the highland areas to over 2000 mm per annum in the hot lowlands. Hence, Eritrea is a water deficit country. UNEP (2002) estimated that Eritrea's annual internal fresh water supply is 2.8 km^3, yielding a per capita water availability of 1000-1700 m^3 per year, which is much lower than the average for Africa (5,729 m^3 per year), making it one of the 14 water stressed countries of Africa. UNEP has further estimated that 42% of the total area of Eritrea that is not classified already as desert is vulnerable to desertification. This poses tremendous threat to the biological diversity of the country.

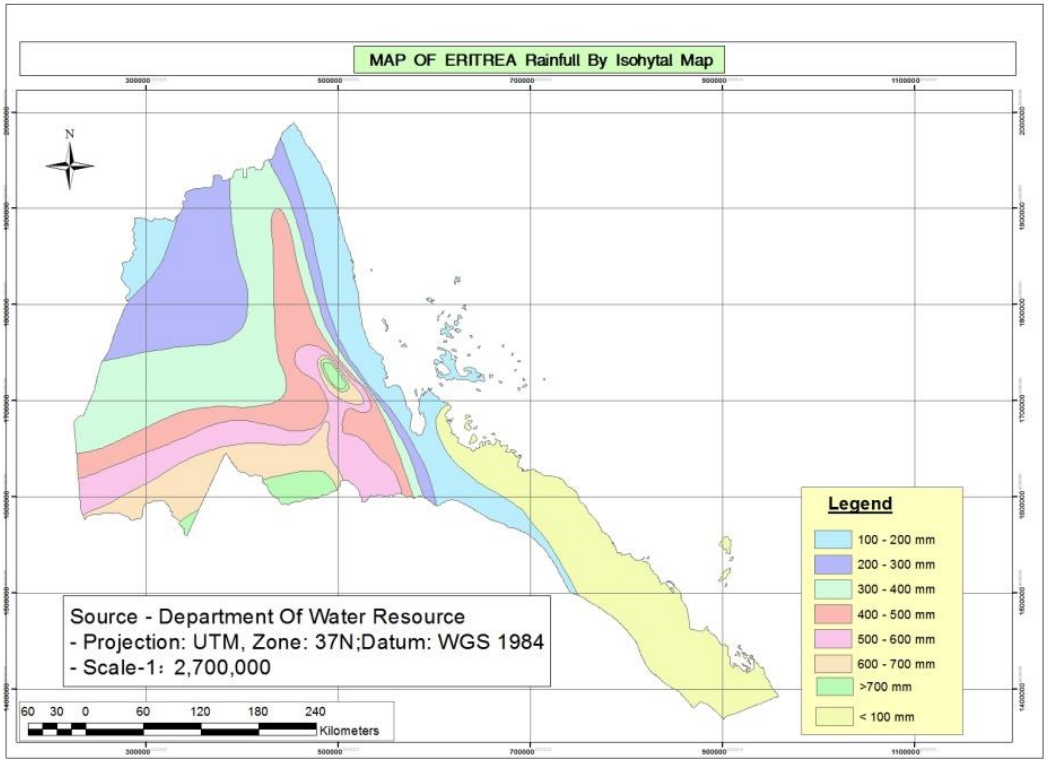

Figure 3: Rainfall Distribution Pattern.

Eritrea is located in the latitude zone (10-30^{O}N) where there has been a decline in rainfall. As outlined in the National Adaptation Programme of Action (NAPA, 2007) and National Communications documents, climatic hazards such as temperature increases, reduced precipitation, chronic and recurrent drought, flash flooding, and heat stress are among the major environmental problems facing the country. Climate variability and change is occurring in Eritrea.The National Communications and NAPA document evidences of observed and projected climate changes. For instance, the Third National Communication shows that mean annual precipitation has decreased by 17% - 30% between 1900 and 2018 (DoE, 2018). Moreover, the duration of the rainy period has decreased from about 5 months in the 1914-1923 period to about 2.5 months now excepting in occasional good years (MoA, 2002). Similarly, between 1961and

2018, mean maximum and mean minimum temperatures increased by 1.85 ^{O}C and 1.64 ^{O}C respectively in the plateau areas. However, in the coastal areas, a decrease of 2.5^{O}C in the mean maximum temepretaure was observed. The record also shows that droughts have become more frequent, more protracted, more sever, and cover larger areas. Between 1970 and 1989, the country witnessed 12 drought events. Between 1999 and 2004 more than half of all households in the country experienced at least one major drought shock.

2.3. Agroecological Zones

Based on differences in climatic, edaphic, topographic, land use and other attributes, Eritrea is divided into six agroecological zones (FAO, 1997a). A brief description of the agroecological zones is provided here (Figure 4).

- **Arid Lowland Zone**: This is found in the northern and western parts of Eritrea, excluding the coastal plains, the extreme north-west, and the lower parts of the eastern escarpment. Accounting for 34% of the total area of the country, it has elevations ranging from 400 meters to 1600 meters above sea level, with general slope of 0-30%. It is characterized by high mean annual temperatures (21-29^{O}C), low mean annual rainfall (200 – 500 mm) and very high PET (1800 – 2000 mm). The dependable length of growing period (DLGP) is 0-30 days. Its vegetation is dominantly bushes with scattered trees and the doum palm (*Hyphaene thebaica*) along rivers.
- **Semi-desert Zone**: Occupying the eastern coastal plains, including Denkalia and the area NW of Barka-Sawa Rivers, this accounts for 39% of the total area of the country, and forms the largest agroecological zone in Eritrea. Its altitude ranges from 100 meters to 1355 meters above sea, with slopes ranging from 0-30%. It is distinguished by high mean annual temperatures (24-32^{O}C), low mean annual rainfall (less than 200 mm) and high PET (1800-2100 mm), with zero DLGP. Its vegetation is dominantly bushes and grass with trees in wadis.
- **Moist Lowland Zone**: this accounts for 16% of the total area of the country. It is found mainly in the South-western Lowlands, and upper Mereb River (Hazemo, Mereb, Ubel, Aala) at an elevation of 500 - 1600 meters above sea level, with slopes ranging from 2% to 30%. With mean annual temperatures of 21-28^{O}C, mean annual rainfall of 500-800 mm, and PET of 1800-2000 mm, it has a DLGP of 50-90 days. Thus, crop production is concentrated in this agroecological zone. Its vegetation is dominantly bushland and grassland with *Acacia tortilis* and *Senegalia senegal* (*Acacia Senegal*) trees.
- **Moist Highland Zone**: This is found in the Central and Southern Highlands, Upland plateau of Rora and Hager. It covers 3% of the total area. With an altitude of 1600 – 3018 meters above sea level, it represents the highest agroecological zone in the country. Mean annual temperatures and mean annual rainfall ranges from 15 to 21^{O}C and 500-700 mm respectively; PET 1600-1800 mm. This agroecological zone has a DLGP of 60-110 days, making it another concentration area of crop production. Scattered trees and shrubs (*Juniperus procera; Olea europpae subsp. Cuspidate; Cordia Africana*) dominate the vegetation cover.
- **Sub-Humid Escarpment Zone:** This is found in the central and eastern escarpment of Semenawi Bahri, and it accounts for 0.9% of the total area. Altitude ranges from 600 to 2600 meters above sea level with slopes ranging from 8% to 100%. With a bimodal mean annual rainfall of 700-1100 mm, this is the wettest agroecological zone in the country. Its mean annual temperature, PET and DLGP are 16-27 ^{O}C, 1600-2000 mm and 90-240 days

respectively. This agroecological zone is an important biodiversity hotspot in the country. Its vegetation is dominantly *Juniperus/Olea* forest at higher altitude, but mixed forest and bushes at lower elevations. Most of this agroecological zone is under Protected Area.

- **Arid Highland Zone:** This is found at an altitude of 1600-2600 meters above sea level, with slopes ranging from 25 to 100%. Accounting for 3% of the total area of the country, it occupies the Northern Highlands, except Rora and Hager uplands, and Mount Ramlo in Denkalia. Its mean annual temperatures, mean annual rainfall, PET and DLGP are 15-21^{O}C, 200-500 mm, 1600-1800 mm and 0-30 days respectively. Its vegetation is mainly Bushland with scattered trees.

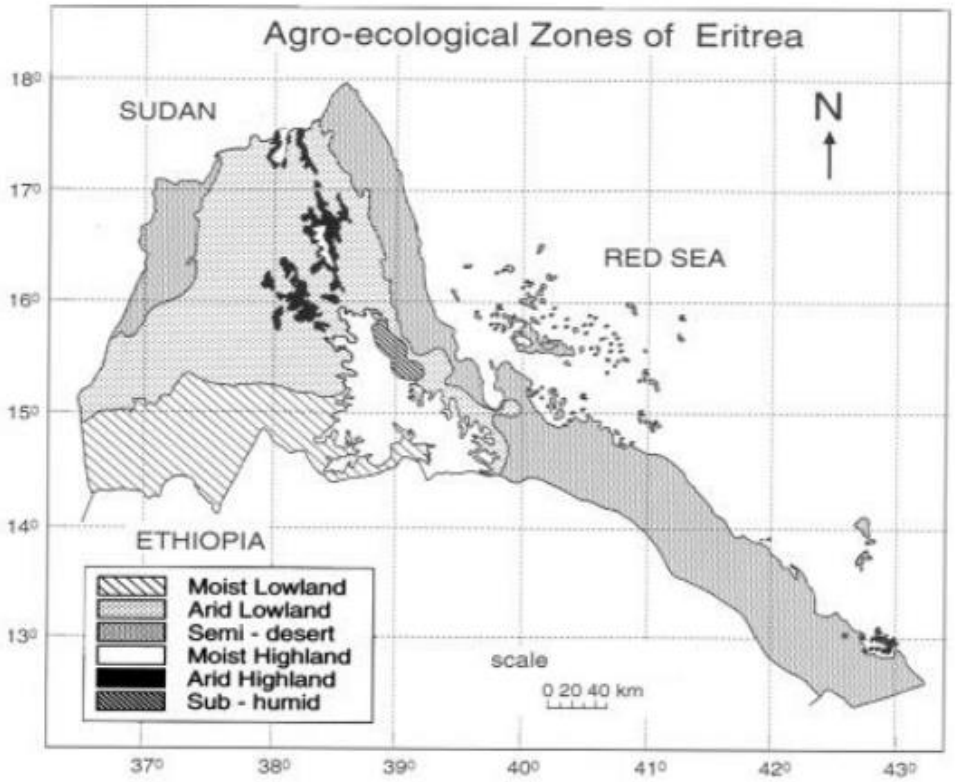

Figure 4: Agroecological Zones (FAO 1997)

2.4. Land Use and Land Cover

The land resources of Eritrea have not been studied in detail yet. There is still a serious gap in terms of accurate data on land use/land cover, which is vital for sound land use planning. The Land Proclamation No 58/1994 (MoLWE, 1998), and Land Use Planning Regulatory Framework, (MoLWE, 1997) regulate access to, and use of, land. Land use planning is urgently required for prudent use of land resources and prevention of land degradation. Recently Eritrea has started to prepare land use plan maps for the Administrative Regions. Once completed, the maps are expected to guide the allocation and management of land based on their inherent qualities.

Various documents provide different classification systems and different data, and selecting the appropriate one becomes difficult. The MoA (2002) for instance stated that agrciculture and

pastoralism are the main land use with cropland accounting for 3.5% and grazing land for 56.3% of the total area. About one-third (34.1%) of the total area is considered barren land. The woody vegetation coveres only 5.9% of which highland forest accounted for 0.4% only; the rest is urban land (0.1%). For comparision, the data for land cover provided by the DoE/MoLWE (2008) is given in Table 1 below.

Table 1: Land cover of Eritrea

Land cover category	Area (km^2)	% of total land area
Closed Woodland	4,600	3.7
Open Woodland	11,200	8.9
Grassland	25,700	20.4
Bush/Shrubland	53,400	42.4
Riverine Forest	1,900	1.5
Mangroves	100	0.1
Agriculture	7,700	6.1
Barren	18,700	14.9
Others	100	0.1
Not Classified	2,300	1.8
Total	125,700	100.00

SOURCE DoE, 1997a cited in DoE, MoLWE, (2008:46)

Table 2: Population, environmental and other data on Eritrea

No	Description		Reference Year	Value
1	Population	Total population[§](million)	2023	3.7
		Natural increase[§] rate	2023	2.4
		Percent rural[§]	2023	66%
		Percent urban[§]	2023	34%
		Population 15-64 years of age[ֆ]	2019	56.1%
		Population 65 years and above[ֆ]	2019	4.8%
		Juvenile population[§] (under 15 years of age	2023	40%
		Life expectancy at birth[§]	2023	67 years
2	Crude population density[§] (persons/Km^2)		2023	30
3	No. of schools[§]		2023	2351
4	Enrolment at all levels		2021/2022	
5	Literacy rate[ֆ]	Overall	2018	77%
		Male	2018	84%
		Female	2018	69%
6	Youth literacy[ֆ]	Overall	2018	93%
		Male	2018	94%
		Female	2018	93%
7	Net enrollment rate at elementary level[ֆ]		2019	83.7%

8	Gender Parity Index[§]	Primary level	2022/2023	0.917
		Secondary level	2022/2023	0.960
		Tertiary level	2022/2023	0.933
	Women holding positions[§]	Women in national assembly	2023	22%
		Women in regional assembly	2023	29%
		Women with ministerial position	2023	24%
9	Universal health coverage[֍]		2019	54.9%
10	Infant mortality rate[֍]		2020	18/1000
11	Maternal mortality rate[֍]		2019	184/100,000
12	No. of Health facilities[֍]		2022	335
13	Percent of population living within 5 km radius of a health facility[֍]		2022	70%
14	International Health Regulation (IHR) core capacity index score[֍]		2020	57%
	Access to safe drinking water[§]	Rural population	2023	79%
		Urban population	2023	95%
16	Percent of households[֍] with Access to toilets/latrines			33%
17	Percent of villages declared open defecation (ODF) free[֍]		2023	93%
18	No. of persons affectedby natural disasters[֍]		2023	551/100,000
19	Greenhouse gas emissions[֍] (megatonnes of CO_2 equivalent)	Total emission	2018	6.396
		Per capita emission*	2018	0.2 tonnes/yearr
20	Extent to which Global Citizenship Education (GCED) and Education for Sustainable Education (ESD) are mainstreamed[֍]	National Education policies and guidelines	2022	0.81
		Curricula	2022	0.76
		Teacher education	2022	0.72
		Student assessment	2022	0.73
21	Access to Electricity[֍]	National (total	2020	52%
		Urban	2020	76%
		Rural	2020	39%
22	Share of non-renewable energy consumption[֍]		2020	78%
23	No. of improved stoves distributed[֍]		Up to 2020	170,000
24	Large and small dams[§]		2023	800
25	Wetland coverage[§]		2023	0.3%
26	Forest area*		2016	14.9%
27	Degraded land*		2016	35%
27	Red list index*		2018	0.907

Source: [֍]MoFND, (July, 2022), Eritrea and the 2030 Agenda: Voluntary National Review of Progress towards the Sustainable Development Goals, Asmara.
[§]MoFND, (2024), ERITREA - Second Voluntary National Review of Progress towards the Sustainable Development Goals, Asmara.
*UNDP (2019), Human Development Report, AGS, New York, USA

3. STATE OF BIODIVERSITY IN ERITREA

Eritrea is part of the Eastern African and Horn of Africa global biodiversity hotspots, but its biodiversity resources have not been studied thoroughly or systematically. There is indeed a critical paucity of information and knowledge on the country's biodiversity. There is no complete and credible documentation of Eritrea's fauna and flora yet. The Department of Environment, MoLWE, prepared a preliminary assessment of the country's biodiversity in 1999. Based on historical records and limited field surveillance, the checklist included plants, mammals, birds, reptiles, and amphibians. This posed a "problem of distinguishing between what had been recorded as historically present and what may actually be present today." (MoA, 2002). Recently, an initiative has been taken to update the stock checklist, and the range of taxa for which information is available and the status of various species is expected to improve. In general, the knowledge available is restricted to prominent tree and animal species, mainly mammals. Knowledge on the existence and status of less prominent species like reptiles, amphibians, fungi, invertebrates, microorganisms, is minimal or absent.

The current condition discussed above leads to two seemingly paradoxical situations. On one hand, it makes it quite challenging to formulate a comprehensive, relevant and effective national biodiversity strategy and action plan without adequate assessment and knowledge about species diversity, species richness, endangered species, local ecosystems and their services. On the other hand, our limited knowledge on biodiversity calls for the urgent need for conservation to ensure that species of great value are not irreversibly extirpated.

3.1. Terrestrial Biodiversity

Historically, the physical and climatic ranges of the country supported an equally diverse life, but its present biodiversity is limited in species richness, species diversity, and endemism. As narrated in the travelogues of past travellers, Eritrea had rich forest and wildlife resources in the past. Father Francisco Alvarez, a Portuguese missionary who visited Eritrea in 1520 on his way to Abyssinia, stated that nowhere else, except in the land of BahreNeghash, does one find such a large number and variety of crops, large herds of livestock, and abundant wildlife, despite high population density. He attributed the abundance of wildlife to non-existence of hunting by the local population, although wildlife damaged farmlands. In the mountains and ridges of the Escarpment, he reported to have seen many animals of various kinds, such as lions, elephants, tigers, ounces (wild feline), wolves, boars, stags, deer and different kinds of birds. He also saw 50-60 wild animals freely grazing or moving around Dibariwa, where he observed abundant fish in the streams, goose, wild chicken, large herds of rabbits, foxes, lions, vultures, francolin, sand grouse, falcons, crows, hawks, parrots, etc. (Alvarez, 1881:14). The NBSAP-2015 recorded, though not adequately verified, 136 species of mammals, over 600 species of birds, 90 species of reptiles, 19 species of amphibians and 24 vegetation types, each of which is composed of different types of plant species, and about 700 plant species. The latest information obtained from the National Database of Fauna and Flora of the Regulatory Services Department of (RSD), MoA, which was collected in collaboration with other stakeholders starting from 2020, and the updated Eritrea Biodiversity Stocktaking Assessment Report prepared by the DoE, MoLWE (2025) shows that there are 84 terrestrial and 17 marine mammal, 16 domestic animal, 516 terrestrial and 81 sea/shore bird, 27 amphibian, 101 terresterial reptiles and 5 marine turtles, 293 invertebrate (288 Arthropods and 5 Nematodes species), and 2,508 plant species.

At present the main areas of wildlife concentration are the Gash Barka Lowlands, Northwestern parts of Zoba Anseba, the Red Sea Coastal Plains (particularly the Buri Peninsula), and the Green Belt.

3.1.1. Flora biodiversity

The natural vegetation cover of Eritrea has not been thoroughly studied. Excepting for the high profile trees and shrubs, little is known about the general vegetation cover, particularly of forbs and graminoids (grasses). However, owing to its topographic, edaphic and climatic contrasts over short distances, Eritrea is endowed with varieties of plant species. According to many authorities in the field, the Horn of Africa (Ethiopia, Eritrea, Djibouti and Somalia) is a major centre of plant diversity and endemism, harbouring more than 8000 plant species, with 24 percent endemic to the region, many of which are useful plants (Vivero, Ensermu and Sebsebe, 2005). In the Quohaito Plateau alone, Ghebrehiwet (2018) recorded 121 flowering plants and two gymnosperms. The record includes *Aloe schoelleri*, which is found only in the Quohaito Plateau and *Ephedera somalensis*, which is found in Eritrea and Northern Somalia. The National Database of Fauna and Flora has so far identified 2508 plant species classified in 48 orders, 187 families and 897 genus, out of which 402 are shrubs (16.0%), and 283 (11.3%) are trees; there was no information for the remaining 310 (12.4%). Herbs (1128 or 50.0%) are the dominat plant species; the rest are grass species (298 or 11.9%), climbers (51), succulents (19), Rhizomes (11) and parasites (6). Grass, herbs, shrub and tree species account for 89.7% of the total flora species. The same database shows that 327 (13.0%) of the plant species in the country are exotic in origin, 1459 (58.2%) plant species are indigenous, but the origin of 722 (28.8%) plant species cannot be detrimned due to lack of accurate information.

3.1.1.1. Vegetation types of Eritrea

Eritrea houses varied ecosystems at various spatial scales across its territory, but some of them have undergone extreme degradation. Forests are believed to have covered a larger part in the past. The country has lost most of its forest cover for various reasons, and today it has small remnants of the forests in few places. In 1912, according to Fiori (2012) forests covered nearly 3.5 million hectares of land. According to NEMP-E (1995), and Bein et al. (1996), by 1952, this figure decreased to about 1.2 million hectares. The figure further decreased to 588,000 hectares by 1960. Now less than 117,000 hectares of Eritrea remain forested. Table 3 presents estimates of the area covered by the different types of vegetation in the six Zobas.

Table 3: Vegetation classification by Zoba

Vegetation Description	Anseba	Maekel	D.K. Bahri	Debub	S.K. Bahri	Gash-Baka	National	National
	(Km^2)	(Km^2)	(Km^2)	(Km^2)	(Km^2)	(Km^2)	(Km^2)	%
FOREST								0.8
Closed to Medium Closed	14	77		37	463		591	0.47
Open	133			15	262		410	0.33
WOODLAND								11.19
Closed to Medium Closed	523	8		448	832	2 722	4 533	3.60
Open	901	18	1 235	1 471	1 555	4 360	9 541	7.59
BUSH								63.12

Grassland/Wooded Grassland	13 943	52	3 678	907	669	6 327	25 577	20.33
Bushland	3 950	282	9 556	1 095	29 416	9 526	53 824	42.79
OTHER FOREST								1.53
Riverine Forest	341		43	99	110	1 272	1 865	1.48
Mangroves			45		19		64	0.05
OTHER CATEGORIES								21.28
Barren Soil	1 868	3	10 344	115	4 532	1 403	18 265	14.52
Agriculture	527	796		3 805	857	2 726	8 712	6.93
Other	4	39	116		9	67	234	0.19
NOT CLASSIFIED	581					1 591	2 172	1.72
TOTAL	22 784	1 274	25 018	7 992	38 724	29 995	125 787	100.00

Source: Interpretation of Landsat TM by FAO Project TCP/ERI/6712 (July, 1997)

Various attempts were made in the past to classify the vegetation of the country into broad "vegetation types", based on the dominant type of plants. A sample of vegetation types given by different authorities is provided in Table 4. Given that various classifications are available, NBSAP (2026-2030) uses and describes the vegetation types of the country based on the vegetation map of Africa developed by Frank White (1983).

Table 4: List of vegetation cover categories proposed by different authorities

No.	Authority	No. of Vegetation Types	Remarks
1	Pichi-Sermolli (1957)	13	Pichi-Sermolli prepared a vegetation map for Eritrea, Ethiopia and Somalia; he identified 24 vegetation types for the whole region, of which 13 are represented in Eritrea
2	Frank White (1983)	9	White prepared a vegetation map for the whole of Africa; 9 of these are represented in Eritrea
3	Flora of Ethiopia and Eritrea (2009)	5	These are broad vegetation types, more or less corresponding to the physiographic regions of the country
4	Ethiopian Mapping Agency (1988)	7	The National Atlas of Ethiopia of 1988 shows 7 climax vegetation types for Eritrea
5	Land use Planning and Regulatory Department, (LPRD), MoA, Ethiopia (1986)	8	These were generated as part of land use /land cover study of Ethiopia
6	Sharma (1988)	8	Developed as part of African Eco-floristic zones, based on F. Blasco and E. Legris Eco-Floristic Zone (EFZ) Classification System
7	Nature Conservancy (2003)	7	Cited in Simon Measho, *et.al*. (2019); similar to White's vegetation mapping units for Eritrea

3.1.1.2. Frank White's vegetation types

Frank White (1983) published a vegetation classification map for Africa, based on physiognomic (vegetation structure), floristic composition and phytochoristic (species chorology or spatial patterns of species distribution and areas of plant endemism) at a scale of 1:5,000,000 (Kindt, *et.al*.2011). The vegetation map is accompanied by a legend and a descriptive memoir. His approach was to study physiognomy and species chorology independently, starting with physiognomy, which is mainly determined by climate, although local factors such as soils and water availability may also play a role.

White believed that the geographic distribution of plant species (plant chorology) is not entirely random. He argued that clear patterns exist, and they can be detected by careful analysis of the distribution patterns of a large number of species. Areas with the same floristic composition form a phytochorion. Phytochoria do not have sharp boundaries; they have transitional areas with species from adjacent phytochoria overlapping.

Using the approached briefly outlined above, White developed 16 main physiognomic types, 19 major vegetation types and mosaics, some of which are further divided into sub-vegetation types called Mapping Units (80 Mapping Units in total). In terms of Phytochoristic classification system, mainland Africa was divided into 8 centres of endemism, 6 regional transitions zones, 3 regional mosaics and one centre of extreme floristic impoverishment; the island of Madagascar had two more Phytochoria bringing the total to 20 for Africa ((Kindt, *et.al*.2011).

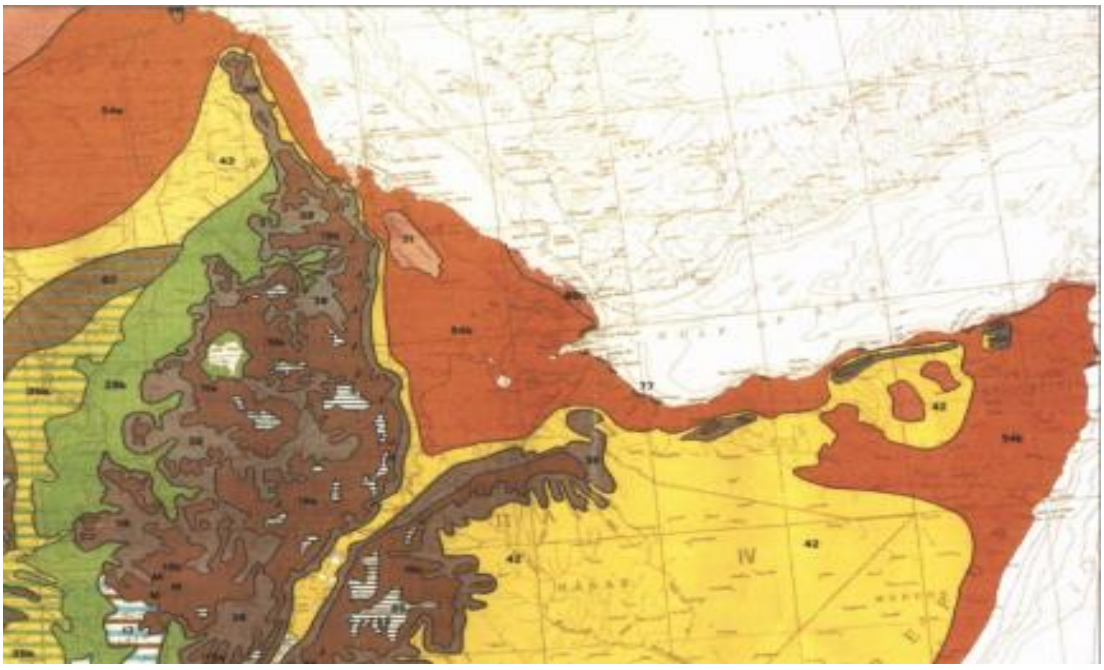

Figure 5: White's Mapping Units of Parts of the Horn of Africa

Source: Friis, Ib, Sebsebe Demissew and Paulo van Breugel, 2010.

A close examination of White's phtyochoria and vegetation maps shows that four of the Phytochoria and nine of the vegetation mapping units are represented in Eritrea. The four phytochoria are:

- Phytochoria III: Sudanian Regional Centre of Endemism
- Phtyochoria IV: Somali-Masai Regional Centre of Endemism
- Phytochoria VIII and IX: Afromontane Archipelago-like Regional Centre of Endemism including Afroalpine Archipelago-like Region of Extreme Floristic Impoverishment Regional Center of Endemism

The nine vegetation mapping units represented in Eritrea are discussed below:

1. **Undifferentiated Afromontane Forest** (**Mapping Unit 19a**): This falls within the Phytochoria VIII and IX: Afromontane Archipelago-like Regional Centre of Endemism including Afroalpine Archipelago-like Region of Extreme Floristic Impoverishment Regional Center of Endemism. It has a number of subtypes such as "*Juniperus procera''* Forest and "Mixed Forest" types. Extending north ward along the highland plateau and escarpments east of Adi Keih, it broadens around Asmara, includes the higher grounds of the Green Belt, and tappers northward where it exists in two isolated patches at Rora Hababb and Hager Mountains. Recently, some parts of the Afromontane Forest of Eritrea have been put under strict protection, where we find intact woody natural vegetation; under protection, it is fast regenerating and coverage, density and canopy has improved substantially in recent years.

   The Eritrean part of this vegetation types is the driest part and it is dominated by the Sub-types designated as Juniperus by White, mainly composed of *Juniperus procera* (Tsihdi) and *Olea europpae subsp. Cuspidate (*Awli'e*).* At higher elevations, *Juniperus procera* is dominant; as elevation decreses, *Olea europpae subsp. Cuspidate* becomes more dominant, along with other species like *Celtis africana* (Chebeale), *Carissa edulis* (Agam), *Teclea nobilis (*Suluh*),* and *Anogeissus leiocarpus* (Hantse) (Elias, 1998). In some places, shrubs, climbers and grass undergrowth are also found. Most of the trees are short, about 15 meters tall, scrub forest and evergreen bushlands type, but in areas where rainfall is over 1000 mm, tall trees of upto 30 meters may be found. Some of the species associated with *Juniperus procera* include *Nuxia congesta* (Atkaro) and *Kigelia africana* (Zlzle) (Bein et al., 1996). The undergrowth contains species like *Jasminum sp*. *Rosa abyssinica, Asparagus Africana*, various climbers, shrubs and herbaceous plants like *Panicum sp, Andropogon sp., Eragrostis sp. Elusein sp.* and *Bidens sp.*

Figure 6: a) Green Belt –Semineawi Bahri, and b) dense remnant forest of Olea europpae subsp. cuspidata, Mountain Bizen, SKB, 2013

(Source: DoE. 2015).

2. **Ethiopian Undifferentiated Woodland (Mapping Unit 29b)**: This vegetation type is found in eastern Gash Barka, south of Barnetu, and extends up to Keren in Zoba Anseba. The greater part of it corresponds with the Moist Lowland Agroecological Zone. This vegetation type is found between the East African Evergreen and Semi-evergreen Bushland and Thicket (Mapping Unit 38) and the Sahel Acacia Wooded Grassland and Deciduous Bushland (Mapping Unit 43). The dominant tree species are *Anogeissus leiocarpus* (Hantse), *Combretum collinum and Combretum hartmannianum* (Sesewe), *Sterculia setigeria* (Darle), *Balanites aegyptiaca* (Mequie), *Boswellia papyrifera* (Meker), *Commiphora africana* (Anqua), *Dalbergia melanoxylon* (Zbe), *Erythrina abyssinica* (Zwawe'a*), Gardenia ternifolia, Lannea schimperi* (Digdugna), *Lonchocarpus laxiflorus*, *Adansonia digitata* (Duma), *Zizyphus spina-christi* (Gaba), *Piliostigma thonningii* (Am'am Gemel), *Stereospermum kunthianum* (Arghezana) and *Terminalia brownii* (Waiba). Along river courses, *Hyphaene thebaica* (Arkobkobay), Ficus sp. and *Faiderbia albida* (Momona) are found. Recently, the mesquite tree/shrub (*Prosopis chilensis; P. juliflora*) (Temr Musa) is fast spreading in this vegetation zone.
3. **East African Evergreen and Semi-Evergreen Bushland and Thicket (Mapping Unit 38):** This vegetation type fringes, almost on all sides, the Undifferentiated Afromontane Forest. It occupies a large area in the southern parts of Eritrea, but tapers northward from the areas around Senafe and Adi Keih in Zoba Debub along the Eastern and Western Escarpments up to the border with the Sudan. Mostly, it occurs in the drier mountain and upland slopes. It forms an altitude-influenced transitional ecotone between the monatne, Juniperus forest, at higher altitudes and the Acacia/Commiphora bushland and thicket at lower elevations. This vegetation type shows great diversity both in floristic composition and species richness. The most common or representative species include *Carissa edulis* (Agam), *Dodonaea angustifolia* (Tahses), *Olea eurpaea spp. africana* (Awlie), *Tarchonanthys camphoratus* (Ebokh), *Achokanthra schimperi* (Mebtae), *Euclea schimperi* (Kleaw), *Teclia nobilis* (Suluh) *Sanseviera sp*. (Eqa) and succulent species of Aloe and Euphorbia.
4. **Somalia-Masai Acacia-Commiphora Deciduous Bushland and Thicket (Mapping Unit 42):** This vegetation type occupies in Eritrea a narrow zone in the East, paralleling the East African Evergreen and Semi-evergreen Bushland and Thicket in a north-south orientation. It forms a dense spinous bushland, mostly 3-5 meters tall with scattered trees of up to 9 meters. In localized places, it forms impenetrable thicket. This vegetation type also shows significant variation in floristic composition, but species of *Acacia, Commiphora* and *Grewia* are almost always present. In Eritrea, the species present in this vegetation type include *Acacia mellifera* (Kenteb; Queday), *A. Nilotica (*Ghered*), Dobera glabara* (Garsay), *Salvadora perisca* (Aday), *Balanites aegyptica* (Mequi'e), *Grewia sp.* (Zerie Mesequa), *Calotropis procera* (Ghindae), *Tamarix aphylla* (Ubel), *Boscia angustifolia* (Kermed), *Cadaba farinosa* (Lecheb), *Euphorbia rebecchi*, *Euphorbia candelabra (*Quolqual*), Adansonia digitata* (Duma). Few climbers like *Vanilla roscheri* and various ephemeral grass species like *Aristida adscensionis, Cynodon dactylon, Eragrostis spp.* are also found.
5. **Sahel Acacia Wooded Grassland and Deciduous Bushland (Mapping Unit 43)**: This mapping unit comprises of two subtypes, namely the Sahel Wooded Grassland and the Sahel Deciduous Bushland. In Eritrea, the Sahel Acacia Wooded Grassland appears to be the dominant subtype, and it occupies the Western Lowlands west and north of a line that runs from Om Hager and Barentu to Keren; following the edge of the Western Escarpment, it extends northward up to the border with the Sudan. There is little information on the floristic composition of this

vegetation type. Some of the species found here are various species of the genus *Acacia, Balanites aegyptica, Boscia senegalensis, Capparis decidua, Commiphora Africana, Aloe spp.* and where the water table is not deep, *Calatropis procera* are found. In the southern parts, especially around Keren, *Adansonia digitata* is also found. Along river courses, *Tamarindus indica* (Humer) and *Tamarix aphylla* may also be found. The grass sward forms a continuous cover of about 60 cm tall, consisting mainly of annual species like *Arisitida spp., Panicum spp*. and some perennial grasses like *Andropogon spp*.

6. **Sahel Semi-desert Grassland and the Transition to the Sudan (Mapping Unit 54a)**: Prevailing in areas where annual rainfall is less than 250 mm, this vegetation type occupies the northern parts of the Sahel. In Eritrea it occupies the western-most parts of the Western Lowlands. Composed of bushes and small bushy trees, it represents the driest vegetation type within the Western Lowlands, and it shows close affinity with the vegetation type in the Sudan. Excepting in rocky outcrops and where soil moisture is relatively better, the crown cover of woody species is less than 10%. The main species are *Acacia tortilis* (Alla), *A. ehrenbergian* (flava)-Qeyh Chea), *A. Laeta* (Kenteb), *Commiphora Africana, Balanites aegyptica*, *Boscia senegalensis* (Obo), *Senegalia Senegal* (previously *Acacia Senegal*), and in brackish water receiving soils *Tamarix aphylla* and *Salvadora perisca* occur. Annual grass species like *Aristida stipoides*, *Cenchurus biflorus*, *Tragus racemosus* are also found. In places where annual rainfall is about 100 mm, *Panicum turgidum* dominates and woody species like *Senegalia Senegal, Balanites aegyptica* and *Commiphora Africana* are almost absent where this grass species dominates.
7. **Somalia-Masai Semi-desert Grassland and Shrubland (Mapping Unit 54b)**: This vegetation mosaic prevails in areas where annual rainfall ranges between 100 mm and 200 mm. In Eritrea it is found in the Coastal Plains of the Red Sea, excluding a small stretch of land in the south-eastern coasts where the Red Sea Coastal Desert (Mapping Unit 68b) prevails. This vegetation type is dominated by semi-desert grassland. In the southern parts of this vegetation mosaic, according to Futsum Hagos, *et.al*. (2019), the plain area is dominated by *Panicum turgidum* whereas the rocky plains are dominated by *Acacia tortilis*. In the sandy plains, widely scattered *Acacia tortilis* (Alla), *A. nubica* (Ghumero), *A. Laeta* (Kenteb), *Salvadora perisca* (Aday), *and Ziziphus spina-christ*i (Gaba) are found. In low depressions *Tamarix aphylla* (Ubel) is found while in places close to the sea, halophytic vegetation like *Suaeda monica* are found. In the central and northern parts, various species are found. Around the plains of Zula, for instance, a patchy cover of *Suaeda monica* (Hichum) with a ground cover *Cenchrus ciliaris* grass prevail. Further north along the coastal plains, scattered *A. Tortilis* with *Panicum turgidum are* the characteristic species, but these species may be accompanied by *Capparis decidua*, *Jatropha pelargonifola, Zygophyllum simplex,* and *Aristida spp.* North of Wadi Felket, there is an extensive open plain with low sparse vegetation comprising mainly of grasses like *Cenchurus ciliate, Arisdia sp., Lepthothrium senegalnesis, along with Euphorbia granulate, Indigofera spinosa, Tribulus longipetalus* and *Ipomaea sultani*. In the Wadis, *Tamarix aphylla, Zyziphus spina-christis,* and *Salvadora perisca* are found. Various succulents like *Euphorbia cuneata* and *Aloe species like Aloe breviscpra, Aloe rigens, Aloe scobinifolia* are also found. Further inland, this vegetation mosaic gives way to Somalia-Masai Acacia-Commiphora Deciduous Bushland and Thicket (Mapping Unit 42).
8. **The Red Sea Coastal Desert (Mapping Unit 68b)**: This vegetation mosaic occupies a stretch of land along the southern coastal plains of the Red Sea with a width of 15-20 km, and it extends to Djibouti. Rainfall in this part of Eritrea is less than 100 mm. Excepting in the Wadis and the

littoral areas, the area is almost devoid of any vegetation cover. In the salt marshes, species like *Suaeda monica, Zygophyllum album, Nitraria retusa*, are found; in the Wadis, species like *Tamarix sp., Acacia tortilis, Capparis decidua, Panicum turgidum* are found.

9. **Wadis and Bare Desert (Regs and Hamada) (Mapping Unit 78**): This is found in the Danakil Depression part of Eritrea. The higher grounds such as Mt. Ramlu have relatively more varied flora species and animal diversity compared to the low-lying areas. In smaller sandy wadis where the water table does not exceed 8 meters, *Tamarix* communities thrive. Acacia communities prevail in seasonally flooded, rocky wadis and alluvial outwash fans. The most widespread community in such sites are characterized by *Acacia tortilis* and *Panicum turgidum*. Others include *Zilla spinosa, Acacia tortilis, subsp. Raddiana, A. ehrenbergiana, Balanites aegyptica, Capparis decidua, Calotropis procera, Salvadora persica, and Ziziphus muaritaniana*. In the larger wadis, *Hyphaene thebaica* communities prevail intermingled with various species like *Acacia nilotica subsp. Adstringens* and *Acacia albida, Salvadora persica and Tamarix articulata*. In the Danakil Depression where soils are salty, *Suaeda monica* and *salicornia spp*. are found.

Figure 7: Dracaena ombet, endemic and endangered species, Semienawi Bahri

Figure 8: Aloe neosteudneri, threatened by alien invasive species of Opuntia ficus-indica (Source: DoE, 2015)

Figure 9: Aloe schoeleri a, critically endangered endemic species, Quohaito

3.1.2. Fauna Biodiversity

In the past, Eritrea is believed to have housed a wide diversity of wildlife. However, frequent natural calamities such as drought, the thirty-year war of liberation, loss and/or fragmentation of habitat, ecosystem degradation, and policy of neglect pursued by colonial powers have resulted in massive decline in species diversity and species population. Most of the current knowledge is about cursorial (on the ground and running) animals; the knowledge about fossorial (burrowing) and arboreal (climbing) mammals in particular is limited. The country continues to provide habitat for African bush elephant, hyena, jackal, greater kudu, African wild ass, Eritrean gazelle, Soemmerring's gazelle, bushback, warthog, Nubian ibex, leopard, Colobus monkey and numerous other species. Various species of birds, amphibians, reptiles and invertebrates are also found in the country. A brief account of the Eritrean fauna is given below.

3.1.2.1 Mammals

According to the Eritrea Biodiversity Stock Taking Assessment Report of 2008 (DoE, MoLWE, 2008), the checklist for mammals comprised of 126 wild mammal species (117 terrestrial and 9 marine mammals belonging to 12 orders and 38 families), which is the same figure provided by Worldrainforest for 2025. This figure accounts for 1.97% of the global share of mammal species

(Worldrainforest, 2025). However, this seems to be based on what was "likely to have been present" in the country during the 19th Century. The checklist for 2008 includes bats (chiropetera), rodents, insectivores, primates, carnivore artiodactyla, (even-toed ungulates), perrisodactyla (odd-toed ungulates), cetacea (whales, dolphins, porpoises), sirena (dugong), and lagomorpha (rabbits and hares). According to the checklist of the Updated Stocktaking Assessment Report (DoE, 2025) there are 84 species of mammals (in 11 orders and 31 families), which have been properly described, and another 20 species of mammals which require verification. The IUCN chaecklist for Eritrea gives 121 mammal species, including 19 marine mammals.

Recent works by the Fauna Thematic Group of the National Database of Fauna and Flora shows that there are 84 terrestrial and 17 marine mammals. The marine mammals consist of 16 cetaceans (7 whales and 9 dolphins) and one dugong (*Dugong dugon*) (Notarbartolo*et al*. 2017). Out of the 16 cetacean species recorded from the Red Sea, fourteen have been recorded from the Eritrean coast. Two of these species, the dwarf sperm whale (*Kogia sima*) and the rough-toothed dolphin (*Steno bredanensis*), have so far been sighted from the Eritrean coasts only.

The Updated Stocktaking Assessment Report (DoE., 2025) has expanded the checklist list on bat spp. Based on the AFRICAN CHIROPTERA REPORT-2018, this report lists 38 bat species compared to 27 in the 2008 checklist, two of which are classified as threatened and two species with data deficient status.

The information on rodents and insectivores is even scantier. Based on the works of De Marchi et al. 2006 and Amori *et al*.2012, the latest draft of the Updated Stocktaking Assessment Report (DoE. 2025) has listed 18 rodents (compared to 24 in the 2008 checklist) and two insectivore species, none of which are endemic. However, the status of these species is unknown.

The current meagre knowledge of mammals is restricted to high profile animals. This includes African wild Ass, subspecies Nubian wild ass (*Equus africanus africanus)* and Somali wild ass (*Equus africanus somaliensis),* Warthog (*Phacochoerus aethiopicus; Phacochoerus africanu saeliana),* Dorcas gazelle *(Gazella dorcas),* Soemmerring's gazelle (*Nanger soemmerringii;* previously *Gazella soemmerringii),* Wild dog (*Lycaonpictus),* Eritrean gazelle (*Gazella rufifrons),* Nubian ibex *(Capra ibex nubiana),* which thrives in rugged desert habitats, African bush elephant *(Loxodonta Africana),* Greater kudu (*Tragelaphus strepsiceros),* bush buck *(Tragelaphus scriptus*), rock hyrax (*Procavia capensis/Heterohyrax brucei*). common ostrich (*Struthio Camelus*), etc. Wildlife like buffalo (*Syncerus caffer*), giraffe (*Giraffa camelopardalis*), lion (*Panthera leo*), cheetah (*Acinonyx jubatus*), aardvark (*Oryceteropus afer*), Beisa oryx-(*Oryx_beisa*). Tora hartebeest (*Alcelaphus buselaphus tora*) and Speke's gazelle (*Gazella spekei*), the smallest of the gazelle species, etc. that may have existed in the country in the past have not been observed recently.

Eritrea has no known endemic mammal species solely found within its political boundary, but it possibly shares endemic species with the neighbouring countries. For instance, the Tora hartebeest (*Acelaphalus buselaphalus tora*), although its present status is unknown, exists only in Eritrea and Northern Ethiopia (Tigray Region). Similarly, the critically endangered African Wild Ass (*Equus africanus somaliensis*) is found only in Eritrea, Ethiopia (almost extirpated) and Somalia in few numbers (Futsum, Jhon and James, 2019). The total herd size of the African Wild Ass is estimated at 600, of which 400 are found in Eritrea, about 40 Wild Ass per 40 km^2 in

Figure 10: Two threatened species: Wild Ass (Equus Africanus Somaliensis) and Tora Hartebeest (Alcelaphus buselaphus tora)

(Source: DoE, 2010; http://download Tora hartebeest1webp)

Figure 11: a) Speke's Gazelle (Gazella spekei),) and b) Greater Kudu - (Adult Male) Mogo Semienawi Bahri

(Source:a) http:// Gazelle. Webp; b) DoE, 2015)

Eritrea. Only Eritrea has a viable population of Wild Ass, mainly due to the conservation ethic of the Afar people (Moehlman, 2002). The Nubian wild ass (*Equus africanus africanus*), a subspecies of African Wild Ass, was spotted during aerial photograph flights in the 1970's in the Barka Valley of Eritrea and North-western border areas between Eritrea and the Sudan (Moehlman, 2002) but it has not been observed in recent years. Thus, it is presumed extirpated in Eritrea (MoLWE, DoE, 2024). The Eritrean Gazelle (*Eudorcas tilonura*) also called Heuglin's Gazelle, which is endemic to the Horn of Africa, was listed as extinct in Eritrea until it was recently sighted by conservationist who came across a small herd of them about 90 years later. The herd was confirmed to be Eritrean Gazelles by biologists.

Figure 12: Bushbucks (Tragelaphus scriptus): Female with young, and Male

(Source: http://330px-Bushbucks_(*Tragelaphus_scriptus*) female_and_young_(6017312458)

3.1.2.2. Birds

Eritrea is endowed with rich bird species. The Red Sea and its islands are attractive to birds. As most of islands are not inhabited, they have good environment for nesting by various types of birds. Thus, the country is also known for hosting migratory birds i.e. migration route and stop-over location for many bird species. At present, 14 Important Bird Areas (IBA), covering 28.011 km^2, have been identified (Birdlife International, 2025). The Semienawi and Debubawi Bahri Protected Area, Coastal areas and Islands, Senafe Bird Area and Western Eritrea are among the important bird areas.

The checklists for the birds of Eritrea mainly comes from studies done by Smith (1957), which lists 528 species, Urban and Brown (1970), Dowsett and Dowsett-Lemaire (1993), and C. Hillman's recent observations of birds in Eritrea from 1992-1997. The latest checklist of the Fauan Thematic Group of the National Database on Fauna and Flora and the Updated Stcoktaking Assessemnt report (DoE, 2025) indicate the presence of 597 bird species (516 terrestrial and 81 sea/shore bird) in the country, including birds that breed on the islands. Some of the birds observed in the Dahlak and other islands are the Grey Heron (*Ardea cinera*), Red Billed Tropic Bird, Reef Heron (*Egretta gularis*), Curlew (*Numenius arquata*), Black-winged Stilt (*Himantopus himantopus*), Greater Flamingo (*Phoenicopterus rubber*), Pelican (*Pelican rufesceens*), Osprey bird (*Pandion haliaetus*), etc. The Avibase - The World Bird Database of Canada - lists 591 bird species for Eritrea for 2023 (Lepage, 2024), while the Eritrean Factsheet of Birdlife Interntaional provides 544 bird species. Three of the birds listed in the Avibase checklist are introduced species: House crow (*Corvus spendens*), House Sparrow (*Passer domesticus*) and the Rock Pigeon (*Columba livia*); the Egyptian goose, sometims considered an introduced bird, is actually an Intra-African Migrant (IAM) bird. As different sources give different number of bird species, all of them require detailed study for verification. Hence, the available data must be used with caution. The majority of birds that are found in Eritrea are resident birds (about 320). There are aslo Palearctic migrants (about 150), some of which (about 40) have known breeding records in Eritrea. The rest are either intra-African migrants or of unclear/unknown status (DoE, NABSAP, 2015).

Eritrea's endemic bird species remains unknown, but it is believed that it shares "regional endemics" with Ethiopia. Ethiopia has until now registered a total of 24 endemic species of birds,

commonly referred to as Abyssinian endemics (Weldemariam, 2016). Eritrea may be sharing 17 of these bird species, but the information and recorded observations on these birds are still too scanty to warrant definite presence of these birds in Eritrea. Ghebrehiwet (2018) provides list of 14 and photos of 12 of the Abyssinian endemics recored in Quohaito Plateau, Adi KeihSub-Zoba (see Annex 2), which lies within Senafe Bird Area (No.13). Examples of the bird species that are found only in Eritrea and Ethiopia include Rùppell's black chat (*Myrmecocichla melaena)* which dwells in rocky montane habitats, White-winged cliff-chat (*Myrmecocich lasemirufus*), Rouget's rail *(Rougetius rougetii),* which resides on the ground, the Golden backed wood pecker (*Dendropicos abyssinicus*), Black-headed Forest Oriole (*Oriolus monacha*), White-collared pigeon (*Columba albitorques*) White-billed starling (*Onychognathu salbirostris*), White-backed black tit (*Parus leuconotus*) and the Wattled Ibis (*Bostrychia carunculata*). Some of these birds like the Rouget's rail are globally near threatened bird species.

Figure 13: Ruppell's Black Chat (Myrmecocichla melaena) with (a) wings spread and (b) wings folded

(Source: https://ebird.org/species/ruecha1)

Figure 14: Some of the threatened birds (a) Black winged Love Bird (Agapornis taranta) and the Golden-Backed Woodpecker (Dinopium benghalense), also known as the Rumped Flameback

(Sources: https://ebird.org/species)

Figure 15: Near Threatened Arabian Bustard (Ardeotis arabs), Ghelalo, SKB, 2013 (NBSAP 2015) and Socotra cormorant (Phalacrocorax nigrogularis)

3.1.2.3. Reptiles

Many reptile species are found in different parts of Eritrea. Based on study made by Largen (1997; cited in DoE, 2008), about 90 reptile species, belonging to the four orders of Testudine (tortoise, turtles and terrapins), Sauria (lizards), Serpentes (snakes) and Crocodylia (crocodiles, have been recorded. The checklist includes sea turtles, tortoise and terrapins (9 species), crocodiles (1 species), lizards (45 species) and snakes (35 species). The book by Largen and Spawls (2010), *The Amphibians and Reptiles of Ethiopia and Eritrea*, provides an excellent description and photos of the species. Some of these records are historical, based on studies done during the Italian colonial period. The Fauna Thematic Group of the National Fuana and Flora Database recorded 101 terresterial reptile species and 5 marine turtles, belonging to 5 orders and 20 families. According to the MoMR (2007), of the seven turtle species present in the world oceans and seas, five of them are known to exist in the Eritrean coast of the Red Sea. These species are: Green turtle (*Chelonia mydas*), Hawksbill turtle (*Eretmochelys imbricate*), Olive Ridley turtle (*Lepidochelys olivacea*), Loggerhead Turtle (*Caretta caretta*), and Leather back turtle (*Dermochelys coriacea*). The Eritrea side-neck turtle (*Pelomedusa gehafie*), which had not been seen for almost 100 years and was declared extinct, was spotted in 2016. The Nile crocodile (*Crocodylus niloticus*) is also found in Eritrean rivers.

It is difficult to state exactly the state of all species of reptiles in the country, due to shortage of experts capable of field data collection, identification, and determination of their status. Some examples of snakes found in Eritrea are: North African Python (*Python sebae)*, longest snake in Africa and the only python found in Eritrea, Eritrean Blind Snake (*Letheiobia erythraea*), Eritrean Worm Snake (*Leptotyphlops erythraeus*), Egyptian Cobra (*Naja haja*), Black Mamba (*Dendroaspis polylepis*) Nubian spitting cobra (*Naja nubiae*) and the widely found Theba Sand Boa (*Eryx colubrinus*) (Largen and Spawls, 2010). Many species of lizards and chamealeons are also found in the country. Most of the Eritrean reptiles are associated with Savannah (37.5%) and desert (33.1%) ecosystems (DoE, 2008).

Eritrea has some endemic reptile species, but studies done todate are still incomplete. Some of the notable endemic reptile species are the Dahlak Islands Racer (*Platyceps largeni*), the Eritrean

Gracile Blind Snake (*Letheobia erythraea*), the Big-headed Carpet Viper (*Echis megalocephalus*), the cross-marked egg-eater (*Dasypeltis crucifera*), and the Eritrean side-necked turtle (*Pelomedusa gehafie*) (DoE, 2025). Massawa Gecho and Quohaito Lizard may also be endemic, but require further verification.

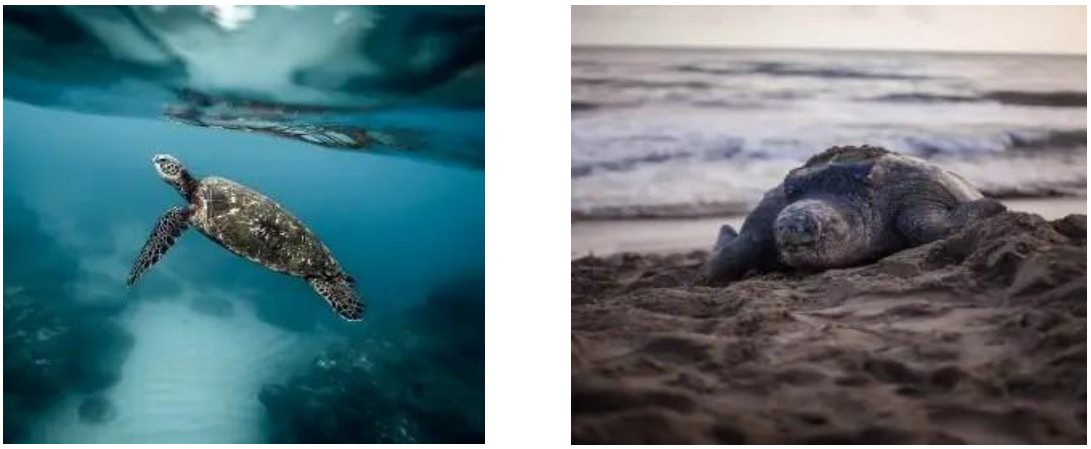

Figure 16: Green Sea turtle (Chelonia mydas) and Leather back sea turtle (Dermochelys coriacea)

3.1.2.4. Amphibians:

Various freshwater and marine amphibians exist in different parts of the country, particularly in wetland/swamp areas. Amphibians are sensitive to air and water conditions and their population status is often taken as a good indicator of the health of the environment. However, there is limited information on the amphibian species of the country; their population, distribution, ecological information, and the level of threat they face is almost unknown.

Based on records of the Italian colonial period and some rapid assessments conducted in the past years, about 19 amphibian species, belonging to five families, are recorded in the amphibian checklist of 2008. Recent updates for the amphibians checklist by the Fauna Thematic Group of the National Database of Fauna and Flora gives 27 species, of which 23 are classified as of least concern but there is no information for the remaining 4 species. However, these studies need further field works for verifications. The assessments done recently have revealed the presence of the Asmara Toad *(Sclerophyrs asmarae;* previously *Bufo asmarae*), which is the only toad named after any capital city. This is another "Lazarus species", believed to have been extirpated before, but which has been observed recently in the country.

3.1.2.5. Invertebrates

No comprehensive study has been conducted to assess the biodiversity of terrestrial invertebrates including worms, molluscs and arthropods. The Fauna Thematic Group of the National Database of Fauna and Flora, however, indicated the presence of 293 species (comprsing of 288 anthropdos and 5 nematods), belonging to 13 orders and 85 families; many of which are serious pests. The major pests are the three locust species that include Desert locust (Schistoceica gregamia), tree locust and African migratory locust, all of which inflict tremendous crop and vegetation damage during their outbreak.

3.2. Marine Biodiversity

The Red Sea is one of the global hotspots of biodiversity and it houses a very high endemism rate compared to adjacent marine regions. The Red Sea is partially isolated by the Strait of Bab al-Mandab in the south, where environmental conditions like temperature and salinity, as well as shallow depths, limit the spreading of species between the Red Sea and the Indian Ocean. The Red Sea is rich in marine fauna, but it is particularly noted for its endemic species including fishes, corals, and invertebrates (Bogorodsky and Randall, 2019).

Due to shortage of taxonomic experts and lack of identification materials, only a few studies have been conducted to identify the marine species. Based on the limited taxonomic works conducted in the Eritrean coast, the the Acquatic Thematic Group of the National Database of Fuana and Flora reported 208 seaweed, 8 seagrass, 3 mangrove, 219 hard coral, 28 soft coral, 569 fish, 5 sea turtles, 81 marine birds, 7 whale, 9 dolphin and one dugong species. However, there is no reported information on species identification of microorganisms, protozoans, sponges, nematodes, annelids, chaetognaths, tunicates, arthropods (except decapods) and other invertebrate phyla from the Eritrean coast of the Red Sea.

The Eritrean coast is endowed with diverse marine ecosystems that harbour rich biodiversity. These ecosystems include coral reefs, seagrass meadows, seaweed stands, mangrove swamps, and pelagic ecosystems. The status of these ecosystems in the Eritrean coast is described below.

3.2.1. Coral reefs

The Red Sea coral reefs are globally significant, harbouring high levels of biodiversity and supporting local economies through fisheries and tourism (Klaus, 2019). Along the 1,350 km Eritrean coastline and around most of its 350 islands, coral reefs are common, occurring as patches in a relatively pristine condition (Figure 17). Reports from the MoMR and Massawa College of Marine Science and Technology show that fringing reefs cover the mainland coast and the coasts of most islands. Based on the nature and distribution of coral reefs, the Eritrean coast of the Red Sea can be divided into three regions: the Northern, Central and Southern Coastal Regions. The Northern Coastal Region, which extends from 16^{O} 00'N up to the Eritrean-Sudanese border, is covered by extensive fringing reefs. Sites with extensive coral developments in this region include Umm Ali, Abu Sherayu, Kad-hu, Entesila and Difnein (MoMR, 2020). The Central Eritrean Coastal Region, which includes the central mainland area and the islands of the Dahlak Archipelago and Hawakil Bay, has relatively well-developed coral reefs (MoMR, 2020). Many sites around Massawa (such as Twalot, Gurgusm, and Sheik Said Island) and most of the islands in the Dahlak archipelago (such as Dehil, Dahret, Madote, Dissie and Shuma) have extensive coral reef (MoMR, 2017a, 2017b). The Southern Coastal Region, which extends from Tio up to the border with Djibouti, is dominated by muddy or sandy substrates. As a result, the southern coast of Eritrea has limited coral growth. However, the coastal areas near the port city of Assab (Gahro and Ras Gombo) and the surrounding islands (Fatuma and Delgus), are known to host diverse coral reef ecosystems. (MoMR, 2014, and personal observation).

Most of the surveys conducted by the MoMR and the Massawa College of Marine Science and Technology were concentrated in Massawa area and in the inshore Dahlak Archipelago. The coasts of Massawa and Sheik Said Island area are covered with extensive reefs which have high live coral cover. In Massawa area, the highest live-coral cover was recorded in Resi Medri reef, which has a cover value of 56.6%. Gurgusm, Agip, and Western Sheik Said Island also have

high live coral cover (more than 20%). Among the five islands of Dahlak Archipelago, live-coral cover ranges from 10 to 20% (Zekeria and Videler 2000).

The coral reef ecosystem shelters diverse communities of marine organisms including fishes, molluscs, arthropods, tunicates, sponges, and seaweed. Coral reef fishes are important components of the coral reef ecosystem, where they play significant role in keeping balance of the ecosystem. Only a few species of fish feed directly on corals but most of them use the reefs for protection. Many of the fish species feed on turf algae, which compete for space with the corals.

Figure 17: Coral Reefs of the Eritrean Red Sea

(Source: Hagos Zerom and Tesfamariam Arefe, MoMR Report, 2020)

Thus, herbivorous fishes are important for the health of corals because they control the growth of the algae. The coral reefs in the Eritrean coast are home to hundreds of fishes and serve as feeding, recruitment and nursery grounds for them. In its survey of coral reefs, the MoMR assessed the abundance and distribution of the fishes. The fish families, which dominate the reefs of the Eritrean coast, are Chaetodontidae, Pomocanthidae, Lutjanidae, Serranidae, Lethrinidae, Haemulidae, Scaridae, and Acanthuridae (MoMR, 2020, 2017a).

Invertebrates are also important components of the coral reef ecosystem, where they play significant role in keeping balance of the ecosystem. The following invertebrates dominate the reefs of the Eritrean Red Sea: sponges, tunicates, soft corals, gastropods, bivalves, crabs, shrimps, sea urchins, sea cucumbers, sea stars and brittle stars. Some of these invertebrates, such as sponges and tunicates, compete for space with the corals, while others, such as sea urchins and molluscs, feed on turf algae from the reefs; others, such as crown-of-thorns (*Acanthaster planci*) feed on corals, causing great damage (MoMR, 2022).

3.2.2. Mangroves

Mangrove forests are important coastal ecosystems that provide essential ecological services, including shoreline stabilization, carbon sequestration, and habitat for diverse flora and fauna. In the Red Sea, mangroves play a significant role in supporting coastal biodiversity and providing livelihoods for coastal communities. The MoMR reported three species of mangroves from the Eritrean coast, namely *Avicennia marina*, *Rhizophora mucronata* and *Ceriops tagal*. According to the ECMIB reports, mangroves are widely distributed in the Eritrean coast from Marsa Beritie in the North to Haleb and Hadaili in the south, wherever there is a soft bottom (MoMR, 2007). Recent surveys by the MoMR research staff recorded a dense cover of mangrove in the Dahlak Archipelago (Durgham, Durgela, Shuma, Bullissar, Mashilagha, Muserie, Anber seil, Mejedih and Dessie Islands), in the Northern parts of the Eritrean coast (Marsa Ibrahim and Marsa Mubarek), but less mangrove cover was reported from the Southern Coastal Region (MoMR, 2014). In all of the islands, especially in Anber Seil and Muserie, the mangroves range from small seedlings to trees as tall as 13 meters, which suggests replenishment of the mangrove forest stock.

Reports from MoMR show that mangrove forests cover about 380 km^2 of the Eritrean mainland and island coastlines (de Grassiac and Negussie, 2007). Studies on temporal variation in mangrove cover along the Eritrean coast showed an increase of 13% in cover between 1997 and 2017 (Elias and Zekeria, 2022). The observed increase was attributed to the pristine nature of the Eritrean coast, where little or no stress takes place due to human actions. Moreover, natural replenishment of mangrove propagules (seeds) has been recorded in most of the surveys. The mangrove restoration and plantation projects undertaken by the MoMR also contributed to the improved covers of mangroves. Recently, the MoMR has planted mangroves in the islands of Kormelil, Dahlak Kebir, Engel, Beradu, and Dessie.

Figure18: Mangrove forest from the Eritrean Coast
(Source: MoMR Report)

3.2.3 Seagrass beds

Seagrasses in the Red Sea are essential for maintaining marine biodiversity, supporting fisheries, and sequestering CO_2. Seagrass meadows provide critical habitat for a wide range of marine species, including endangered dugongs and sea turtles. Investigations conducted from 2005 to

2007 by the ECMIB project reported that out of the 60 species of seagrasses existing worldwide, eight species were recorded from the Red Sea coast of Eritrea. These species are *Thalassia hemprichii, Halassodendron ciliatum, Halodule uninervis, Syringodiun isoetifolium, Halophila ovalis, Halophila stipulacea, Cymodocea rotundata and Enhalus acoroides*. The majority of the shallow intertidal zones in Eritrea are dominated by *Thallasia hemprichii* and *Halodule uninervis* (co-dominance). *Enhalus acoroides* stands cover large areas at depths below 4m in certain sites such as Norah Island (de Grissac and Negussie 2007).

Recent surveys by the MoMR reported dense seagrass cover in Massawa area, Northern Dahlak Archipelago and the Southern Eritrean coast. Seagrass cover was recorded from many sites around Massawa (such as Hirgigo Bay, Sheik Said Island, Kutmia, Twalot Island, and Emberemi), from Dahlak Archipelago (including Dahret, Dehil, Madote, Durgela, and Durgham) and Southern coast (including Gelalo, Marsa Fatuma, Mieder, Harassen, Tio, Edi, Barasoli, Beilul and Assab). Most of these sites are protected from strong waves and they have sandy or muddy bottom, which creates conducive environment for the growth of seagrasses. Some sites are exposed to waves and they are usually covered with rocky shores or coral reefs that are not suitable for growth of seagrass (MoMR, 2022).

Figure. 19. A Seagrasses from the Eritrean Coast of the Red Sea, Cymodecea rutandata (left)) and Thalassia hemprichii (right)
(Source: Semir Abdelwehab and Tesfahiwet Berhe, MoMR report, 2022)

3.2.4. Seaweeds

Seaweed is often found in coral reefs, rocky shores, and other areas with high levels of productivity, such as upwelling regions and nutrient-rich waters. Seaweed plays a vital role in the tropical marine environment, providing a crucial source of nutrition and habitat for a diverse array of marine life. It is a primary component of the marine food web, serving as a food source for many fish, invertebrates, and other organisms. In addition, seaweed provides shelter and habitat for various species, including fish and invertebrates, which are often found growing on its surface or attached to its branches.

Collection of seaweeds was conducted in 1962 and 1965 during the Israel South Red Sea Expeditions (Lipkin & Silva, 2002). This collection comprised of 127 specific and infraspecific seaweed taxa representing 73 genera. Among the collection were algae, belonging to 13 genera and 47 species, which–had not been recorded previously from the Red Sea. In his survey of

seaweeds from the Eritrean coast of the Red Sea, Ateweberhan (2004) identified 101 specific and infraspecific taxa, including 26 Chlorophyta, 20 Phaeophyta and 55 Rhodophyta. The survey yielded 36 new records for Eritrea (11 Chlorophyta, 7 Phaeophyta and 18 Rhodophyta). Of these Eritrean records, 26 are new for the Red Sea (5 Chlorophyta, 4 Phaeophyta and 17 Rhodophyta). The Aquatic Thematic Group of the National Database of Flora and Fauan reported 202 seaweed species from the Eritrean Red Sea coast (MoA, 2025).

The MoMR reported extensive seaweed cover in the coastal areas and around the islands, including Twalot, Gurgusum, Sheik Said Island, Dissie, Madote, Asarka, and Shuma. The seaweeds grow during the cold season and attach their blades during the hot season leaving the underground rhizomes, which regenerate in the next cold season. The dominant seaweed species reported belonged to the three types of macroalgae: Chlorophyta (green algae), Phaeophyta (brown algae) and Rhodophyta (Red Algae). The species of green algae include; *Valonia aegagrophilla, Boergesenia forbsii, Dictyosphaeria cavernosa, Ulva pertusa, Caulerpa taxifolia, Caulerpa sertularioides, Caulerpa lentillifera, Caulerpa racemosa, Halimeda discoidea* and *Halimeda opuntia.* The dominant brown algae are *Dictyota ciliolata, Dictyota dichotoma, Padina gymnospora, Turbinaria conoides, Cystoseira myrica, Hormophysa cuneiformis, Colpomenia sinuosa and Sargassum asperifolium.* The red algae include *Gracilaria salicornia, Gracilaria crassa, Gracilaria edulis, Champia indica*, *Acanthophora muscoides* and *Laurencia papillosa* (MoMR, 2022).

Figure 19: A Seaweeds from the Eritrean Coast of the Red Sea, Gracilaria spp., (left)) and a Turbinaria conoides (right)

(Source: Semir Abdelwehab and Tesfahiwet Berhe, MoMR report, 2022)

3.2.5. The intertidal zone (mudflats and sandy beaches)

The intertidal zone, a coastal strip where the land meets the sea, is home to some of the richest and best studied marine communities. Although this coastal strip is narrow, its importance is enhanced by the wealth of marine organisms present. The intertidal zone is covered by rocky shores, mudflats or sandy beaches. The intertidal zone supports a variety of invertebrates and serves as feeding grounds for birds and fish. The supratidal zone and adjacent dunes offer nesting sites for birds and breeding grounds for invertebrates. The Eritrean coast of the Red Sea is mainly covered by mudflats or sandy beaches.

Mudflats are coastal wetlands formed by the deposition of mud by tides or rivers. These ecosystems are characterized by their unique physical and biological attributes, making them essential for maintaining biodiversity, supporting fisheries, and providing various ecological services. In the Red Sea, mudflat ecosystems are particularly significant due to the region's unique climatic and oceanographic conditions. The mudflats of the Eritrean coast of the Red Sea remain largely unstudied. The limited studies conducted by the MoMR indicate that mudflats have rich invertebrate diversity, including molluscs (chiton, gastropods and bivalves), crustaceans (barnacles, decapods), and echinoderms (asteroids, holothurians, and echinoids).

Sandy beaches are dynamic ecosystems characterized by their shifting substrates, which are continually reshaped by waves, tides and currents. Along the Red Sea, these beaches serve as important ecological zones that support diverse communities of organisms and provide critical ecosystem services. Sandy beaches provide essential habitats for a range of marine and terrestrial species. Preliminary studies on invertebrates on some sandy bottom indicated rich biodiversity of molluscs, crustaceans and echinoderms.

The Red Sea is rich in invertebrate biodiversity. Taxonomy of marine invertebrates is very difficult because many of the species are small in size and a number of them are cryptic. There are some taxonomic studies conducted on limited taxa of the invertebrates of the Eritrean coast. These studies are limited to corals, gastropods, echinoderms, sea cucumber, and to some extent shrimp (MoMR, 2022b). However, taxonomy of the following invertebrates remains unknown: Protozoa, Porifera, Worms, Arthropods (with the exception of commercially important shrimp), Molluscs and Echinoderms (with the exception of sea cucumber). The MoMR has compiled a list of macro-invertebrates, which mainly occur in the intertidal zone and the subtidal coral reef areas.

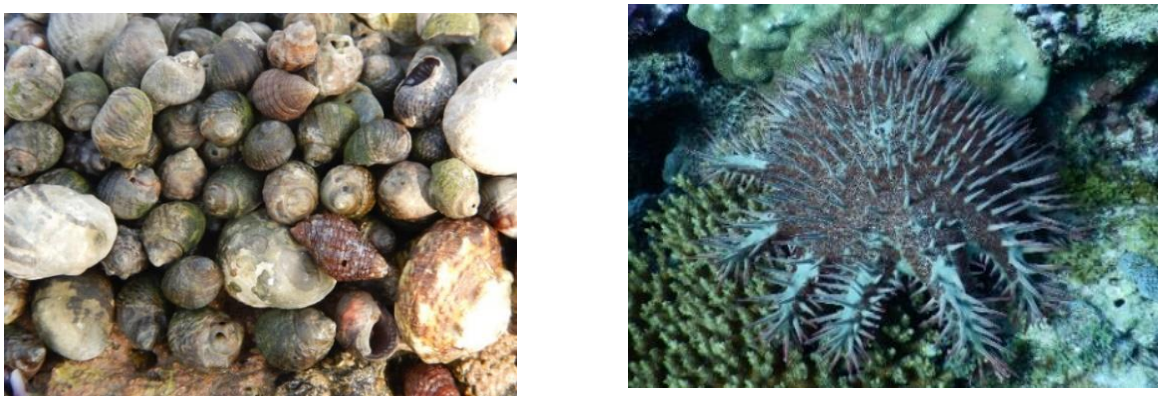

Figure 20: Gastropods (a) and an Echinoderm from the Eritrean Coast of the Red Sea

(Source: Senay Gebru and Hilal Ghirmay, MoMR Report, 2020)

3.2.6. Pelagic ecosystems

The pelagic division of the Red Sea includes the entire water mass of the sea. This division includes the neritic province, which includes the water over the continental shelves, and the oceanic province, the water of the deep basins. Each of these subdivisions is inhabited by characteristic assemblages of marine organisms. The water column is home to the small plankton

(both phyto and zooplankton) and larger nekton (including turtles, fishes, and marine mammals). There is no report on planktons of the Red Sea and the information on nektons is scanty.

Among the notable member of the pelagic biodiversity are the megafauna, which include marine mammals, sharks, sea turtles, and large fish species. The megafauna play a crucial role in maintaining ecological balance. This group of species is especially significant due to their roles at or near the top of the marine food webs, influencing the population dynamics of other marine organisms. The Red Sea is home to a rich diversity of megafauna, with notable species such as the whales, dolphins, dugong (*Dugong dugon*), bony fishes, sharks, rays, and turtles. As mentioned in Section 3.1.2.1. There is limited information on the diversity of the other megafauna in the Eritrean coast. Out of the megafauan present in the Red Sea, fourteen species of marine mammals (cetaceans) and five species of turtles have been recorded from the Eritrean coast of the Red Sea. In its fisheries catch data, the MoMR has reported many pelagic bony fishes, 19 species of sharks and many pelagic invertebrates (including sepia, octopus and squids). The pelagic fishes that dominate the catch are tuna, mackerel, jacks, and sharks. Five species of turtles have been recorded from the Red Sea. The MoMR is closely following the nesting of three turtle species.

The Red Sea is rich in fish species diversity. According to Golani and Bogorodsky (2010) there are 1078 species of fish in the Red Sea belonging to154 families, 25 orders and two classes. Head (1987) pointed about 18% of the Red Sea fishes are endemic to the area. Recently, 569 fish species have been recorded by the Acquatic Thematic Group of the National Database of Flora and Fauna (MoA 2025).

Figure 21: Indo-Pacific bottlenose dolphins (Tursiops aduncus)

Source: Cesario cited in Notarbartolo et al (2017)

A few studies on the diversity of zooplankton in the Red Sea have been conducted. These studies are restricted to certain locations in the Northern Red Sea and Gulf of Aqaba. So far, no study has been conducted on the species list of zooplankton in the Eritrean Coast of the Red Sea.

Furthermore, no studies have been conducted on soft bottom benthic invertebrates, which include nematodes, polychaetes, and molluscs.

3.2.7. Fisheries Resources

The Eritrean coast is rich in fisheries resources, on which coastal communities depend for their livelihhod. The best fishing grounds in the world are areas where nutrient exchange occurs due to upwelling or where different ocean currents meet, but these phenomena are absent or minimal in the Red Sea due to its small size and closed nature. Although the sustainable rate of harvest should be carefully determined and properly regulated to avoid depletion of fish stock, the Eritrean Red Sea is generally recognized as being highly favourable for fishery development. The coast in particular is recognized as being highly favourable for the development of artisanal fisheries. Earlier estimates of the fisheries potential of the Eritrean coast indicate that up to 80,000 tons of fisheries products can be harvested annually from the Eritrean coast on a sustainable basis (Tesfamichael and Mahmud, 2016).

3.3. Agricultural Biodiversity

Agriculture is the dominant and cornerstone of the Eritrean economy. An estimated 60% of the Eritrean population depends on subsistence agriculture and produces about 60-70% of the country's annual food requirements although in good years it can be much higher (MoA 2021). The difference is covered by imports through commercial channels (MoA, 2006). Eritrean agriculture is a rainfed, labour intensive, low input and low productivity enterprise.

Eritrea possesses various agro-ecological zones that are suitable for growing field crops, vegetables, fruits and rearing livestock. Eritrea benefits from three rainy seasons: summer (Kiremti), short (Azmera) and winter (Bahri) rains, but the country is prone to recurrent droughts which on the average may occur every 3-4 years. Production is geared to subsistence. Productivity is low due to various constraints such as lack of inputs, lack of modern farm technologies, climate change and variability, farm land degradation, etc. (see Annex 5).

Eritrea is one of the centers of origin for several field crops. There are clear indications for the existences of rich field crop genetic diversity both in the cultivated and wild forms, including vegetables and fruit tree. The country grows various field and horticultural crops ranging from cereals, pulses, oil crops to fruits, vegetables, spices, and medicinal plants. The total potential land for agriculture is about 2.1 million hectares, of which about 500,000 hectares (24%) is currently under rainfed cultivation. The arable land suitable for irrigation is estimated at 600,000 hectares, of which about 58,000 hectares (9.5%) have been developed so far. These figures indicate that there is a considerable scope for further expansion of rainfed farming and irrigation development in the country. There is also unique livestock biodiversity in Eritrea. There are diverse breeds of livestock, which provide food, direct cash, draft power and prestige to their owners. The livestock mainly depend for their feed on the rangeland, which covers 50% of the total area of the country. The rangeland is rich in browse trees and grasses.

Despite the massive management efforts undertaken to restore and conserve the agricultural biodiversity, recent studies indicated that many crop, animal and forage species are either extinct or on the verge of extinction. The status of field crops, animal and forage biodiversity are discussed below.

3.3.1. Crop Genetic Diversity, Wild Progenitors and Their Status in Eritrea

3.3.1.1 Major field crops genetic diversity of Eritrea

The major staple and field crops in Eritrea include cereals, legumes, and oil crops. Many farmers in the highlands are practicing mono-cropping with mixed farming system. Sorghum, pearl millet, barley, wheat and maize are the priority crops from cereals, whereas chickpeas, lentils, field peas, and faba bean are the priority legume crops in the highlands. In the lowlands of the country, sorghum, millet and oil crops like sesame and groundnuts are grown. Farmers throughout the country, practice traditional farming and they use local varieties with limited agricultural resources.

According to the Russian scientist N.I. Vavilov, Eritrea is considered a primary and secondary center of origin for certain crop species such as barley, wheat, taff, sesame, sorghum, flax, pearl millet, finger millet, sorghum, okra, cowpea, and others (Vavilov, 1992). The country is also rich in crop landraces that are of national and global conservation concern. There are 51 varieties of sorghum, 12 maize, 16 barley, 10 taff, 17 pearl millet, 8 finger millet, 2 sesame, and 2 niger seed varaieties. (FAO-GEF, 2022). Annex 4 shows some of the crops believed to originate in Eritrea and/or shared with neighbouring countries. Based on the study conducted and discussion with key stakeholders, some of the landraces are in good conditions while others are endangered or on the verge of extinction. Considering crop specific indigenous landraces, the following are the major staple crops that are widely grown and familiar to farming communities.

Barley *(Horedeum vulgare)*

The cultivation areas of the six-rows barley varieties, which are locally identified as Kuento and Dessie, is significantly reduced because they require relatively high moisture compared to the other local barley varieties. These varieties are now cultivated in few places that are favourable for cool season crops like Serejeka Sub-Zoba, which is located in the Moist Highland Agroecological Zone.

Wheat *(Triticum spp.)*

Wheat farming communities in Eritrea grow either improved or landrace varieties. According to the MoA (2023), about eighty percent of the farmers of Zoba Debub and Zoba Maekel grow improved wheat varieties released by the NARI. Based on the focus group discussion with the stakeholders and wheat growing farmers during the survey period, 16 improved varaities of wheat have been distributed throughout the country, and there was important difference in the cultivation of wheat varieties among the surveyed Zobas. However, due to the promotion and popularity of the improved wheat varieties, the local landraces of wheat are highly endangered. This is particularly worrisome in Zoba Debub and some parts of Zoba Maekel. During the farmers' consultation, most farmers indicated that during moisture stress season and adverse environmental conditions, the landraces are preferred as they give better yields and serve as insurance against climate risks to the wheat growing farmers when compared with the improved varieties.

Pearl millet *(Pennisetum glaucum)*

Pearl millet is another important cereal crop in Eritrea, grown mainly by small scale farmers in the lowlands and midlands. It is grown mainly in areas where rainfall is variable and low (250-300 mm). The pearl millet landraces that are currently grown contain the traits that farmers have

selected over the past generations, and thus represent a very valuable resource. However, because of cross-pollination, desirable traits may not exist in high frequency in landrace populations and they may contain various undesirable traits, such as susceptibility to downy mildew (Roden et al, 2007). The Pearl Millet Improvement program at NARI in collaboration with ICRISAT has identified two high yielding varieties, Kona and Hagaz, which are adapted to Eritrea's marginal environments. Besides, improved white Kona, in bristle and non bristle forms, has been developed for pearl millet growers. Some of the common pearl millet landrace grown are indicated in Annex 7.

Sorghum *(Sorghum bicolor)*

Sorghum, first-ranking crop by acreage and production, is an important staple crop. Farmers use either improved or landraces of sorghum. Between 2000 and 2020, 12 improved varieties of sorghum were released, out of which only one improved variety Seare (ICSV 111) is currently grown by few farmers. Even this variety is mixed up with local landraces and needs careful purification.

The sorghum landraces cultivated by farmers have unique traits that can be used by crop breeders for the development of resistant varieties (Tesfamichael, *et.al.,* 2013). The largest collection of germplasm by the Genetic Resources Division of NARI is for sorghum. About 700 accessions of sorghum are in ex-situ conservation facilities of the Genetic Resources Division (Annex 3). However, according to the consultation held during the field survey, very few sorghum landraces were widely grown in the last seven years, i.e. 2018–2024. The late maturing landraces of sorghum are under the threat of extinction due to the shortening of the growing season and replacement by early maturing varieties in areas where the dependable growing season is short. The lists of sorghum land races along with their biological status are indicated in Annex 3.

Maize (Zea mays)

Most landrace varieties of maize, which were cultivated for several decades, are fast disappearing; maize landraces are among the most genetically eroded crop in the country. Currently, their cultivation is limited to areas with supplementary irrigation such as spate irrigation in the Eastern Lowlands and in of semi-commercial farming in the highlands as offset of vegetables or mixed crops.

Oil crops

There is a reduction in the cultivation of oil crops. Two to three decades ago, linseed and niger seed were widely cultivated for home use and as cash crops, but today farming households rarely cultivate them, mainly because of the availability of cheap imported edible oils and farmers' preference to the cultivation of basic food crops. At present, the most widely cultivated oil crops are sesame and ground nuts. The local and introduced sesame varieties grown in the country, particularly in Zoba Gash Barka are Hirhir, Abu Sanduk or Abu Sita, Tegil, Kefif, Deda, Baria, Abuleben, and Abunaam. All of these sesame land races exist in good condition except the red-seeded sesame (Baria cultivar) and Hirhir, which have been abandoned due to climate variability and market acceptance. The Deda landrace is also grown in limited areas of Gash Barka.

Pulses

The cropland covered by pulses, namely chick pea, grass pea, field pea, and various varieties of beans, is steadily decreasing. The area under chick pea, the major pulse food crop, is decreasing in certain areas due to heavy root rot attack.

Figure 22: Varieties of sorghum (sorghum bicolour) and Pearl millet: (Pennisetum typhodiem). Left (Kona improved pearl millet), Center (ICSV 111 (Seare) improved sorghum), and Right (White bazenay local sorghum)

3.3.1.2. Horticultural crop diversity

The diverse agro-ecological conditions prevailing in the country allow cultivation of many types of horticultural crops. The major horticultural species grown in Eritrea are: root and tuber crops, fruits, vegetables, stimulants, herbs, spices and edible wild species. The vegetables grown in Eritrea include crops such as okra, onion, tomato, potato, peppers, eggplant, melons, watermelon, pumpkins, squash, sweet potato and radish. Most of the fruits and vegetables grown in Eritrea are relatively in good condition. However, the indigenous potatoes are endangered due to increasing replacement by exotic improved potato varaieties.

The common potato varieties are Cosmos, Zafira, Picasso, Kondor, Electra, Shashemane, Yeha and Ajiba. Electra is an exotic improved potato variety popularly grown in Zobas Debub, Maekel and Anseba. The local varieties Yeha, Zaffira and Shashemene are on the verge of extinction due to replacement by improved potato varieties such as Electra and Cosmos.

3.3.2. The State of Wild Crop Genetic Diversities in Eritrea

The importance of the genetic diversity of wild crops can be looked from two different angles. On one side, the genetic diversity they possess may be a necessary condition to achieve high productivity and yield stability. From the other perspective, these genetic diversities can be used as raw material by plant breeders for the long-term development of crop varaities that are resisitant to crop diseases and insects. Some of them are not yet exploited while others such as the wild vegetables are over-harvetsed as source of food. Infromants in the FGD explained that some of the wild vegetables in Zoba Maekel are found only in protected or enclosure areas whereas in Zobas Debub, Anseba and Gash Barka, the wild vegetables are found in farming as well as in marginal areas. The list of wild crop species that exist in Eritrea is provided in Table.5.

.Table 5: List of Wild Crop Species in Eritrea

Wild relative name	Scientific name	Location found	Status
Wild Sorghum	*Sorghum verticilliflorum, S. aethiopicum, S. arundiaceum*	The road side of Goluj Omhager in Gash Barka	Found in limited area and endangered due to climate change
Wild Sesame	*Sesamum indicum*	Around Shambuko, Goluj and Tokombia in Gash Barka	Found in limited area and endangered due to climate change
Wild Vernonia	*Vernonia gulmensis*	Road side from Tsebab to Genfelom in Anseba; Shambuko on the road to Barentu in Gash Barka	Endangered
Wild Vegetables - Shibeni - Hamli Chaquit - Brnhayo - Gidebelu - Hamli Adgi - Gergemgema - Hamli Chegora - Hamli Alem - Molokya - Bamya/waika - Kakito - Agule - Chew Mrakut - Hamli Gudoo - Okra - KeihHamliadgi	 *Gynandropsis gynendra* *Colocasia esculentum* *Amaranthus gracitor* *Erucastrum abyssinicum* *Amaranthus spinosus* *Portulaca oleracea* *Solanum anguivii* *Solanum villosum* *Corchorus olitorius* *Abelmoschus caillei* *Tribulus terrestris* *Agaricus bisporus* *Oxygonum sinvatum* *Balanites aegyptiaca* *Abelmoschus esculentus* *Amarantus hybradus*	Found scattered in different parts of Zoba Debub, Anseba, Maekel and Gash Barka	*Colocasia esculentum, Solanum anguivii* and *Solanum villosum* are endangered and rarely available in limited areas. The rest are relatively in good condition. (Kesete, 2018)
Wild Chick pea	*Cicer arietinum*	Found Scattered in different parts of Zoba Debub, Anseba, Maekel and Gash Barka	Abundantly available
Wild Tomato (Tsebhi Abun)	*Solanium indicum*	Zoba Debub, Zoba Semienawi Keih Bahri - mainly in Semienawi and Debubawi Bahri PA	Endangered and on the verge of extinction
Kenaf	*Hibiscus cannabinus*	Zoba anseba and zoba Gash Barka	Abundantly available
Castor Bean	*Ricinus communis*	Zobas Debub, Anseba and Gash barka	Abundantly available

Figure 23 Some Wild Crops Left (Wild species, Vernonia gulmensis), Center (Wild vegetable, Colocasia esculentum), and Right (Wild vegetable, Amarantus hybradus (L).
(Source: DoE, 2025)

3.3.3. The State of Livestock and Rangeland Biodiversity

3.3.3.1. Livestock biodiversity

Eritrea is endowed with diverse species of livestock that provide food, direct cash, draft power and prestige to their owners. The livestock mainly depend for their feed on the 50% of the range land which is rich in browse trees and grasses. According to the stocktaking assessment report of 2024, 4 breeds of cattle, 5 breeds of sheep, 6 breeds of goat, 4 breeds of camel, 3 breeds of donkey, 2 breeds of horse, 1 breed of mule, 7 breeds of chicken and 2 wild species of honeybee are identified so far. The diversity of indigenous livestock species is relatively intact, but species face certain threats (DoE, 2019). All breeds are still widely distributed, population numbers are increasing and the rate of introduction of improved stock from overseas is also increasing (Table 3). The livestock population of Eritrea is projected based on the survey carried out in 1997. Since then the MoA indicates that the population of livestock is in an increasing trend except for the pure and crossbreeds.

The main local breeds of cattle in Eritrea are *Arado* of the highlands, *Barka* of western lowlands, *Arebo* of the coastal areas and *Afar* of the Southern Red Sea region. Some attempts to phenotypically and genotypically characterize the Barka cattle were made in 2016 and 2017. According to Solomon G., et al., (2019) and unpublished data from the MoA, these were the only attempts carried out to identify, characterize and conserve for further utilization of the cattle breeds.

The Barka breeds are unique to Eritrea. However, the pure Barka cattle breeds of Eritrea face certain threats. They are inter-crossed with the indigenous local cattle breed of ‘Arado and Dewhin’. Moreoevr, the population of pure Barka breeds is decreasing due to extreme climatic events such as frequent drought and thermal stress. As a result, high rate of mortality prevails, particularly among young stock, especially when the lactating cows are subjected to nutritional stress and milk yield becomes too low to meet the calf’s requirements. Traditional livestock-

production systems, existence of various livestock diseases and shortage of animal drugs are additional threats.

The diversity of other indigenous livestock species is relatively intact and all breeds are still found widely distributed. Populations of sheep and goat are increasing (Table 6). Generally, the trend and status of camels and donkey are stable. However, the status and trends of horses and mules are declining i.e they are genetically eroded.

Table 6: Estimated Livestock Population, Nationwide (Source: MOA, 2023)

Livestock Type	Livestock population
Cattle extensive -Traditional	2,496,551
Cattle intensive – local, pure and crossbreeds	21,307
Goats	6,038,206
Sheep	2,757,528
Camel	413,075
Horse	3,000
Donkey	500,000
Mule	9,000
Poultry, Local	1,295,412
Poultry, Commercial (Exotic)	105,685
Pig	1800
Rabbit	1200
Bee (Colonies)	
Traditional	18,911
Frame hive	21,321
Top bar hive	1,123

Figure 24 Barka breeds in Gergef and Mensura of Zoba Gash Barka

3.3.3.1. Rangeland Biodiversity

The rangelands ecosystem contains a number of herbaceous and woody plants many of which are of value to pastoralists, particulary during feed scarcity. The natural rangelands in Eritrea are estimated to cover about 6 million hectares, about 49% of the total land area of the country. The average annual precipitation for most of the country is less than 400 mm and the vegetation is mainly composed of arid land grasses and shrubs. About 5% of the total population are pastoralists, with another 25% classified as practicing agro-pastoralism. In the lowlands grazing land is vast, but productivity is low. They are dominated by various grasses (mostly annual), herbs and browse species. The natural grassland is constrained by overgrazing both during dry wet seasons. In the highlands there is shortage of arable as well as grazing land. However, there are special communal grazing areas with seasonal closure called *hiza'ati* around the villages. The economic importance of the natural rangelands thus lies in their ability to provide the bulk of feed required to support the livestock sector in Eritrea.

About 60% of the livestock of all types are kept in the lowlands within the pastoral and agro-pastoral livestock production systems in the lowlands, while the remaining 40% are kept within the cereal-livestock production system in the highlands (FAO, 1994). Crop residues such as cereal straw, stover, chaff and agro-industrial by-products like cotton seeds, sesame cake, wheat bran and brewery grain are important components of animal feed that supplement grazing.

In terms of the forage resources, much research has not been done in Eritrea. The information documented is not derived from systematic research but based on general assessment and surveys and some from development projects. The amount and quality of native forage available to livestock varies with altitude, rainfall, soil and cropping intensity. Depending on the climate, different types of forage grow in different agro-ecological zones. A close relationship exists between forage and climate as a result of plant evolvement and adaptation over long periods of time. Because of this interaction, dominant natural pasture groups have become associated with a particular climate regime and agro-ecological zones of the country.

3.4. Threats to Biodiversity

Despite the efforts taken to stop and reverse loss of biodiversity, like in many countries, biodiversity in Eritrea experiences various pressures and threats. To combat the threats, research and complete inventory with focus on the identification of plant and animal species, their habitat, population size, breeding behaviour, endemic and endangered species, etc. is an essential prerequisite for effective management of biodiversity. Excessive exploitation of animal and plant resources, pollution, spread of invasive species and global climate change are undermining the resilience of ecosystems and could easily lead to the permanent loss of certain plant, animal and crop species. This is dangerous not only in terms of their loss as resources and the disruption of ecological balance and local life support systems, but it will also have adverse effect on the tourism industry of the country. Hence, effective actions must first identify the drivers of biodiversity loss. Some of the major threats are discussed below.

3.4.1. Threats to Terrestrial Biodiversity

Eritrea's terrestrial biodiversity faces various threats. A threat is understood as a natural or human force with an actual or potential negative impact on biodiversity (Wong, 2011). Some of the negative forces are direct threats to floral and faunal biodiversity, while others are drivers.

The combined consequences of the threats and drivers are either extinction or drastic population decline of species. According to the IUCN, there are nine classifications of the status of species, of which four categories refer to levels of threatened species: Near Thretatned, Vulnerbale, Endangered, and Critically Endangered. The status of terrestrial plant and animal species has not been adequately studied and the information available is not very reliable. A brief description, based on available information, of threatened plant and animal species and the major threats is given below.

3.4.1.1. Threatened plant species and threats to flora biodiversity

The information on the status of the plant species of the country is very scanty. Data collected from different sources depict different situations of threats and threatened species. According to Proclamation 155/2006, The Forestry and Wildlife Conservation and Development Proclamation, there are 55 tree and shrub species that are nationally threatened or near threatened. However, there are threatened species that are not in the Proclamation list. Vivero, Ensermu and Sebsebe (2005), in their work, *The Red List of Endemic Trees & Shrubs of Ethiopia and Eritrea*, include 17 endemic threatened trees and shrubs that are found both in Eritrea and Ethiopia of which two are found only in Eritrea (see Annex 1); none of these taxa are in the Proclamation list. The Flora Thematic Group of the National Database of Flora and Fauna (MoA, in press), found out that only 42 plant species from Eritrea are included in the CITES Appendix II (no threat of extinction, but trade needs to be controlled), the rest are not included in any CITES category due to lack of information. The Flora Thematic Group of the National Database provided two categories of flora status: National and IUCN. According to the national status, 54 plant species are threatened; two are of least concern, and there was no information for 2452 plant species. The result according to the IUCN status, provided by the National Database of Flora and Fauna (MoA, 05 September 2025), is given in Table 7 below.

Table 7: Threatened plant species

IUCN Red List Categories	No. of Plant Species
Least Concern (LC)	601
Near Threatened (NT)	20
Vulnerable (V)	23
Endangered (EN)	8
Critically Endangered (CR)	7
CD (Lower Risk LR / Conservation Dependent CD)	1
Data Deficient (DD)	23
No Info (No Result upon search)	1,825
Total	**2,508**

During the field data collection, some Zobas provided additional information on threatened plant species. Zoba Maekel stated that three tree/shrub species, namely Euphorbia, *Euclea shimperi,* and *Calpurnia aurea* are endangered in the Zoba. Zoba Debubawi Keih Bahri stated that various *acacia spp*. and duom palm trees are endangered. Similarly Zoba Semienawi Keih Bahri stated that there are 29 trees/shrubs that are threatened; some of these tree/shrub species are not in the

Proclamation list. However, the information provided by the Zoba Administrtions on threatened species requires further field verification.

Threats to flora biodiversity

Various forces are adversely impacting the plant resources of the country. The major ones are discussed below.

Over-exploitation of forest resources: There has been progressive pressure on ecosystems and natural resources. Overharvesting of forest resources for timber, construction of houses, furniture making, domestic fuel, fodder, etc. is one of the major causes of deforestation and loss of plant species. In Eritrea, annual off-take of forest resources is far in excess of their regeneration.
Land use/land cover changes: Conversion of forests, woodland and grasslands to farmlands due to increasing demographic pressure is another force of species endangerment.
Invasive Alien Species (IAS): Invasive alien species are another major threat to native species. IAS cause irreversible destruction to the native flora and fauna by changing the habitat and the plant community structure of native species. Forests, woodlands, croplands and grazing lands are being infested with IAS. There are at least 29 invasive plant species in the country. The mesquite tree (*Prosopis Chilensis* and *P. Juliflora)* (Temri Mussa), *Lanthana camara (*Bun Tilian*), Nicotiana glauca* (Asha Gereb*) and Opuntia spp. (Opuntia ficus indica, Opuntia maxima, Opuntia subulata, Opuntia vulgaris, opuntia delinii)* (Beles) and a variety of invasive weeds are fast spreading and have invaded large swaths of land in Eritrea, posing serious threat to native plant communities.
Climate change: The International Panel for the Convention of Climte Change (IPCCC) recognizes climate change as one of the major causes of biodiversity loss. Climate change causes major disturbances on habitats and ecosystem functioning by bringing about changes in rainfall regimes, increasing frequency and protractedness of drought, heat waves, storms and floods that cause land degradation and species loss. Climate change also disrupts the phenology, flowering, and fruiting of plants. In this way, it brings about change in plant communities.
Other threats: Overgrazing, developmental pressures on land resources in general, pollution, underdevelopment and associated poverty, population growth, genetic erosion, information gaps, and natural disasters are also causes of environmental degradation in Eritrea.

3.4.1.2. Threatened animal Species and threats to fauna biodiversity

The status of wildlife is not adequately known, and different authorities give different figures of threatened species. According to the Forestry and Wildlife Conservation and Development Proclamation (Proclamation No 155/2006), 23 wild animal species are under threats and they need a great conservation attention. Later, six criteria were set up to state their status as Extinct, Critical Endangered, Endangered, Rare, Common, or of Unknown Status. These criteria were established to guide the conservation requirements of mammals, rather than to state their actual status. Based on this criteria, the Eritrea Biodiversity Stocktaking Assessment Report of 2008 (DoE, MoLWE, 2008), listed 18 mammals as critically endangered, 13 as endangered, 11 as rare, 64 with status unknown and 20 as common. However, this status category did not represent any direct assessment of threat; it only indicated local population status. Even with these general criteria, due to lack of taxonomic knowledge and comprehensive studies, the status of over 50%

of the listed mammal species could not be determined. Thus, to be on the safe side, the rest were to be considered as threatened until further survey work is completed.

The latest information, which is provided by the Fauna Thematic Group of the National Database of Flora and Fauna, is presented in Table 8 below. The table indicates that overall, 89.8% of the fauna are of least concern while 1.4% have no information. The remaining 8.8% are under the threatened category, ranging from critically endangered to near threatened. By fauna type, 9.1% of the bird species, 16.7% of mammals, and 3.0% of the reptiles are under the IUCN threatened categories. The same source indicated that according to CITES classification, 11 fuana species are listed in Appendix I, 99 species in Appendix II and 48 species in Appendix III.

Table 8: IUCN status of terrestrial wildlife

No.	IUCN Status	Birds*	Mammals*	Amphibian	Reptile	Total
1.	Critically endangered	6	1	0	0	**7**
2	Endangered	11	3	0	0	**14**
3	Vulnerable	15	7	0	0	**22**
4	Near threatened	15	3		3	**21**
5	Least concern	469	68	23	94	**654**
6	Data deficient	0	2	4	4	**10**
7	**Total**	**516***	**84***	**27**	**101**	**728**

* Only terrestrial birds and terrestrial mammals are considered in this table.

However, these figures should be used with caution. For instance, the Avibase and Birdlife Interntaional commonly list 39 bird species as threatened. Moreover, Avibase has 9 bird species while Birdlife Interntaional has 4 bird species that are not in the common list. Both checklists do not include nationally thretaend bird species like the Common Ostrich (*Strithio camelus*), Black-winged Love Bird (*Agapornis taranta*), Rouget's Rail (Rougetuis rougetii) and Secretary bird (*Sagittarius serpentarius*). Even some of the wildlife observed like African bush elephant (which numbered 110 in 2008; estimated at 200 now), Nubian Ibex, and Eritrean Gazelle, are classified as endangered and the African wild ass as critically endangered by the IUCN. Dorcas gazelle, bushbuck, soemmerring's gazelle, klipspringer, greater kudu, aardvark, warthog etc. exist in small herds; they are listed as nationally threatened species and they need special conservation care. Excepting for few mammals like hyena, foxes and caracal (*Felis caracal),* many of the mammals that are found in the country are described by local communities as rare, seen in small numbers or declining in number. Some mammals seem to have been extirpated from some of their former habitats and are found in few numbers in fragmented habitats. For instance, warthog, porcupine, the soemmerring's gazelle and the red-fronted gazelle that were common in Hagaz Sub-Zoba exist no longer today there. Similarly, Warthog and Greater Kudu once common in Hamelamlo Sub-Zoba are absent today.

The same situation applies to birds. As cited above, **t**he Forestry and Wildlife Conservation and Development Proclamation No. 155/2006, included the Arabian bustard (*Ardeotis arabs*), Black winged lovebird (*Agapornis taranta*), Rouget's Rail (*Rougetuis rougetii*) and Secretary bird (*Sagittarius serpentarius*) and Common ostrich (*Struthios camelus*) in the 23 wildlife species that are nationally threatened with extinction. According to the ABC Eritrean Checklist, there are 35 bird species that are of global conservation concern. According to the IUCN Red List, 30 birds

that are found in Eritrea are among the globally threatened bird specis (25 according to Birdlife Interntaional). The Avibase -The World Bird Database for Eritrean Birds shows that 68 are rare/accidental, 17 are near threatened, 14 are vulnerable, 10 are endangered and 6 are critical.

The status of amphibians and reptiles in particular is little known, and requires further studies. What we know for sure is that of the seven marine turtles found in the world oceans and seas, five are found in Eritreans waters, and all of them are either endangered or critically endangered.

Threats to fauna biodiversity

The faunal biodiversity of the country faces various human and natural threats. The major ones are described below.

Habitat loss and fragmentation: This is the primary cause for species extinction. Habitat loss refers to the reduction, degradation or complete destruction of the habitat required by wildlife. Habitat fragmentation refers to the transformation of natural habitat into smaller and spatially scattered patches (Kumari, Deepali, Bhatnagar, 2021). Due to population growth and land use/land cover changes consequent upon it, natural habitats are being degraded, fragmented and even totally obliterated, seriously impacting on the functioning of ecosystems and their capacity to support wildlife.

Climate Change: Climate change is a double-edged threat to wildlife. Severe weather events like recurrent and protracted drought, recurrent floods, and extreme temperature conditions cause habitat degradation or destruction; such conditions also cause death of wildlife.

Invasive Alien Species (IAS): Invasive alien plant and animal species are also major threat to native biodiversity**.** IAS cause irreversible destruction to the native habitat and fauna, resulting in a change in the entire ecosystem and its functions through competition, predation, infection, hybridization, or alteration of habitats. The threat may come from invasive plants, animals, pathogens, microbes, or even genetic material. At least 8 invasive insetcs, one invasive diseases and one invasive bird are present in the country.

Development/expansion of human settlements: the development of new settlements and expansion of old ones (urban, suburban, and rural) is another threat to wildlife. This causes habitat loss and/or habitat fragmentation.

Lack of sufficient information: Little is known about wildlife habitat, the herd size, distribution, movement, status of wildlife. In the face sufficient knowledge, it is difficult to design effective conservation measures.

Development initiatives: Eritrea tries to balance its development programmes with environmental sustainability. However, certain development activities like infrastructure development (road construction, telecommunications, power lines, dams, impoundments). mineral extraction, industrial developments, etc. may produce adverse impacts on ecosystems and biodiversity.

Capacity gaps: There are institutions and human capacity gaps in ecosystem and biodiversity studies. There is a need for a wide range of experts like taxonomists, conservation ecologist, botanists, zoologists, etc.

Other threats: Long war of liberation, human-wildlife conflicts, population growth, expansion of settlements, and diseases.

3.4.2. Threatened Marine Species and Ecosystems

The Aquatic Thematic Groups for National Database of Fauna and Flora has compiled the list of marine organisms and their conservation status (MoA,2025). Out of a total of 1,367 species, 12 are endangered, 3 critically endangered, 47 near threatened, 44 vulnerable, 30 data deficient, 210 least concern, and 1021 not evaluated (Table 9). Among the marine organisms, marine turtle has great conservation concern in which one species is endangered, one is critically endangered and 3 are vulnerable. The marine mammals are also of great concern because the abundance of most them is very low and their conservation status is not evaluated. Most of the fish, coral, invertebrate, halophytes and seaweeds are not evaluated although their distribution and abundance does not indicate signs of concern. According to the same report most of the bird species are of least concern but 8 species are near threatened and 2 are vulnerable. According to the CITES classification, one fish species, 2 marine mammal, and 5 sea turtles are listed in Appendix I, another 7 fish species and 7 mammals are listed in Appendix II.

Table 9: IUCN status marine species

S.No	Category	Total species Record	Endangered	Critically Endangered	Near threatened	Vulnerable	Data deficient	Least concern	not evaluated
1	Fish	569	7	2	19	18	16	88	419
2	Coral	247	0	0	20	16	0	25	186
3	Marine Birds	81	0	0	8	2	0	71	0
4	Marine invertebrate	202	3	0	0	4	3	12	180
5	Sea turtle	5	1	1	0	3	0	0	0
6	Marine mammals	17	0	0	0	1	11	3	2
7	Seagrass	8	0	0	0	0	0	7	1
8	Halophytes	29	1	0	0	0	0	4	24
9	Seaweeds	209	0	0	0	0	0	0	209
Total		**1367**	**12**	**3**	**47**	**44**	**30**	**210**	**1021**

3.4.2.1. Threat to the marine biodiversity

The Red Sea is rich in biodiversity but it is prone to various threats including coastal development, deforestation of mangrove, pollution, climate change overexploitation of resources and invasive alien species. The main threats to the marine biodiversity arise from coastal development, overexploitation, marine pollution, and climate change.

Coastal development: This may cause damage to the marine biodiversity through habitat destruction, sedimentation, and alteration of river flow. No major damage was documented in Eritrea due to the coastal development projects. However, the construction of Assab-Massawa road has blocked flow of fresh water into the sea resulting in degradation of mangrove forests in some sites, such as Akelo and Free Zone area in Massawa (DoE, 2014). Degradation of corals

around Massawa caused by sedimentation has been discussed in section 3.3.1.1. Furthermore, construction of the Massawa-Assab road has cut the flow of river into the sea killing the mangrove treea in Akelo village near Gelalo. Natural threats to mangroves include global warming and drought. No study has been conducted in the Eritrean coasts to assess the effect of global warming on the mangrove ecosystem.

Overexploitation: Overfishing, illegal fishing and non-compliance with national fisheries laws and regulations pose significant threats to the longer-term sustainability of living marine resources. Overgrazing and cutting for firewood and timber also pose threat to marine biodiversity and ecosystems. In Eritrea sea cucumber fisheries, shark fisheries and trawling poss threat to the marine ecosystem. In some localities the mangroves ecosystem is under pressure from oerexploitation of mangrove for different purposes. Mangrove has been cut mainly for firewood, for animal fodder and for processing (boiling) sea-cucumber. For example, the mangrove in Hirgigo Bay was overgrazed by camels which caused complete degradation of the swamp.

Marine pollution: The Eritrean coast is relatively free from pollutants but there is a potential for land-based and sea-based pollution. The Red Sea region is a major oil producer and transportation route for crude oil. Thus, oil pollution is of great concern for the marine biodiversity including corals, fish, birds and the other ecosystems. The coastal towns and cities, including Massawa, Tio, Eddi and Assab, have high level of plastic pollution. Plastic pollution affects the life of marine organisms by entangling and suffocating mammals, birds, turtles, fish and large invertebrates. Other pollutants of concern include agrochemical runoff, untreated sewage, chemical contaminants, and plastic debris.

Climate change: This impacts marine ecosystems through sea-level rise, increase in seawater temperature and ocean acidification. Rising sea levels can lead to the erosion of beaches, submergence of seagrass habitats, inundation of mudflats and the loss of critical habitats such as the intertidal zones. Increased water temperature can affect the physiology, metabolic rate, growth patterns and reproduction cycle of marine organisms. Rising sea temperatures can also disrupt the stratification of the water column, affecting nutrient availability and primary production. Ocean acidification can impair the ability of corals, seagrasses, echinoderms, and molluscs to calcify, affecting their structural integrity.

Global warming is the main natural threat to coral reefs. The Southern Red Sea is subject to high temperature, which exceeds 35^{o}C. Elevated temperature causes periodic massive coral bleaching during the summer months. Earlier bleaching events were followed by rapid recovery, but the heat wave of 2023 caused massive bleaching of corals, which caused mass mortality in many parts of the Eritrean coast. Coral bleaching causes changes in the abundance and distribution of organisms that makes up the coral reef ecosystem. Although not studied in sufficient detail yet, seal level rise and ocean acidification could also have negative effect on the coral reefs.

Other threats: Threats to marine mammals (megafauna) include collusion with vessels, entangling in fishing net, harvesting sea turtle and turtle eggs for food and disturbance of nesting grounds. The MoMR has reported more than ten stranded carcasses of mammals, mainly dolphins. Turtles face different threats including habitat loss, climate change, poaching and marine pollution. Additionally, the accumulation of plastic waste poses severe risk, as turtles often ingest debris, mistaking it for food.

3.4.3. Threats to Agro biodiversity

Despite the massive management efforts undertaken to restore and conserve agricultural biodiversity, recent studies indicated that many crop, forage and animal species are either extinct or face the risk of extinction due to different threats and drivers. To alleviate the threats, it is important to know the status of crop and animal biodiversity through a careful assessment, which is vital for the design and implementation of appropriate conservation methods and action plans. The status of crop and animal biodiversity and the major threats that may lead to species endangerment and extinction are briefly presented below.

3.4.3.1. Threatened crops and livestock breeds

a. Crop biodiversity

Field crop production in Eritrea depends on local landraces. However, due to adverse climate conditions, some of the major field crop landraces are either endangered or on the verge of extinction. The summary of the landraces under threat of extinction or endangerment are listed in Table 10. Examples of threatened landrace crops from cereals include: in Barley the six rows varieties that are locally known as Quenito,Gunaza, Dessie and Atsa; in wheat Mana, Felasit, Ruiso, Quadrino, Guande, Tselimo and Tselim Chir'uu; in pearl millet Shileti, Alewa, Delakda; in Sorghum Ajebsidi, Aklamoy, Gunseber, Ghimbilu, Amighe, Hile, Letemhret, Mahajen, Senadir, Shifun, and Ugana; in Taff Ele and Felema; in Maize Berih, Shagiya, Wedi Lbab and Shashemane. From oil crops, the Sesame landraces of Hirhir, Deda and Baria are under threat of extinction. The other field crops like pulses are relatively in good condition.

Table 10: National status report of crop varieties

Crops Name	Scientific Name	Status			
		Extinct	Endangered	Near Threatened	Least Concern
1. Sorghum	*Sorghum biocolor*	4	6	3	38
2. Pearl millet	*Pennisetum glaucum*	1	2	-	14
3. Wheat	*Triticum spp*	2	3	3	8
4. Barley	*Hordeum vulgare*	1	4	2	11
5. Taff	*Eragrostis tef*	-	1	-	9
6. Maize	*Zea mays*	1	1	-	10
7. Finger millet	*Eleusine coracana*	1	-	-	7
8. Seasame	*Sesamum indicum*	1	1	1	5
9. Potato	*Solanum tuberosum*	1	1	1	3

Most of the horticultural crops, such fruits and vegetables are also in good condition. However, the indigenous potato varaieties such as Yeha, Zaffira and Shashemene are on the verge of extinction due to replacement by imported improved potato varieties.

The use of wild relatives of domesticated crops may lead to potentially environment-friendly methods of managing insect pests and soil organisms. In Eritrea, there are many wild crop species that are distributed over a wide range of agro-ecological zones of the country. Currently,

the indigenous wild crop genetic resources are becoming seriously endangered owing to the high rate of genetic erosion resulting from natural calamities. Furthermore, replacement of indigenous landraces by genetically homogeneous crop varieties, changes in crop pattern and land use have greatly affected the wild crop genetic diversity in the country. Similarly the wild vegetables such as *Colocasia esculentum,* (Hamli chaquit), *Solanum anguivii* (Hamli Chegora), *Solanum villosum* (Hamli A'alem) and *Solanium indicum* (Tsebhi Abun) are endangered or sporadically available in limited areas.

b. Livestock and forage biodiversity

With so little exotic stock present in the country and increasing trend of livestock population, there is little threat to the genetic diversity of the livestock breeds in Eritrea. However, very little is known about the genetics of the indigenous breeds, and this situation may change over the next 10-20 years. The Eritrean farm animal genetic resource is not at-risk status; however, some indigenous breeds are known to be found at different risk levels for various reasons.

Historically, the Barka and Afar cattle have been moved across the borders into Sudan or Ethiopia to take advantage of seasonal grazing pasture. The Barka and Afar breeds are at risk due to uncontrolled crossbreeding.

Goat and sheep breeds do not face immediate endangerment. At present, there is a tendency for pastoralists to switch from cattle to sheep and goats, which are less dependent upon seasonal grazing and more resilient to drought, climate change (heat wave in the coastal plains), change in land use, and shortage of feed and water.

The current population of horses is estimated to be less than 5000 (MOA, 2018). Horses in Eritrea can be considered endangered. The population is declining from time to time. Similarly, the body frame and size of the horse breeds are shifting towards smaller size, and the Abyssinian breeds seem to be dominating. In addition, the crossbreeding practice in use to improve the local horse genetic makeup poses another threat.

Table 11: National status report of livestock

Livestock Name	Scientific Name	Status			
		Extinct	Endangered	Near Threatened	of Least Concern
1. Cattle	*Bos indicus* (Zebu)	-	1	-	3
2. Goat	*Capra agagrus*	-	-	1	4
3. Sheep	*Ovis aries*	-	-	-	6
4. Camel	*Camelus dromedarius*	-	1	-	3
5. Horse	*Equus ferus*	-	1	-	-

3.4.3.2. Threats to crop and livestock biodiversity

Eritrea is the center of many crop and animal genetic resources. However, due to several threats some of the crop lnadraces and animal genetic resources face various threats. The major threats are discussed below.

a. Threats to crop biodiversity

Climate change: Climate change is one of several risks to resources, livelihoods, assets and ecosystems. It also modifies the likelihood and magnitude of natural hazards thereby creating new vulnerabilities. The major components of climate change that affect crop biodiversity in Eritrea are recurrent drought, fluctuation in the amount and distribution of rainfall, extreme temperature events, and heat waves.

Inappropriate farming system: These threats include mono-cropping, and dependence on few exotic improved crop species at the expense of the rich landrace diversity. These threats are affecting the existing plant genetic resources and diversity. Moreover, expansion of agricultural land, unsustainable agricultural practices that disturb the natural ecosystem of cultivated and wild crop relatives and overharvesting of some wild vegetables could ultimately lead to the extinction of crop species.

Invasive alien species (IAS): A number of invasive insect pests and weeds have appeared in the country such as desert locust, which affects both tree and crop diversity; fall army warm and *Tuta absoluta* on maize and tomato respectively; UG 99 and wild oat on wheat; witchweed (*Striga spp*.) and shatter cane (*Sorghum halpense*) threaten sorghum and maize cultivation.

Currently new IAS are also expanding in the cropland and grasslands. For instance, *Senna abtisifolia* L., locally known as 'Abaeke harmaz', covers 30% of farmlands and almost 100% of grazing lands in most parts of Zoba Gash Barka and Zoba Debub. This invasive species is also observed in Zoba Maekel. Very recently a new herbaceous weed (*Ocimum spp*) locally called 'Ane Beyney' meaning 'me alone' is rapidly expanding at an alarming speed in Zoba Debub and fast spreading to other areas (Zoba Maekel and ZobaAnseba) covering both the farm and the grasslands.

Farm land degradation: The main causes of farm-land degradation in Eritrea are deforestation, inappropriate agricultural practices, overgrazing, inadequate land use planning and limited application of scientific knowledge and agricultural technologies.

Pollution: In Eritrea the major sources of agricultural pollution are chemical fertilizers, herbicides, insecticides, industrial and urban swage pollution that affect both crop biodiversity and animal health. The highest application of insecticide is for the control desert locust. Higher amount of herbicide is also applied for the control of weeds.

Other threats to crops: Some landrace varieties are being abandoned by farmers due to their susceptibility to diseases and pests. The population of some beneficial insects that serve as pollinators is also declining due to drought, habitat disturbances, expansion of agriculture and wider use of pesticides.

b. Threats to livestock biodiversity

There are animal breeds that are unique to Eritrea such as the Barka cattle. However, the unique and pure Eritrean Barka breeds face ceratin threats. The major threats include:

Animal movement and uncontrolled inter-crossing: The pure Barka breed are inter-crossing with indigenous local cattle breeds such as 'Arado and Dewhin'. This leads to the erosion of their unique genetic traits. There is also uncontrolled crossbreeding among other cattle breeds.
Climate change and variability: Extreme climate events such as repeated drought and thermal stress that often occur in the northwestern and southwestern parts of Eritrea pose threats to the livestock population in general and the Barka breed in particular.

Pasture degradation and feed unavailability: There is shortage of feed and this may be aggravated due to climate change and variability. Because of feed shortage, high rate of mortality prevails, particularly among young stock because lactating cows are subjected to nutritional stress and milk yields get too low to meet the young animal's requirements.
Limited water availability: Water is a limitation during the dry season, particularly in areas underlain by basement complex rocks (non-water bearing rocks) in areas of high livestock concentration such as the southwestern and northwestern lowland of Eritrea.
Inadequate animal management: Traditional livestock production systems, presence of various livestock diseases and shortage of animal drugs lead to reduction of livestock population and corresponding genetic diversity.
Shifting prefernces: Pastoralists are shifting to exotic breeds of cattle and to goats and sheep.

c. Threats to rangeland resources

Recurrent drought: The rangelands are the most vulnerable to climate change and variability, particularly recurrent drought. The impacts of recurrent drought are further exacerbated by misuse and mismanagement of land resource resulting in low feed production.
Excessive clearing of woodland: Unregulated expansion and excessive clearing of woodlands for agriculture, especially in the southwestern parts of the country leads to the contraction of forage and grasslands.
Overgrazing: Grazing selectivity and over-grazing/over browsing are another threat to rangelands. Due to the present pattern of rangeland utilization, some highly palatable forage plant species show a decrease in their availability and they are endangered species.

4. BRIEF DESCRIPTION OF NBSAP-2015

Eritrea developed its first NBSAP in 2000 through broad-based consultation process as per Article 6 of the Convention on Biological Diversity, General Measures for Conservation and Sustainable Use, which calls upon the parties to develop national strategies and action plans for the conservation and sustainable use of biological diversity. The NSBAP provided biodiversity targets and indicators that can be fed into a wide range of other environmental progremmes and plans at national and regional scale. The first NBSAP had 30 simple themes divided equally into the three major biodiversity classes: Terrestrial, Marine and Agricultural. This action plan was revised in 2015 following the decision issued by the 10th CBD COP meeting. The revised strategic plan was aligned with the country's national policies and legislation as well as with the global strategic plan for Biodiversity 2011-2020 and its Aichi Targets. NBSAP-2015 embodied Eritrea's overall policy position on biodiversity, and it attempted to position this policy in the context of its major development objectives from 2014 to 2020. The main mission of the revised NBSAP was to reduce biodiversity loss by 2020 and stabilize the state of the natural environment by 2040. Twenty general targets and eighteen ecosystem-specific targets were considered in the revised NBSAP.

NBSAP-2015 document has six chapters and four annexes. The first four chapters provide background information on the national biodiversity, including background context, country profile, the status of biodiversity in Eritrea, and national policy, legislative & institutional framework. Chapter 5, which is the main part of the document, comprises of detailed information on the strategic goals and action plans for biodiversity. The last chapter deals with implementation arrangements, including implementation mechanisms and monitoring and evaluation.

In line with the Global Strategic Plan for Biodiversity 2011-2020, the revised NBSAP had 5 strategic goals and twenty general targets, which are similar to Aichi Biodiversity Targets. For example, the first Strategic Goal addresses the causes of biodiversity loss by mainstreaming biodiversity across government and society. The goal statement for the first target is: "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". Targets 12 and 13 aimed at conserving threatened terrestrial and agricultural biodiversity respectively. Target 12 aimed at conserving threatened species by preventing their extinction and improving their population size. This target singled out the Somali wild Ass (*Equus africanus somaliensis*), the African elephant (*Loxondonta Africana*), the Nubian Ibex (*Capra ibex nubiana*), the Aloe spp (*A. neosteudneri* and *A. schoelleri*), and the endangered trees *Juniperus procera* (coniferous) & *Olea europea sub-spp Africana* for biological conservation. Similarly, Target 13 aimed at maintaining genetic diversity of cultivated plants and domestic animals. It specifically focused on conserving genetic diversity of "Emmer" wheat (*Triticum dicoccun*), and Barka cattle breed (*Boss indicus*, Ungulates).

The eighteen ecosystem-based targets were equally divided among the three major ecosystems prevailing in the country. The first six targets (E-target 1-6) aimed at conserving the terrestrial biodiversity and were related to (1) the control of excessive firewood collection and construction wood; (2) reduction of pressure on forests by use of alternative energy; (3) reduction of overgrazing/over browsing by reducing grazer populations; (4) prevention of extinction of threatened species by reducing decline of the population; (5) rehabilitation of degraded lands, and (6) control of expansion of invasive alien species. The next six targets (E-target 7-11) were

related to marine biodiversity and they were concerned with (7) reduction of degradation of mangrove forests; (8) mitigation of coastal pollution; (9) reduction of coastal erosion; (10) identification of coral species & monitoring the health of coral reef; (11) control of invasive and alien species, and (12) conservation and rehabilitation of endangered marine species. The marine species considered for conservation in E-target 12 included five marine turtle species, one bird species, Socotra Cormorant (*Phalacrocorax nigrogularis*), and one marine mammal (*Dugong dugon*). Finally, the last six ecosystem-based targets (E-target 13-18) were related to the agricultural biodiversity and focused on (13) raising public awareness on the importance and sustainable use of agricultural biodiversity; (14) sustainable management of agricultural genetic resources; (15) reduction of pollution by agrochemical;(16) conservation of threatened agricultural species; (17) conservation and management of agricultural genetic resources; and (18) documentation of traditional knowledge and its integration into agricultural biodiversity.

NBSAP-2015 provided detailed explanations for each of the Aichi Biodiversity Targets and the E-targets. Each target is complemented by priority actions, timeframes, performance indicators, implementing institutions, information sources and costs. The annexes given at the end of the projects were (i) List of marine birds recorded and their status along the Red Sea, (ii) List of common and local (Afar) names and IUCN Category of Sea Turtles in Eritrea, (iii) List of genera of corals recorded from Eritrea, and (iv) List of trees and shrubs important for Agriculture.

4.1 Progress Made in the Implementation of NBSAP 2015

In spite of the limited circulation of NBSAP-2015, different line ministries, particularly FWA, MoMR, MoEM, MoA, the NUEW, which includes environmental sustainbility in its Gender Action Paln, and to limited extent NUEYS, in collaboration with Zoba and Nues Zoba Administrtions (MoLG) implemented programmes that directly or indirectly contributed to the conservation and sustainable use of biodiversity. This section provides a brief review of the progress made since 2015 with respect to some of the targets.

1. ***Progress made on ecosystem rehabilitation through appropriate restoration and management measures of biodiversity to enhance their resilience.***

The FWA, MoEM, MoA, MoE, NUEW and NUEYS have been implementing various projects that aimed at reducing the pressure on natural habitat. The programmes included the following activities:

- Empowering forestry and wildlife inspectors and rangers;
- Development and promotion of alternative energy like renewable energy resources and technologies, and the dissemination of improved, more efficient traditional stoves (Adhanet Mogogo), which reduces fuel wood consumption by 50% and totally eliminates indoor pollution. The MoA and the NUEW (through its small grant programmes) are active in the dissemination of the improved stoves. Local women have been trained on how to construct the stove to support stove making in their localities, and up to 2017, 152,165 stoves were distributed. Throughout the country home solar systems for lighting have been expanded and many efficient lamps (Light Emitting Diodes, LED) were also distributed in different parts of the country to replace incandescent lamps in the last 8 years. Moreover, 1.6 MW PV combined capacity ranging from 2 to 300 KW PV system have been installed for agriculture post harvest storage. A 4 MW solar system has been installed at Areza and Mai dema to provide clean energy to the two towns and surrounding villages. Many organizations and

households installed small PV system up to 3 KW and many rural households have solar lanterns.

- Afforestation/reforestation, enclosures and sustainable utilization of forest products: Millions of trees are planted every year by local communities and yearly summer student and youth afforestation campaigns, coordinated by the MoE. At present, over 400,000 hectraes of land are also under community-managed closures.
- Awareness raising: Various awareness raising and training events were organized by key stakeholders, including the NUEW and NUEYs to increase people's awareness on the conservation and sustainable use of biodiversity, restoration and management of ecosystem. Green Clubs are formed in schools to promote enviromantal stewardship among the youth. Biodiversity related information was also disseminated through various means such as: manuals and guidelines, newsletters, flyers, posters, documentary films and TV spots, articles in local newspapers ('Hadas Eritra' and 'Eritrean Profile') radio programs like "Hrshana Nemaebl" ('Let us develop our agriculture'), etc. Such programmes were produced and broadcasted in major languages: English, Tigrigna, Arabic and Tigre. The media programmes covered soil and water conservation, crop production and husbandry, vegetables production, meat and dairy production, improved seeds production, bee keeping, local poultry keeping, animal and plant health.

  Similarly, the MoMR, in collaboration with the MoI, conducted awareness programmes on the importance of marine biodiversity, covering mangroves, coral reefs, megafauna, fisheries and their sustainable utilization. One hundred ninety-two weekly articles were published on weekly basis in the local daily national newspaper Hadas Eritrea and also broadcasted through the local radio Demtsi Hafash, which cover the whole of Eritrea and transmitted via the internet. Moreover, the MoMR in collaboration with the MoI prepares biweekly TV programmes which present biodiversity and other aspects of the marine environment. So far more than seventeen sessions have been broadcasted in the Eri-TV, which has national coverage through cable, and global coverage through satellite and the Internet.

2. Progress made on preventing land degradation and biodiversity rehabilitation measures taken on terrestrial ecosystem

The main causes of land degradation in Eritrea are deforestation, inappropriate agricultural practices, overgrazing, inadequate land use planning and limited application of scientific knowledge and technologies to enhance productivity. As part of preventing land degradation, the following measures were undertaken:

- SLM Projects: Sustainable land management projects were and are being implemented in various parts of the country by MoA, MoLWE, MoLG, and FWA. For instance, the implementation of the SLM project in Zoba Maekel (Serejeka Area) is considered a successful sustainable management practice, and is scheduled to be upscaled to other parts of the country.
- Integrated Strategy on Degraded Catchments: This includes watershed treatment through afforestation and soil and water conservation programmes, focusing on the construction of hillside terrace, soil/stone bunds, check dams, ponds, and diversion canals by local communities. Seeds from indigenous trees and shrubs are collected, propagated in nurseries, and distributed for planting by local communities to improve habitat of degraded ecosystems.

- During the LDN target setting program, more than 23 major land degradation hotspot areas, which cover about 1,190,552.80 ha., have been identified and partially addressed at national level. There are also approved integrated strategy documents that address the issue, such as: Five years' strategic plans for MoA (2014-2018) and (2019–2023) and Forest and Wildlife Authority (2017-2021); and Land Degradation Neutrality Target Setting program (2017).

3. Progress made on protected areas

Informally, certain areas were designated as protected areas. Although not gazetted, they were treated and managed as protected areas. Fortunately, to overcome this gap, a recent directive issued by the MoLWE defines what a protected area is and sets out the procedures to be followed in establishing terrestrial, marine and community protected areas, including how and by which institution they are to be managed. The directive clearly stipulates that the FWA is responsible for terrestrial protected areas, the MoMR for marine, island and coastal protected areas, and local communities for community protected areas.

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4. Progress on minimizing the level of pollution from all sources and reduce excess nutrients, pesticides and herbicides to levels that are not harmful to ecosystem function and biodiversity

In order to reduce pollution due to agro-chemicals, the MoA is advising farmers to use organic fertilizers such as compost, liquid fertilizers extracted from fish amino acids and seaweeds, and farmyard manures. Enviromnetal cleanliness is also being promoted by the NUEW and NUEYS, which organize Cleanliness Day.The NUEW also distributes organic fertilizers to vulnebrable women farmers. To facilitate the shift from chemical to organic fertilizers, the MoA in collaboration with MoMR, formed a committee in 2022 to oversee the production of a large quantity of organic fertilizers. The MoA is also promoting organic farming i.e., farming without synthetic pesticides and chemical fertilizers, to reduce the use of chemical and other hazardous pesticides. The MoA is promoting integrated pest management, and researches are under way to develop biopesticides.

The Regulatory Services Department (RSD) in the MoA is responsible for the regulation of the imports and supply of agro-chemical by developing standards, guidelines, policies and regulations, and improving pollution information management, including a list of agro-chemicals that can be legally imported to the country. It is also responsible for disposal of obsolete agro-chemicals. The Department safely disposed of about 363 tons of obsolete pesticides in 2016/2017; which were shipped to the UK, and another 30 tons are in a safe store waiting similar disposal. In 2017, the Eritrean Environmental Protection, Management and Rehabilitation Framework (No. 179/2017) and Legal Notice No. 127/2017, which includes Articles 11 – 17 on control of pollution, were gazetted.

Public awareness on the negative impact of pesticides on the environment and the importance of biopesticide in particular and Integrated Pest Management approach in general are among the main task of the technical committee in the ministry and this is improving farmers' attitude toward safety of pesticide application to some extent although it is gradual process.

5. *Progress made on the reduction and control of invasive alien species:*

The common IAS introduced to Eritrea includes *Prosopis juliflora*, *P. chilensis, Lantana camara, Nicotiana glauca* in the terrestrial ecosystem and several we**e**ds like: *Xanthium spinosum, Xanthium strumarium, Tagets minuta, Striga hermonthica* and pests mainly white fly, (*Trialeurodes vaporariorum*) in the agricultural ecosystem. Of great concern is the woody plant species, *Prosopis juliflora/P. Chilensis,* which was introduced through the Sudan in the 1970s and from Ethiopia (to the Gahtelay area) in the 1980s. This invasive species is aggressively expanding, including to the riparian habitat, seriously affecting indigenous plants.

Currently new invasive alien species are expanding in the croplands. For instance, *Senna abtisifolia L*., locally known as 'Abaeke harmaz', is present in 20% of farmlands and in almost all grazing lands in most parts of Zoba Gash Barka. Very recently a new herbaceous weed (*Ocimum spp*) locally called 'Ane Beyney' (me alone) is spreading at an alarming rate in Zoba Debub and fast encroaching on other areas (Zobas Maekel and Anseba) invading both farmlands and grasslands.

Although various measures like charcoal making from Prosopis, mechanical uprooting, burning, collecting pods as feed supplement, or even spraying salt to roots have been attempted, there has not been any significant progress in controlling invasive alien species or in reducing the negative effects of the species. However, various awareness raising programmes such as training and workshops on the sustainable utilization and management of invasive alien species have been conducted at all levels by the relevant sectors and Zobas.

6. Progress made to tackle climate change and climate variability effects on biodiversity

NARI and HAC have conducted a number of researches to develop crop varieties for better yield, and drought, diseases and pest resistance. Moreover, various initiatives have been taken by the Agricultural Extension Department (AED) of the MoA to mitigate, and/or adapt to, the effects of climate change. The measures include;

- Mobilizing communities to participate in on-farm soil and water conservation measures like *in- situ* water harvesting using stone/soil bunding and diverting running water to farms;
- Promoting climate smart agriculture (CSA) and sustainable farming practices, including composting, using drought and disease resistant crop varieties, row planting, crop rotation, integrated crop and livestock management, agroforestry, improved grazing, improved water management, intercropping, water conservation infrastructures (dams), sustainable forage and rangeland management. The 'Geshinashim Climate Smart Community' project is a specific example that promotes Climate Smart Communities in the Eritrean Highlands. The project is built around a package of activities designed to combat the adverse impacts of climate change on small-scale farming communities.

7. Progress on the conservation of threatened and endangered agricultural species and management of agricultural genetic resources

Conservation of the genetic resources of threatened and endangered species of plants (including trees and shrubs), and farm animals is the mandate of NARI. Although various activities relating to threatened and endangered species were carried out as per the gene bank annual work plan, few activities were conducted for on-farm conservation of landraces and vegetatively propagated plant species. Similarly, few attempts were made to domesticate indigenous wild fruit trees like

Mimusops kummel, *Tamarindus indica*, *Adansonia digitata*, *Hyphaene thebaica* and *Diospyros mespiliformis*.

Morphological characterization of indigenous cattle breeds, phenotypic characterization of Barka cattle and genetic diversity of cattle population has been conducted in Eritrea. This is expected to strengthen the management of threatened and endangered species, particularly the conservation status of the Barka cattle. However, establishing cryopreservation of farm animal genetic resource and supporting community conservation of farm animals has not been initiated yet.

A study on indigenous chickens was conducted by MoA and HAC to assess and evaluate their phenotypic variability in Zoba Gash Barka. The result revealed that there is tremendous genetic variability in the indigenous chicken population of the study area and requires special attention for their genetic conservation and further use.

Similar assessment on indigenous leafy vegetables was conducted by HAC in 2018. The study found out that some of the wild leafy vegetable species are getting endangered due to natural and human causes and require conservation measures before they become extinct. The seeds of the endangered wild sesame (*Sesame indicum*) and Vernonia (*Vernonia gulmensis*) were collected in 2018 and 2024 for conservation and breeding programmes.

8. Progress on fair and equitable access and benefits of sharing (ABS) that arise from the utilization of genetic resources and traditional knowledge

Farmers in Eritrea are knowledgeable about crop and animal husbandry, including the different attributes of various varieties of crops and livestock. They know what varieties to cultivate during adverse environmental conditions, to maximize yields, ensure nutritional balance, spread workloads and capture market opportunities. Experts of agriculture have been trying to make use of this traditional knowledge.

Eritrea acceded to the Nagoya Protocol on June 11, 2019. The Nagoya Protocol aims at providing a basis for legal certainty and transparency on accessing traditional knowledge, genetic resources and the fair and equitable sharing of benefits arising from their utilization for both providers and users. In 2024, the DoE prepared working document on Nagoya Protocol, which assessed the capacity, agencies, national policy, laws, challenges and opportunities relating to the conservation and management of genetic resources in the country. Moreover, the national gene bank division under NARI, which maintains genetic materials relating to food crops, forages, industrial crops, medicinal plants and others, conducted several meetings with communities and stakeholders on the Nagoya Protocol. The staff in the division have participated in several capacity building programs both in the country and abroad.

There is also valuable traditional knowledge on medicinal plants. Unfortunately, only limited studies have been done so far and there is a dire knoweldeg gap in this area. There is an urgent need for a comprehensive national survey on ethnobotany, plants with medicinal value and their current status.

9. Progress on plantation of mangrove

The baseline of the coastal marine and island mangrove area was updated in 2017 by estimating the mangrove cover along the entire Eritrean coast using remote sensing techniques. Results showed an increase in mangrove cover by 13%. This expansion is a net result of afforestation and awareness projects by the MoMR, and natural regeneration of mangrove. In few years' time the planted mangrove is expected to self-propagate and cover larger area.

The Research Division of the MoMR monitored the status of planted mangrove in the Dahlak archipelago in 2023. Results of the assessment showed that most of the mangroves planted in 2017 in Dahlak Kebir Island were in good and healthy condition reaching a height of 1.6-2.36 meters. The mangroves planted in the areas around Kormelil and Sejeret had grown well and represented a successful plantation activity in areas where there was no mangrove before. They cover around 54 hectare in Kormelil and around 10 hectare in Sejeret. According to the assessment carried out in the two places, the seedlings were free from seaweed smothering. The height of sampled mangroves in Sejeret and Kormelil ranged from 2.58 - 3.62 meters and 1.01 - 2.27 meters respectively. This result indicates the mangrove trees in Sejeret are in good status whereas the mangrove trees in Kormelil didn't show the desired growth. According to the report of the Ministry of Marine Resources the planted mangroves are becoming home for a number of marine invertebrates such as crabs and gastropods, and fishes and birds. This is the ecological importance, which mangrove offer to the environment. In the four assessed sites, mangrove trees are in a healthy status, already bearing flowers and seeds.

Figure 25: Status of mangrove trees in Kormelil (Dahlak Archipelago)
(Sourec: Semir Abdulwahab and Tesfahanes Berhe, MoMR report, 2022)

10. Progress on assessing the effect of climate change on the coral reef ecosystem

Coral reefs are vital marine ecosystems that support biodiversity and coastal protection, but they are increasingly threatened by climate change, particularly through coral bleaching events. The MoMR in collaboration with Mai Nefhi College of Science is assessing the extent of coral bleaching in the southern Red Sea and it is investigating the associated impacts on reef fish populations. Using line transect surveys, the team quantified the percentage of bleached coral cover across multiple reef sites. Concurrently, fish counts were conducted to determine any potential shifts in fish community structure related to bleaching severity. Results of the investigation indicate widespread bleaching, with some reefs exhibiting up to 100% coral cover loss. Fish diversity showed significant change in which the abundance of herbivorous fish decreased in severely bleached sites. The findings highlight the vulnerability of coral reefs in the southern Red Sea to thermal stress and underscore the importance of ongoing monitoring for

effective conservation management. Furthermore, the MoMR is assessing the impact of global warming on fisheries and socioeconomic conditions of coastal communities.

The MoMR in collaboration with Mai Nefhi College of Science has initiated a coral monitoring programme in which the status of the coral reefs will be assessed using 3D mapping method and the richness of fish communities will be assessed using Environmental DND techniques. Four permanent monitoring sites have been selected: two in Massawa area (Twalot and Sheik Said Island) and the other two in the Dahlak Archipelago (Dahret and Madote Island). Preliminary report of the monitoring studies reveal that live coral cover in all of the sites is drastically reduced due to intense heat wave of the summer of 2023.

11. Progress on assessing the effect of fisheries on biodiversity

The Eritrean part of the Red Sea is endowed with rich fish stock, relatively high biodiversity and endemism. One of the main activities of the MoMR is to monitor the status of fish stocks and the health of the marine ecosystem. The research division of the MoMR keeps uptodate report of catch and effort data from the small scale and industrial fisheries. It also assesses the effect of fisheries on the marine environment. Staff of the MoMR often join fishing trips to assess the effect of trawlers on the marine ecosystem. The Ministry also conducts studies to assess the effect of fisheries on sea cucumber stock.

Trawling is a controversial fishing method. It is known for its high rate of discards due to captures of large quantity and diversity of non-target species including endangered species such as sea turtles and stingrays. According to studies conducted between 2013 and 2014 on trawling fishing, 56.12 % of the total catch was discards. Similarly, the use of shrimp net caused high rate of discards (60.53%) than fish net which was 51.04%. There was also higher discard rate (59.54%) in the depth ranges between 10-20 meters than the depth ranges of 31-40 meters, which was 43.74% (MoMR, unpublished).

A study conducted by the MoMR in 2019 identified a total of eleven sea cucumber species within the Dahlak Archiplego. The abundance and species diversity among eleven fishing grounds shows that Seil-Nora has the highest commercial sea cucumber species diversity; it recorded eight species. It was reported that H*olothuria atra* is the most abundant sea cucumber species which is found in almost all of the surveyed islands. The report indicates that fishing intensity has a pronounced impact on the overall abundance of sea cucumber species. With the exception of some species, which are found in the muddy and seagrass substrate, most of the commercial sea cucumber species were found mainly on coral reef and white sand substrate.

4.2 Challenges in Biodiversity Conservation

Various challenges were faced in biodiversity conservation. These challenges remain active even today, and they will continue to constrain effective implemnation of NBSAP (2026-2030).

i) Inadequate institutional capacity in some key institutions: The FWA, for instcne, is insufficiently staffed; it has shortage of human power in both number and expertise. The FWA has also a structural gap at the Department levels. There is the Office of the General Manager and three Divisions (Forest Conservation and Development, Wildlife Conservation and Development, Inspection of Forestry and Wildlife); each division has Units under it. which are further. There are only two masters, about 10 BA/BSc holders,

and about 15 diploma holders. At NuesZoba level, there are not even diploma holders. There is large number of non-qualified personnel (about 1700).

ii) Shortage of experts: There is problem of skilled manpower and equipment. There are no of few taxonomists, forestry experts, wild life experts, forest/wildlife rangers, conservation experts, etc.

iii) Biodiversity data management: There has not been a clear or stnadardized approach to update biodiversity data, to how to collect, code, store and manage the collected data. However, at presentimprovements are underway to address this issue.

iv) Infromation Gaps: No complete inventory of forest and terrestrial and aquatic wildlife, which is supported by field verification, has been made so far and this lack of knowledge is a serious handicap for conservation works. The same applies to insects, reptiles, amphibians, weeds and fungi.

v) Insufficient mobilization of resources: there was no clear strategy or approach to resource mobilization for biodiversity conservation. Thus, the flow of resource was not as required. Inadequacy of budget allocated mentioned as a serious impediment to restoration of degraded ecosystems.

vi) Weak forest and wildlife research and extension in relation to the needs.

vii) Policy and regulation guidelines are not sufficiently or properly implemented up-to lower levels.

viii) Under development and wide spread poverty.

ix) Lack of incentives and alternatives for communities whose land is put under protected area networks.

x) Relegation of traditional resource management ethics: Weakening, abandonment and/or replacement of the customary rules, community values and practices that regulated access to ecological resources.

xi) Increasing introduction of improved crop varieties and cattle breeds, adulterating indigenous crop and cattle genetic make-ups.

5. RATIONAL FOR UPDATING AND REVISING NBSAP 2015

Eritrea is a party to the Convention on Biological Diversity (CBD). Eritrea officially acceded to the United Nations Convention on Biological Diversity (UNCBD) on 21 March 1996 and it has complied with the three objectives of the Convention: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. Ever since its accession, the country has taken important steps to conserve its biodiversity resources and maintain ecosystem services.

In 2019, the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) issued a Global Assessment Report on Biodiversity and Ecosystem Services, commonly referred to as the fifth edition of the *Global Biodiversity Outlook*, by analysing the national implementation progress reports of all member countries. This report revealed that, despite some progress, none of the Aichi Biodiversity Targets was fully achieved at global level. Moreover, the report, and many other scientific documents, provided clear evidence that despite ongoing efforts, biodiversity is deteriorating worldwide at rates unprecedented in human history. To show the gravity of the deterioration of biological diversity, the IPBES Global Assessment Report stated that:

- An average of around 25 per cent of species in assessed animal and plant groups are threatened, suggesting that around 1 million species already face extinction, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss. Without such action, there will be a further acceleration in the global rate of species extinction, which is already at least tens to hundreds of times higher than the average over the past 10 million years.
- The biosphere, upon which humanity as a whole depends, is being altered to an unparalleled degree across all spatial scales. Biodiversity is declining faster now than at any time in human history.
- Nature can be conserved, restored and used sustainably while other global societal goals are simultaneously met through urgent and concerted efforts fostering transformative change.

Taking these issues into consideration, the CBD - COP 15, which was held in Montreal, Canada, adopted the Kunming-Montreal Global Biodiversity Framework (GBF) to respond to the issues raised by the Report. The GBF includes four goals and 23 targets to be achieved by 2030. The four goals are a long-term plan for 2050 Vision for Biodiversity, '*living in harmony with nature*' where 'by 2050 biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services sustaining a healthy planet and delivering benefits essential for all people'. The Parties were thus requested and encouraged to update and revise their NBSAPs in accordance with Article 6 of the Convention, and align them with the Kunming-Montreal Global Biodiversity Framework (GBF), including its goals, targets, and means of implementation.

Despite some success in conserving biodiversity at the local levels, the status of biodiversity remains of great concern and the preservation of the floral, faunal and microbial diversity remains a major endeavour in the country. In conformity with the CBD - COP 15 decision, Eritrea embarked on the task of revising and updating its NBSAP - 2015 to make it compliant with the goals and targets of GBF. A NBSAP Updating Team under the auspice of NHERI was selected to support the MoLWE in revising and updating NBSAP-2015 and ensure that the

updated NBSAP is alignedt with the GBF, related MEAs, SDGs and national environmental policies, guidelines, legislations, and programmes, taking into consideration old and emerging biodiversity concerns at national, regional and global levels. The team consisted of a core consultant team of experts drawn from institutions of higher education and technical assistants/experts drawn from the MoA, MoLG, MoLWE, FWA and MoMR. The Consulancy Team consulted recent reports and conducted field data collection and focus group discussions with key actors and stakeholders. The recent reports and discussion highlighted priority biodiversity issues for the updating and revision process.

In view of climate change and other significant drivers and their consequences, updating the NBSAP in conformity with the GBF is highly relevant to the country and the region. Issues that were not adequately considered and/or stressed in the NBSAP 2015 are treated in the updated and revised NBSAP. The detailed status, trend and threat to biodiversity are compiled in the two projects - Establishment of National Database of Flora and Fauna, and the Updated National Biodiversity Stocktaking Assessment Report. The NBSAP Updating Team also consulted these reports in updating and revising the NBSAP--2015. The issues to be considered in the updated NBSAP include capacity development; financial mobilization and monitoring plans; and alignment with GBF. As per the 2022 GBF decisions, the revised and updated NBSAP attempted to:

- Assess available capacity and resources to implement and monitor the national targets,
- Assess policy alignment more widely across the country's policies and policy instruments,
- Develop and/or update actions, policies and programmes to implement national targets, and
- Develop and/or update capacity development plans, resource mobilization and monitoring and evaluation plans as part of the updated NBSAP.

A number of lessons emerged from the analysis of NBSAP-2015. The major ones are:

First, NBSAP-2015 was ambitious; it has 20 global and 18 national targets. This calls for the need of balancing actions with what is achievable in the NBSAP timeframe. The present NBSAP has tried to balance the targets and actions with i) the existing human, scientific and technical capacities, ii) what is doable and achievable in the NBSAP timeframe, and iii) possible inter-institutional cooperation and preparedness to incorporate NBSAP into institutional plans and programmes.

Second, NBSAP-2015 was not widely shared with stakeholders. Some of key actors like Zoba and Sub-Zoba administration, and even some departments within line ministries stated that they were not familiar with NBSAP. This hindered the mainstreaming of NBSAP action plans into the plans and programmes of line ministries and primary stakeholders. To overcome this problem a National Biodiversity Platform and a National Steering Committee have been suggested.

Third, even those ministries and departments who had knowledge of NBSAP had a wrong understanding of the implementation approaches; they were expecting resources to be allocated to them by the MoLWE for the implementation of actions that fell within their jurisdiction. Using the National Biodiversity Platform, stakeholders will have to be reminded that they should allocate resources for the conservation of biodiversity.

Fourth, the line ministries have developed various strategies, policies, plans and programmes into which NBSAP actions could be easily integrated, and they represent lost opportunities for the implementation of NBSAP-2015 actions. The revised and updated NBSAP has taken note of these and it is duly aligned with them.

Fifth, actions that are expected to be mainstreamed to the plans and programmes of line ministries and other stakeholders are beyond control of the DoE, particularly when an entity to oversee and coordinate implementation is lacking.

Sixth, Eritrea has developed a number of policy and legislative frameworks to address issues of natural resources management. Many of these policy and legislative frameworks have strong biodiversity implications, but implementation and/or compliance with the policies and legislations need to be strengthened.

Seventh, there was no resource mobilization, monitoring and evaluation plan for NBSAP-2015. This necessitated the preparation of a resource mobilization and monitoring and evaluation plan for the revised and updated NBSAP. Resource needs for the implementation of NBSAP (2026-2030) will have to be identified early and serious efforts made to mobilize the resources required.

6. OBJECTIVES OF UPDATING NBSAP 2015

The main purposes of updating the NBSAP-2015 are to properly aligned it with the Kunming-Montreal Global Biodiversity Framework (GBF), the Sustainable Developmental Goals, as well as national policies, strategies and action plans, and prepare a companion Resource Mobilization and Evaluation and Monitoring Plan for the impelmnation of the Updated NBSAP (2026-2030). This will ensure Eritrea's compliance with the Provisions of Article 6 of the CBD and the decision of COP15/6. The updating process tried to take full consideration of the status of terrestrial, agricultural and marine biodiversity and the trends of, and threats to, biodiversity in the country.

6.1. Scope of the Updating Task

The scope of the assignemt to update NBSAP-2015, as per the ToR, is given below.

- Designing the work plan for updating the NBSAP that includes financial, and monitoring plans;
- Stakeholder analysis, including identification of the roles and responsibilities of relevant stakeholders and establishing a team of technical assistants from the relevant stakeholders;
- Conduct assessment of how stakeholders were involved in the revision and implementation of the NBSAP-2015;
- Conduct a rapid review of the NBSAP-2015 and national targets to identify gaps and align the national targets, goals, objectives and action plans with the Kunming-Montreal Global Biodiversity Framework (GBF);
- Identify gaps in the existing data and knowledge on monitoring the status, threats and trends of biodiversity, and other elements of the targets and indicators of the NBSAP-2015, and plan for strengthening the national monitoring and evaluation systems;
- Undertake consultative process by coordinating a team of technical assistants and/or experts from various stakeholders to review and update the national goals and targets which were set in the NBSAP-2015, as key thematic areas, and align with the new GBF targets, goals and relevant SDGs, and develop indicators (measureable, costed, spatially-explicit where appropriate grounded in programmes), that are operational;
- Conduct a rapid review of inter-institutional/sectorial processes and policies to align them with Kunming-Montreal Global Biodiversity Framework and other environmental agreements/plans;
- Prioritize actions that can assist in filling institutional gaps towards the whole-of-government approach;
- Review expenditure spending related to biodiversity across relevant sectors (e.g. Energy and Mining, Agriculture, Forestry and Wildlife, Marine Resources);
- Identify review and prioritize Biodiversity-harmful subsidies;
- Develop biodiversity finance, and monitoring plans to fill the gap; and
- Prepare a revised updated NBSAP (2026-2030) for Eritrea.

6.2. Components of the Updated NBSAP

The updated NBSAP, among others involved the following four components: -

Component 1 – Rapid review of NBSAP-2015 for alignment with the Kunming-Montreal Global Biodiversity Framework (GBF) that includes the review of national biodiversity targets and goals.

Component 2 – Gaps in monitoring system were assessed and identified. Based on the assessment, action plan was developed.

Component 3 – Policy and institutional alignment and review of the coherence with Global Biodiversity Framework. This included review of the existing national policies, and development of an aligned whole-of government-approach to capture the value of biodiversity and priority action plan for policy coherence and alignment with the GBF.

Component 4 – Review of biodiversity expenditure was conducted and estimated costs that are aligned with GBF related actions plan developed. No biodiversity harmful subsidies were identified.

6.3. Approach and Methodology

The process of revision and updating of NBSAP-2015 involved an inclusive and participatory stakeholder consultation process. The consultation process included two national workshops, a series of consultations with key departments of ministries, Zoba and Sub-Zoba admirations and community/farmer representatives. The NBSAP-2015 is updated based on the information collected from the six Zobas, primary line ministries and departments, local communities and knowledgeable persons. Data was collected using questionnaires, FGD, and expert group discussions. The consultations were instrumental in identifying biodiversity-related priority areas for action. The information collected highlighted the priority areas for the revised and updated NBSAP (2026–2030). As indicated above, the revision process also benefited from the NDC, the Updated Biodiversity Stocktaking Assessment Report, and the Thematic Groups of the National Databse of Flora and Fauna.

6.3.1. Data collection, collation, analysis and presentation

In order to implement the tasks listed under the objectives and scope sub-sections, the NBSAP Updating Team tried to adopt a broad participatory, consultative and multi-disciplinary approach to deeply understand the local, national, regional and global dimensions of biodiversity conservation so as to develop appropriate, acceptable and doable strategies and actions for biodiversity conservation in Eritrea. The approaches, methods and tools that were used are outlined below.

1. The Team used a whole-of-Government (WoG), whole-of-Society (WoS), gender inclusive, and ecosystem approaches. This approach helped to buy-in the support of relevant line ministries and high-ranking government officials as well CBOs and local communities. The Team also ensured that the interests of women, girls, the disabled and the youth are fully addressed in the revised and updated NBSAP.

The Team started its work by assessing the implementation gaps of NBSAP-2015. This was done by conducting preliminary assessment of the progress and achievements made in fulfilling national biodiversity targets as formulated in NBSAP-2015 and other national/sectoral policies

relating to biodiversity, using the criteria of relevance, effectiveness, efficiency, sustainability and impact as defined and explained in the Kunming-Montreal Global Biodiversity Framework (GBF). This was followed by the identification of relevant sectors, government agencies, and primary stakeholder groups closely associated with the CBD. This enabled the Team not only to prepare an effective stakeholder consultation and engagement plan, but also to determine those stakeholders that are involved and should be engaged around each national and global goal or target.

Once the implementation gaps and extent of alignment were identified, the NBSAP Updating Team proceeded to the revision and updating process including the reformulation of the national vision, mission, principles, goals, objectives and targets of the NBSAP based on the data collected. The indictors, implementing groups, and non-state actor commitments were also considered at this stage. Due care was taken to ensure that new or revised biodiversity targets fill gaps identified within the national context, priorities, and existing capacities, and that it is adequately aligned and meets the requirements of the Kunming-Montreal GBF. The steps indicated above involved a number of tasks which are detailed below.

i. Review of relevant literature and documents: the NBSAP Updating Team has collected and conducted a comprehensive desk review of relevant literature and documents available at the DoE, relevant ministries, CBOs, and other stakeholders. The Task Team also undertook a thorough desk review of reports, literature and other documents related to biodiversity, strategic action plans, implementation plans, policies and conventions. The T Team consulted scientific publications and progress reports generated by the scientific community, international organizations, secretariat of the Convention and other relevant organization. The Team looked at the NBSAP of other countries to benefit from their experiences and best practices.
ii. Stakeholder engagement: The Team continuously engaged with the stakeholders identified in order to get a clear view and understanding of the NBSAP-2015. The stakeholders consulted included:
    - CBD focal point and relevant ministries at national and Zoba (regional) levels;
    - Implementing agencies/partners, both governmental and non-governmental organizations stated in the TOR;
    - Community based organizations, mainly the NUEW and NUEYS; and
    - Policy makers (to see if the sector plans and reports relate to the NBSAP).

    The list of experts, institutions and organizations that were consulted and from which data was collected are provided in Annexes 8 and 9.

    The purpose of the stakeholder engagement in the initial stage was to:

    - Identify key issues that the revised and updated NBSAP should address;
    - Build consensus on the priorities for biodiversity conservation; and
    - Develop a framework for creating public and cross-sectoral awareness in biodiversity conservation
iii. Field Visits: The Team organized field visits to selected hotspots in the Zobas to collect views and information relevant for updating the NBSAP. Visits to hotspots that are critical for biodiversity conservation was important to directly observe and document current status, prevalent activities and verify the progress of implementation of the action plan. Primary qualitative data was also collected through direct observation and

discussion with stakeholder actors, local community leaders, elders and other knowledgeable persons using participatory approaches like focus group discussions (FGD) or key informant interviews (KII).

iv. Engagement of technical assistants: The Core NBSAP Updating Team was responsible for the execution of the tasks, and it guided and oversaw the process of revising NBSAP-2015. However, in consultation with the DoE (MoLWE), it also engaged a team of technical experts/assistants and field data collectors. The technical experts/assistants were properly oriented to perform the duties assigned to each of them. These experts were immensely helpful in the overall preparation of the NBSAP (2026–2030) document.

v. Archival data collection: secondary data was collected from progress reports, annual/periodic reports, strategic and action plans, relevant proclamations and databases of CBD focal Institution, implementing agencies, relevant line ministries, key stakeholders and Zoba administrations. The technical assistants that were co-opted from relevant stakeholders were responsible for the collection of archival and field information. The NBSAP-2015 and the 5th and 6th National CBD reports were key sources of latest information, which were used for assessing progress in biodiversity conservation over the last 10 years, focusing on the 18 biodiversity targets of NBSAP-2015. Data relating to the progress made towards achieving the Aichi Biodiversity targets were collected to assess achievements and implementation gaps. A data collection template correspeonding to GBF targets was prepared to ensure that relevant data are collected.

vi. Data compilation and analysis: The information collected using the activities and approaches explained above was collated, organised and analysed using appropriate data handling methodologies. The results are presented in the updated and revised NBSAP in the form of tables, summaries, figures/photos, etc.

vii. Organizing Workshops: A two-day national workshop on NBSAP (2026-20230) was conducted on June 30 and July 01, 2025 at the conference hall of the National Confederation of Eritrean Workers (NCEW), Asmara. More than 60 experts from primary line ministries, agencies, corporations and Zoba Administrations participated in the workshop. A separate workshop report has been prepared and submitted to the DoE (MoLWE). A validation workshop, with more than 50 participants from line ministries, Zoba Adminsitrtions, CBOs, agencies and corporations was also held on 26 Septemebr 2025. A brief review of the first workshop is provided below.

In the opening session, Ato Estifanos Bein, Director of Biodiveristy Conservation and CBD National Focal Person at the DoE (MoLWE), welcomed the workshop participants and thanked them for attending the workshop. He further highlighted that the main purpose of the workshop was to discuss the draft NBSAP (2026-2030) and ensure that the targets, objectives, and actions proposed are properly aligned with, and can easily be mainstreamed into, the plans and programs of relevant sector ministries, agencies, corporations, Zoba Administrations, community-based organizations (CBO) and other institutions.

Ato Kibrom Asmerom, Acting Director-General of the DoE (MoLWE), in his workshop opening remarks underscored the importance of biodiversity for the overall

development of the country and the need to conserve and sustainably use biodiversity resources of the country. He stressed that the NBSAP (2026-2030) is Eritrea's national policy, strategy and action plan to inform and guide the management of the country's biodiversity resources sustainably. He also indicated that despite Eritrea's commitment to the protection of the environment, various factors and drivers continue to pose serious threats to the ecosystems and biodiversity resources of the country. Thus, in view of the existing and emerging threats and their consequences, updating the NBSAP in conformity with the Kunming-Montreal Global Biodiversity Framework (GBF) is highly pertinent. He requested the workshop participants to actively participate in the discussions, and provide useful comments and suggestions to enrich and strengthen NBSAP (2026-2030). He expressed his profound appreciation and gratitude to the participants for their attendance. He concluded his speech by wishing the workshop fruitful deliberations.

The workshop was divided into two parts. On the first day, following the opening session, seven presentations and discussions on the presentations were conducted (see Annex 11: Workshop Program). The presentations covered the NBSAP updating process, the state of marine, agricultural and terrestrial biodiversity in the country, justifications for the selected targets and action plans, progress made in biodiversity conservation and challenges faced, and resource mobilization, monitoring and evaluation. The presentations were organized in three clusters. A one-hour discussion followed each presentation. Very useful and insightful comments and suggestions were put forward by the participants.

On the second day, four groups were formed and each group was provided with a set of targets and guiding questions to review and discuss in detail the targets, objectives, action plans, indicators, and resources requirements for implementations of the action plans. Each group presented its views and recommendations. The participants candidly gave their comments on the group presentations, further refining the comments and recommendation given by the groups. The NBSAP Updating Team has incorporated all of the constructive comments and suggestions into the final copy of NBSAP (2026-2030).

Unlike NBSAP-2015, the revised and updated NBSAP (2026-2030) has a companion resource mobilization, monitoring and evaluation plan. The resource mobilization, monitoring and evaluation plan is designed to identify finance needs for the implementation of NBSAP (2026-2030), and mobilize the resources required in a systematic and structured way. The DoE (MoLWE), in close consultation and collaboration with its national and international partners will implement the resource mobilization plan.

7. ENVIRONMENTAL POLICY, LEGAL AND INSTITUTIONAL REGIMES

7.1. Institutional Context

Eritrea has a favourable institutional environment for the conservation and sustainable use of biodiversity, but there is a strong need for inter-institutional cooperation and coordination for the coherence and effectiveness of the proposed actions. The relevant line ministries are directly or indeirectly the lead institutions responsible for the regulation, conservation, development and management of natural resources. The major institutions that are relevant to the conservation and management of biodiversity are briefly described below:

7.1.1. National level institutional context

The **Ministry of Finance and National Development** (MoFND) has the overall responsibility of coordination of national developmental programmes and projects in collaboration with various developmental partners and line ministries. The MoFND maintains close relationships and cooperation with bilateral and multilateral agencies in support of resource mobilization, resource allocation, coordination, and monitoring and evaluation. It ensures alignment of overseas development assistance with the development principles, policies, plans and progarmmes of the GoSE as well as national and international development programmes and standards. Moreover, the MoFND regulates and coordinates the financial sector of the country.

The **Ministry of Land, Water and Environment** (MoLWE), is the primary ministry entrusted to protect the environment. The Ministry is responsible for developing environmental policy and legislative frameworks and guidelines; it also plays a coordinating and monitoring role on the management and sustainable use of natural resources as well as in addressing environmental issues like climate change, conservation of biodiversity, and land use planning. It is also responsible for facilitating and monitoring of the implementation of MEAs, with a view to promoting the country's environmental commitments as well as meeting international obligations. The ministry has three key Departments with specialized functions.

i) **Department of Environment (DoE),** is the core institution mandated to monitor and protect the environment. The DoE oversees Eritrea's commitment to the protection of the environment for the benefit of present and future generations. The DoE has a lead role in coordinating and regulating environmental issues, generating environmental knowledge and information and it has developed various national policies, legislations, guidelines and programmes to address environmental concerns like climate change, conservation of ecological resources, EIA, pollution control, etc. It is also the focal institution for many international multilateral conventions and protocols such as; UNCBD, UNFCCC, CPB, NP (ABS), BRS etc.

ii) **Department of Land (DoL)**, MoLWE, which draws its legislative mandate from the Proclamation to Reform the System of Land Tenure in Eritrea (No. 58/1994), is responsible for the protection and management of land in the country. It is responsible for land use planning and this provides ample opportunity for streamlining and integration of biodiversity consideration into its land use plans.

iii) **Water Resources Department** (WRD), is responsible for the formulation and implementation of policies and guidelines for the development and management of the

water sector, focusing on providing the entire population with reliable access to safe drinking water. It also works closely with institutions responsible for hygiene and sanitation. The WRD has formulated various policy frameworks for the sustainable use and management of the freshwater resources of the country.

Ministry of Agriculture (MoA): As stipulated in the Proclamation for the Establishment of Regional Administrations (PERA), No.86/1996, the mandate of this ministry covers five strategic areas, namely: Policy Formulation and Sectoral (agricultural) Planning; Regulatory Functions; Agricultural Research; Promotion and Development of Agriculture; and Human Resources Development related to agriculture. Accordingly, its development and support programmes encompass research and extension in livestock production, field and horticultural crops, soil and water conservation, water harvesting and irrigation development, agro-infrastructure development, and corresponding human resource development, deployment and management. The activities of the Ministry have direct impacts on biodiversity, and mainstreaming NBSAP into the policies, plans and programmes of the Ministry is critical for its success. The Ministry is also directly responsible for the genetic conservation of crops, plants and animals of the country. Moreover, the MoA acts as the focal institution for Convention to Combat Desertification, Convention on Migratory Species, and Convention on International Trade on Wild Fauna ands Flora.

The **Ministry of Marine Resources (MoMR**) has the mandate and authority for promoting the development and the proper management and sustainable utilization of marine resources, and as well as the development and enforcement of regulations and laws pertaining to marine, coastal, and island ecosystems and biodiversity including related community programmes. The MoMR as an agency of the GoSE has been striving to develop, manage and sustainably use marine living resources, protect and preserve the marine habitat and work towards Integrated Coastal Zone Management (ICZM) including the islands. Furthermore, the MoMR is responsible for fisheries development planning and it regulates, promotes and coordinates fisheries development programs and projects. As per Proclamation No. 176/2014 and the directives issued by the MoLWE (MLWE/02/2023), the MoMR is responsible for overseeing the establishment, management, conservation, protection, promotion and development of all marine protected areas.

The **Forestry and Wildlife Authority (FWA)** was established in 2012 to oversee all matters relating to the development, monitoring, management and rational utilization of forests and wild animals, establishment of protected areas (PAs), rehabilitation of degraded ecosystems, coordination, technical backup, and resource mobilization. As per the directives issued by the MoLWE (MLWE/02/2023) the Forestry and Wildlife Authority is responsible for the establishment, management, conservation, protection, promotion and development of all terrestrial protected areas. The FWA, as per the Proclamation No. 155/2006. is also responsible for issuance of permits for use of forest and wildlife species.

The **Ministry of Energy and Mines (MoEM)** is responsible for the development and management of energy and mineral resources of the country. The Ministry provides regulatory framework, and has been designing sustainable energy policies and strategies that aim at the development of clean, affordable and efficient national energy system. The Ministry has been developing sustainable energy pathways through the development of the renewable energy resources of the country, development and dissemination of efficient stoves and renewable energy technologies, appropriate energy tariff and pricing structures, capacity building, modernizing and expanding power generation and distribution system, building decentralized

power production systems, etc. The Ministry is also responsible for guiding and manageing the development of mining in the country. Thus, mainstreaming biodiversity considerations into developmental activities and initiatives of the Ministry is imperative to minimize any adverse impacts of energy use and mining on biodiversity.

The **Ministry of Local Government (MoLG**) oversees, coordinates and implements the activities of all line ministries through the Zoba (regional) and Sub-Zoba (district) Administrations. The MoLG is core institution responsible for the implementation of development policies and activities at local levels, including the mobilization of resources and communities. At Zoba level the MoLG, in collaboration with the MoA, FWA, MoMR and MoLWE are responsible for the supervision and management of the regional forestry, wildlife and fisheries development and management, soil and water conservation, reservoir construction and the development of irrigation, conduct surveys, undertake Monitoring and Evaluation for natural, agricultural and fisheries related issues.

The **Ministry of Tourism (MoT**) is responsible for the development of sustainable tourism in the country. Eritrea has significant tourism resources such as clean beaches, beautiful coral reefs, rich marine, coastal and island biodiversity, scenic and unique landscapes, wildlife, protected forest areas, archaeological and historical sites, diverse cultures, hospitable people, safety etc. Tourism development policy and strategy must thus be situated within the environmental, cultural, archeological and historical heritages of the country. Sustainable tourism has the potential to promote and support the conservation and sustainable use of environmental resources and the Ministry is an important ally in biodiversity conservation programmes.

The **Ministry of Information (MoI)** engages in educating, informing and entertaining the public through television, radio and newspapers. It plays key role in raising the awareness of the public on global, regional, national and local issues of interest. Thus, the MoI can be instrumental in galvanizing public support and raising public awareness on the importance, conservation and sustainable use of biodiversity and ecosystems through well-prepared radio, newspapers and TVprogrammes. Best practices and lessons learned from the experience of other countries in biodiversity conservation can also be disseminated through the Ministry's various media outlets.

The **Ministry of Education (MoE)** is the key institution to nurture and promote environmental stewardship among the student population by integrating environmental education into the mainstream education. Sustainable use and protection of biodiversity cannot be achieved unless tomorrow's leaders are equipped with the principles, values, ethics, perspectives, knowledge and skills of the concepts of conservation, sustainable use, and intergenerational equity. The Ministry is already actively engaged in environmental protection through Student Summer Campaigns of tree planting, promotion of environmental clubs, school afforestation programmes, life skill and citizenship educations, etc. These and new programmes can be effectively used to bring about behavioral changes in support of biodiversity conservation and ecosystem resilience.

7.1.2. Community based organizations/civil society organizations

The **National Union of Eritrean Women (NUEW)** is a national entity mandated with the promotion and safeguarding of the equality, rights, and welfare of women in Eritrea. Women are the main users of ecological resources in Eritrea, and co-opting the NUEW in biodiversity conservation programmes is vital. The structure of the NUEW extends up to the grassroot levels

and it can be effectively used to mobilize women for participation in all matters relating to the conservation and sustainable use of biodiversity and ecosystem restoration programmes.

The **National Union of Eritrean Youth and Students (NUEYS)** is one of the biggest national CBOs in Eritrea. The NUEYS has country-wide structures that enable it to reach the youth anywhere in the country. It is active in the implementation of various developmental and environmental protection programmes. In collaboration with the Ministry of Education, every year during the summer season, tens of thousands of youths and students from all over Eritrea are mobilized to participate in environmental protection and/or rehabilitation activities such as planting tree seedlings, digging wells, terracing hillsides, repairing conservation structures, collecting plastic and other pollutants, etc. The NUEYS could be instrumental in the restoration of degraded ecosystems

Other institutions, associations and cooperatives' such as National Confederation of Eritrean Workers, Dairy Development Associations, Horticultural Development Cooperatives, NHERI, Water Users Associations, etc. are other potential entities that could be mobilized in the conservation and sustainable use of biodiversity.

7.1.3. Regional/Zonal level institutional context

The Zoba (regional) Administrations assume overall responsibility for the implementation of development programmes at local levels, in collaboration with line ministries. The Zoba Administrations are responsible for regional and local development plans and initiatives, including coordination with respect to planning, implementation, financial management, and monitoring of development programmes into which biodiversity conservation consideration can easily be incorporated. Branches of line ministries, corporations, authorities, and agencies form part of the Zoba Administrations.

At Zoba level, the MoLG in collaboration with MoA, MoLWE and FWA are responsible for the supervision and management of the regional forestry and wildlife development and management, soil and water conservation, reservoir construction and the development of irrigation, conduct surveys, undertake monitoring and evaluation for natural and agricultural resources and related issues.

The Department of Agriculture and Land under the Regional Administrations is responsible for the preparation of land use plans, the prevention and management of environmental pollution and ecological damage, as well as the development and wise utilization of the water resources.

The CBOs like NUEW, NUEYS and various associations operating at Zoba level play significant role in supporting the development and management of natural resources.

7.1.4. Sub-Regional level institutional context

The Sub-Regional Administration is the lead agency responsible for the overall mobilization of communities for the implementation of programmes relating to soil and water conservation, tree planting, watershed rehabilitation, protection and management, establishment and management of closures, clean water supply, prevention of environmental pollution and ecological damages, dam construction, mangrove plantations, etc. The Sub-Regional Administration also coordinates planning, financing, implementation and monitoring of all development activities at the Sub-Zoba level. CBOs, particularly the NUEW and NUEYS closely work with the Sub-

ZobaAdministration to mainstream gender into development activities mobilize workforce for various activities, including like catchment rehabilitation and resource conservation.

7.1.5. Community level institutional Context:

The **Kebabi (Local) Administration** is the lowest in the administrative structure of the country**.** The Kebabi Administration sets up a Planning and Implementation Committee (PIC) to formulate the Kebabi Development Plans, including local projects. The PIC is headed by the Kebabi Administrator, assisted by local Zoba assembly members. PIC receives technical support from the Sub-Zoba Administration.

The **Local Communities** are custodians and beneficiaries of the natural resources including pasturelands, farmlands, forests, and fishing grounds. Local communities bring unique indigenous knowledge to the conservation and management of biodiversity resources. Communities identify and prioritize their own particular problems and define development actions to address them. They are custodians and end users of all developmental interventions. Local communities also participate in planning, management, identification, implementation, adaptation, SLM/SFM techniques, income generating activities and monitoring.

7.2. Relevant Environmental Policy and Legislation

Eritrea inherited a devastated economy and highly degraded environment at the time of independence in 1991. Recognizing the environment as the natural capital and basis for sustainable development, Eritrea developed and enacted various environmental policies, laws and guidelines to address environmental issues and to protect its natural capital from further deterioration immediately after liberation. Eritrea recognizes the natural capital both as common heritage for all Eritreans now and the future and a basis for sustainable development. Today, the importance of the environment for the wellbeing of people and sustainable development and the need for people to live in harmony with it is strongly recognized and underlined in almost all government policy documents. The country has also a focal department for environment, The Department of Environment, MoLWE. In general, as a developing country, Eritrea to the best of its abilities tries to carefully balance its environmental policy and legislative regimes with its development programmes. Sectoral policies and instruments have also been either reviewed or developed for environment, fisheries, forestry and wildlife. The formulation of these instruments was prompted by national and international developments such as the development of the Macro-economic Policy (1994), the National Environmental Management Plan (NEMP-E 1995), the Eritrean Constitution at national level, and the Rio Declaration and the World Summit on Sustainable Development at the international level. Overall, the environmental policies and legislations that the country has adopted intended to address the country's environmental problems and meet commitments to the MEAs. However, a brief assessment showed that some of the policies are not yet fully implemented for various reasons.

At present, Eritrea's environmental framework is primarily governed by the Environmental Protection, Management and Rehabilitation Framework Proclamation (No. 179 of 2017). This proclamation aims to establish the foundation for environmental management and protection and it provides institutional and legal instruments for their implementation. It outlines principles for environmental management, including integrated management, sustainable development, human well-being. It also establishes administrative arrangements, such as the National Environmental

Council, and addresses specific areas like pollution control, waste management, and environmental impact assessment.

Historically, Eritrea adopted the NEMP-E in 1995. The NEMP-E was developed through a broad-based consultative process to serve as a blue print for the protection of natural resources and promotion of sustainable development. The NEMP-E recognized Eritrea´s dependence on biodiversity for its development and the satisfaction of the daily life needs. Accordingly, it called for the wise use of terrestrial, agricultural and marine/coastal biodiversity resources.

The country has made significant developments in streamlining issues of sustainable and responsible environmental management into its national charter, development policies and programmes. To ensure that Eritrea's environmental resources are sustainably managed for the present and future generations, Eritrea has developed various environment policy documents and legislations. A sample of the major legislations and policies, which are formally proclaimed and issuedis provided in Table 7.

Eritrea's commitment to a path of sustainable development is affirmed in its National Constitution of 1997. Article 8 of the National Constitution specifically asserts that the "state shall bring about a balanced and sustainable development throughout the country" through fair and equitable sharing of resources and that development projects must align with the principles and approaches of sustainable development, manage land, air, water and natural resources in a balanced and sustainable manner and secure participation of people in safeguarding the environment.

Similarly, Proclamation No. 179/2017, The Eritrean Environmental Protection, Management, and Rehabilitation Framework**,** asserts that sustainable development can only be achieved when developmental and environmental needs of present and future generations are fairly and equitably met and that natural resources (biological as well as non-biological) will be exploited in accordance with the environmental and developmental policies and that all activities will be carried out in harmony with nature without casing damage to the environment. It provides for the development and enforcement of an environmental policy framework consistent with sustainable development understood by the same proclamation as "development that meets the needs of the present generation without compromising the ability of future generations to meet their needs by maintaining the carrying capacity of the supporting ecosystems." In addition, it strives to guarantee and promote maximum public and community participation in the conservation, protection and enhancement of the environment; and set up the basis for Eritrea's effective contribution to and benefit from international cooperation in the global efforts for environmental protection.

The Forestry and Wildlife Conservation and Development Proclamation, Proclamation 155/2006, in particular focuses on the conservation, development and sustainable management of forest and wildlife of the country. Its core objectives are:

i. The conservation of endangered species;
ii. The conservation of other indigenous species;
iii. Afforestation and reforestation;
iv. The establishment and proper management of protected areas; and
v. The promotion of people's awareness and participation in the conservation, development and sustainable management of forests and wildlife.

The Proclamation stipulates that i) an inventory of forest and woodlands should be made to monitor them, ii) survey of habitats and wildlife species should be conducted, iii) a national action plan should be prepared and adopted based on the inventories, and that iv) a Forestry and Wildlife Advisory Board should be formed to advise the Minister on matters relating to the Implementation of the Proclamation.

Other government documents like the National Economic Policy Framework underline the need for coherent environmental policy that aim at the preservation of Eritrea's ecological integrity through prudent utilization of land, forest, air, water, and marine and coastal resources, establishment of sound environmental standards and adoption and implementation of a comprehensive national environmental policy framework

Eritrea has also signed important multilateral environmental agreements (MEAs); Eritrea is now a party to 13 MEA (conventions, treaties and protocols). As part of its commitment to the MEAs, it has prepared various reports and action plans: Six CBD National Reports, three National Communications (NC) for Climate Change (that include greenhouse gas emissions); NBSAP; National Adaptation Plan of Action (NAPA) and National Action Programme (NAP) to combat climate change and desertification respectively; the Nationally Determined Contribution (NDC), which describes Eritrea's climate change mitigation and adaptions actions, etc.

These policies, laws and guidelines should provide a sound and sufficient bases for environmental management. However, there is much to be desired in terms of implementation and enforcement.

Implementation of environmental policies and legislations requires effective cross-sectoral coordination. The MoLWE is entrusted with the overall responsibility for the administration of Proclamation No. 179/2017**,** and the establishment and implementation of an integrated environmental management plan. Recognizing that environmental issues are cross-cutting and call for cross sectoral collaboration, the Proclamation stipulates that every line ministry shall establish an Environment Unit to ensure compliance by that line ministry with the requirements of the Proclamation and report to the Department of Environment, MoLWE, any contraventions of the environmental law. Moreover, a National Environmental Council (NEC), composed of Director Generals, from nine ministries[1] as assigned by the respective ministers, has been established to promote cooperation and coordination on environmental management. Some of the relevant environmental legistlations and policies issued by relevant government ministries are listed in Table 7 below.

[1] These are the Ministry of Agriculture, Ministry of Health, Ministry of Energy and Mines, Ministry of Land, Water and Environment, Ministry of Marine Resources, Ministry of Public Works, Ministry of Trade and Industry, and the Ministry of Transport and Communications.

Table 12: List of relevant environmental legislations and policies

No	Environmental Policy, Legislation and Directives	Purpose in Brief
MoLWE, DoE		
1.	Directive to Determine the Establishment and management of Protected areas, No. MLWE/02/2023 (Issued)	The Directive aims to establish a consolidated and coherent protected area system. It provides for the management and operation of protected area.
2.	Proclamation No. 179/2017 The Eritrean Environmental Protection, Management, and Rehabilitation Framework (Issued)	It establishes the foundation for environmental management and protection laws; it advances an environmental policy framework consistent with sustainable development and aims at promoting public and community participation in conservation, protection and enhancement of the environment.
3.	National Conduct of Environmental Security 1995. (Adapted)	It promotes respect for all living things and sustainable use of environmental resources.
4.	National Environmental Assessment Procedures and Guidelines (1999) (Issued)	It provides procedures for conducting environmental impact assessment for projects with potential impacts (Category A and B projects) on the environment.
5.	Regulations for the Issuance of Permits for the Importation or Exportation of Ozone Depleting Substances (ODSs) and Ozone Depleting Substances Based Equipment or Products (L.N.No.117 of 2010) (Issued)	It regulates import and export of Ozone Depleting Substances (ODS) as well as products containing ODS, bans import of Ozone depleting substance except Hydro-Chloro-Fluoro-Carbons (HCFC), and includes measures to control their consumption through a licensing and quota system.
6.	The Ban on Importation of Thin Plastic Bags (Legal Notice (L.N) No. 99/2004) (Issued)	It bans and outlaws use of plastic bags throughout the country via the prohibition of the import, production, sale or distribution of plastic bags in Eritrea.
7.	The Environmental Management Regulations, (Legal Notice No. 127 of 2017) (Issued)	Designed for the implementation of the Eritrean Environment Protection, Management and Rehabilitation Framework Proclamation, No. 127 of 2017, the regulation includes EIA, control of unacceptable discharge levels of effluents and emissions into the environment, and it obliges administrative authorities to establish waste management systems and safe dumping sites in urban and rural areas.
8.	National Adaptation Program of Action for Climate Change (NAPA, 2007). (Submitted)	It outlines short to medium term adaptation needs to address the country's vulnerability to climate change and develop adaptation strategies; prioritize adaptation strategies to address these vulnerabilities; and develop plans for implementing adaptation measures at the national, sectoral, and local levels.
9.	Eritrea's First National Communication (2001), Second National Communication (2012) and Third National Communication (2021). (Submitted)	These reports serve as a crucial tool for tracking progress towards meeting the goals of the Paris Agreement and other international climate agreements. The primary purposes of National Communications are transparency and accountability, facilitating international Cooperation, Supporting the UNFCCC Process by providing data and information for decision-making. The national

No	Environmental Policy, Legislation and Directives	Purpose in Brief
		communication documents can help attract international support, including finance and technology, for climate change efforts.
10	Eritrea's Intended Nationally Determined Contributions (INDCs) Report to UNFCCC (2015)	Aimed to undertake mitigation and its population, environment and economy to the adverse effects of climate change, based on its Climate Resilient Sustainable Economy Development policy for addressing both climate change. adaptation and mitigation goals.
11	Eritrea's Nationally Determined Contributions (NDCs) Report to the UNFCCC 2018 (submitted) and 2025 (under review)	Nationally Determined Contributions (NDCs) reports Eritrea's contributions to the reduction of greenhouse gas emissions incompliance with the Paris Agreement.
MoLWE, DoWR		
12	Eritrean Water Proclamation (No. 162/2010). (Proclaimed)	This Procalmation establishes and provides a comprehensive framework for the sustainable use, management, equitable distribution and regulation of water resources in Eritrea.
13	Integrated Water Resources Management Plan (2009) (Issued)	This sets Action Plans for the management of surface and underground water resources of the country, ensuring equitable, efficient, and environmentally sustainable water resource management.
MoLWE, DoL		
14	The Regulation to Provide for the Procedure of Allocation and Administration of Land (L.N. No. 31/1997) (Issued)	This is a legal document that outlines the procedures for the allocation and management of land in Eritrea. It is a key component of the country's land reform process, which primarily aims to establish clear guidelines and procedures for the allocation, use, and administration of land within the country. It serves as a complementary piece of legislation to the Land Proclamation No. 58/1994. .
15	The Land Proclamation No. 58/1994. (Proclaimed)	The main purpose of the Proclamation is to a) replace the existing system of land tenure with a more equitable and efficient one, b) determine the manner of expropriating land for the purposes of development and national reconstruction and c) establish procedures for the government to acquire land for public projects and development initiatives.
MoA		
16	Forestry and Wildlife Conservation and Development Proclamation (No. 155/2006). (Proclaimed)	The Proclamation provides a legal framework for the protection of biodiversity through the conservation and sustainable management of forests, wildlife including protected areas and riverine forest areas, conservation of endangered indigenous species, afforestation and reforestation.
17	Plant Quarantine Proclamation (No. 156/2006) (Issued)	This Proclamation is designed to protect Eritrea's agriculture and natural environment from the introduction and spread of plant pests and diseases and it provides a framework for regulating the import, export, and movement of plants and plant products.
18	Regulations for the Issuance of Forestry Permit (L.N. No. 111/2006). (Issued)	Based on the provisions of Proclamation **(No. 155/2006)**, the Regulations grant the Minister of Agriculture the power to issue permits for collecting dead trees and shrubs or parts thereof for commercial or domestic

No	Environmental Policy, Legislation and Directives	Purpose in Brief
		purposes, to harvest forest products other than wood for commercial purposes, to transport forest products,to export forest products, and to import forest products.
19	Regulations for the issuance of wildlife permits (L.N. No. 112/2006). (Issued)	Based on the provisions of Proclamation **(No. 155/2006)**, the Regulations grant the Minister of Agriculture the power to issue permits for harvesting wildlife products for various uses including clearance scientific purposes, creation of wildlife farms, and the exportation or importation of wildlife.
20	Proclamation No. 129/2003 to form the National Drought Relief Coordinating Committee in Eritrea. (Issued)	The Proclamation provides for the establishment of a committee to respond to severe drought conditions, ensure effective coordination of all participants in drought relief efforts, and secure involvement of high-level government officials to oversee and manage the relief efforts.
21	The Regulations for the Importation, Handling, Use, Storage, and Disposal of Pesticides (L.N. No. 114 of 2006)	Designed to regulate the use of pesticides in Eritrea, the primary purposeof the Regulation is to protect public health and the environment by ensuring that pesticides are used safely and responsibly. It has a comprehensive guideline for the use and management of pesticides and it restricts importation of pesticides to the annexed list only.
22	National Action Program to Combat Desertification and mitigate the Effects of Drought (NAP, 2002) (Issued)	It is a comprehensive sectoral document that outlines measures to combat desertification, address the impacts of drought through the adoption of drought mitigation measures and prevent desertification and land degradation through sustainable land use practices.
MoMR		
23	Fisheries Proclamation (1998/2003/2014). (Proclaimed)	The Proclamation has comprehensive coverage on the marine sector and it includes environmental provisions including establishment of marine protected areas, powers to declare closed seasons and areas and prohibition of specific fishing methods and gear. It also prohibits direct harvest and domestic trade in endangered and protected species.
24	The Foreign Fishing Vessel Regulation: L.N. No. 38/1998. (Issued)	The Regulation specifies the conditions under which a fishing license is granted; sets the rules for fishing to qualify for license.
25	The National Fishing Vessel Regulation: L.N. No. 39/1998. (Issued)	This Regulation aims to control and manage fishing activities to ensure sustainable resource utilization. It also seeks to minimize environmental impact and prevent overfishing. It Protects certain species and habitats. By regulating fishing activities, protecting species, and promoting sustainable practices, the government aims to ensure the long-term viability of its fisheries sector while safeguarding the marine environment.
26	Regulations issued to amend the Foreign Fishing Vessels Regulations (Legal Notice No. 38/1998): Legal Notice No. 70/2003. (Issued)	This Legal Notice amends the Foreign Fishing Vessels Regulations (Legal Notice No. 38/1998) and it introduces several key changes aimed at improving the management and regulation of foreign fishing activities in Eritrea.
27	The Fishery Product Hazard Analysis Critical Control Points Regulation: Legal Notice No. 41/1998. (Issued)	This regulation focuses on ensuring the safety and quality of fish and fishery products through hazard analysis and critical control points. The scope of the HACCP system applies to various fish and fishery products, emphasizing safe and sanitary processing and importing methods.

No	Environmental Policy, Legislation and Directives	Purpose in Brief
28	The Aquaculture Products Regulation: L.N. No. 64/2003. (Issued)	These regulations lay down measures to monitor the substances and groups of residues listed in Annex I of the legal notice. The production process of aquaculture products and primary products of animal origin must be monitored for the presence of residues and substances listed in Annex I.
29	The Heavy Metals Regulations: Legal Notice No. 66/2003. (Issued)	The Heavy Metals Regulations pursues to safeguard public health and ensure the safety of fishery products by setting limits on harmful heavy metals. While not explicitly stated, the regulations indirectly contribute to environmental protection by limiting heavy metal pollution in aquatic ecosystems.
MoLG		
30	Proclamation for the establishment of Local Governments (No. 86/1996). (Issued)	Provides for regional decentralization of administration and implementation of development policy with implications for environmental management. Six regional administrations (*Zobas*) that are responsible for implementing policies and plans established at central government level.
MoT		
31	The Tourism Development Policy and Strategy (1999). (Issued)	This is a foundational document outlining the country's vision for leveraging tourism as a driver of economic growth, cultural preservation, and sustainable development. The strategy aimed to position Eritrea as a unique and attractive destination for international travellers.
32	National Tourism Development Plan from 2000-2020. (Issued)	This aims to establish a comprehensive framework for the development of sustainable tourism that generates economic benefits for local communities and the business sector in the country.
33	Tourism Proclamation (No. 152/2006. (Proclaimed)	This Proclamation aims to establish an integrated and interactive system for identifying, assessing, registering, preserving, protecting, and sustainably developing Eritrea's cultural and natural heritage for present and future generations.
MoEM		
34	Proclamation to Promote the Development of Mineral Resources (No. 68/1995) (Proclaimed)	This provides a legal framework for the exploration, exploitation, and development of mineral resources in Eritrea, by both commercial and artisanal mining; enforces EIA, and provides for appropriate environmental management plans; empowers the MoEM to exclude certain areas from mining operations.
35	Revised Proclamation to Govern Petroleum Operations (108/2000). (Issued)	It provides for environmental protection in petroleum operations; applies to search, exploration and exploitation of sea beds and sub-soil.
36	Revised Regulations on Petroleum Operations, Legal Notice No. 45/2000. (Issued)	The Regulation incorporates EIA in survey and exploration stages; requires that petroleum operations must comply with accepted petroleum industry standards and practices
MoH		
37	Environmental Health Policy and Guidelines, 2010. (Issued)	A comprehensive document that outlines the government's approach to protecting public health and the environment; provides a framework for addressing environmental health issues.
38	Rural Sanitation Policy and Strategy Directions, 2007. (Issued)	A comprehensive document that outlines the government's approach to improving sanitation and hygiene in rural areas of Eritrea. .
MoI		

No	Environmental Policy, Legislation and Directives	Purpose in Brief
39	The Press Proclamation No 90/l996. (Proclaimed)	Regulates the media in Eritrea. It outlines the rights and responsibilities of journalists and media outlets in the country. The proclamation aims to balance freedom of the press with the government's interest in maintaining national security and public order.
Port Authority		
40	Port Authority Proclamation (148/2005). (Proclaimed)	This establishes office of a Port Chief Executive Officer for each port who is charged with responsibility, inter alia, for maintaining safety, security and environmental conservation in accordance with existing laws.
41	Port Regulation Legal Notice No. 104/2006. (Issued)	This is primarily a legal instrument for regulating port operations, and its implications for biodiversity and the environment are significant. It addresses issues such as EIA, pollution control, waste management, coastal zone management, and marine resource conservation.

8. UPDATED NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

The revised NBSAP is premised on the recognition that biodiversity assets are critical for the sustainable development of the country and wellbeing of people. Accordingly, it aims at the conservation, restoration, and sustainable use of biodiversity and ecosystem services as well as equitable sharing of benefits derived from them, without compromising the sustainable socioeconomic development of the country.

The revised and updated NBSAP is an *inclusive biodiversity conservation strategy* because it is informed by biodiversity issues raised during the consultation process and this approach has been quite useful in formulating a robust strategy and action plan that can easily be integrated into the policies and programmes of public sectors. Care has also been taken to ensure that it is well aligned with the country's national vision, laws, development policies, priorities and global commitments. However, it should also be emphasized that its effective implementation will require a strong and effective inter-institutional or inter-ministerial cooperation at national, Zoba and local levels. Thus, a shared ownership of the NBSAP is crucial for its implementation.

The revised and updated NBSAP includes the vision, goals, objectives, targets and principles of biodiversity in the country. Each one of them are presented separately below.

8.1. Vision of the NBSAP:

The vision of the NBSAP (2026-2030) articulates the long-term goal for the state of biodiversity in the country. The vision asserts that: "Eritrea's biodiversity is valued, protected, managed, restored and sustainably used to ensure equitable benefits to the people of Eritrea, now and in the future".

8.2. Mission of the NBSAP

The mission of the NBSAP (2026-2030), which strives towards the 2050 vision, is: "To chart out a policy framework that provides a strategic direction to halt biodiversity loss or decline through efforts and actions that effectively respond to the threats and pressures."

8.3. Strategic Objectives

The main objectives of the NBSAP (2026-2030) are to:

1. Develop national targets and action plans that are well aligned with the national development policies and programmes, as well as with the Kunming-Montreal GBF and SDGs.
2. Serve as a national policy framework for the conservation, management and mainstreaming of biodiversity and ecosystem services into relevant sectoral programmes and policies to ensure that ecosystems and biodiversity continue to provide services essential to the well-being of people.
3. Provide strategic direction and consolidated action plans for reversing loss and/or decline of biodiversity and ecosystem degradation and promote harmony between people and

nature through the elimination and effective management of all pressures on, and threats to, biodiversity.

4. Raise people's awareness on the benefits of biodiversity assets and ensure that benefits arising from genetic resources and traditional knowledge are shared equitably, so that people adopt practices that protect and enhance biodiversity assets of the country.
5. Ensure participation of local communities, women, girls, the youth and disabled persons in the conservation, management and sustainable use of biodiversity resources.
6. Improve the capacity of relevant institutions for the conservation and management of biodiversity.
7. Improve the knowledge base of biodiversity for effective conservation, management and sustainable use of biodiversity assets.
8. Develop a resource mobilztion and monitoring and evaluation stragey for the proper implemnation and follow-up of NBSAP (2026-2030).

8.4. Principles

The revised NBSAP fully recognizes that biodiversity assets are critical for the sustainable development and their capacy for use now and in the future should not be undermined. Accordingly, the strategies and actions plans are anchored on the following principles. These principles are derived from the Kunming-Montreal GBF.

- Eritrea's realization of the importance of biodiversity, its commitment to its conservation and suatinablre use;
- Avoidance of all activities that may lead to the loss or reduction of biodiversity, loss or fragmentation of habitats, and pressures on biodiversity hotspots;
- Protection of threatened fauna and flora from extinction;
- Rehabilitation/restoration of degraded ecosystems and habitats;
- Enhancement of ecosystem integrity and the functions and the services they provide;
- Ensuring intergenerational equity;
- Efficiency and effectiveness of conservation measures;
- Involvement of women, girls, the youth and disabled persons and local communities in biodiversity conservation decision-making; and
- Fair and equitable sharing of benefits derived from biodiversity.

8.5. Targets

The targets represent the priority biodiversity issues that the NBSAP aims to address. Each target has a set of time-bound actions, which represent the tasks that will have to be undertaken for its realization, including the entities responsible for the implementation of the actions, resources (human and material) required, and indicators to track progress in the implementation of NBSAP (2026-2030).

The targets were shared in draft form with relevant ministries and all Zoba Administrations to ensure that they align with their plans and strategies. The stakeholders were requested to provide their views, suggestions and recommendation on the proposed targets. This was expected to ensure that NBSAP (2026-2030) is integrated into sectoral and regional plans, strategies and programmes, and that it does not create unnecessary additional burden on implementing institutions and stakeholders.

8.5.1. Justification for the targets

The targets and the reasons for selecting each of the targets are provided below.

Target 1: By 2030, 15% of the degraded terrestrial coastal and marine ecosystems, and particularly those that provide essential services to livelihoods and well-being of people, are under restoration or rehabilitation through appropriate ecosystem restoration and management measures to enhance their resilience, integrity, structure and function; loss of natural habitats, degradation and fragmentation of ecosystems is at least halved and where feasible brought close to zero.

Eritrea has two fragile terrestrial ecosystems: hilly/mountainous and arid/semi-arid areas, which are very sensitive to natural and human induced processes. At present they suffer from degradation, loss of biodiversity and threats of desertification. These ecosystems remain vulnerable to further degradation due to several direct and indirect drivers. Thus, restoration of degraded ecosystems and prevention of further degradation must go in tandem to enhance ecosystem functions, and improve the integrity and health of ecosystems.

Animal and plant communities require habitats of good composition and size to meet their needs for food, water and shelter. Habitat degradation, fragmentation, reduction in size and/or its complete loss has been occurring in Eritrea due to various direct and indirect causes. Land degradation baseline assessment was done using three UNCCD progress indicators: land cover, net primary productivity and soil organic carbon (SOC) stock. The results showed that 36% of land cover suffers from declining land productivity of which 8% of the Eritrean land mass has declining trend of land productivity,16% shows early signs of land productivity decline, and 12% of the land covers are stable but stressed. The "National Land Degradation Neutrality Targets of the MoA, 2018, further revealed that between 2000 and 2010, about 5.62% or 385,300 hectares were affected by degradation. Based on the LDN TSP, 23 major degradation hotspot areas have been identified. Moreover, according to UNEP (2002), 42% of the total area of Eritrea that is not classified already as desert is vulnerable to desertification. Habitat loss or degradation is thus a major threat to ecosystems and genetic diversity in the country.

The Red Sea represents a complex and unique tropical marine ecosystem, with a high degree of endemism. The Red Sea has rich biodiversity and diverse ecosystems, which include coral reefs, mangroves, seagrass meadows, and other benthic and pelagic ecosystems. At present, there seems to be limited degraded seascape in Eritrea. However, coral reefs, mangroves and seagrasses are some of the ecosystems which are being fast degraded. The recent massive bleaching of corals could result in extensive degradation. Coral reefs support thousands of species by providing shelter, feeding and breeding grounds. Thus, in view of the dangers they face by global warming, appropriate strategies will have to be put in place to mitigate the effects of global warming. Mangrove and seagrass meadow ecosystems also need enhancement and protection measures. It is also possible that some degradation may be occurring in the trawling sea grounds, and deserves proper monitoring and remedial measures.

The agroecological conditions of the country are also changing, particularly due to climate change, introduction of high yielding varaities, use of pesticides (greatly affecting pollinators) , herbicides (loss of some plant species) and chemical fertilizers, overgrazing, invasive alien species, over-cultivation (particularly expansion of farming to marginal lands), and deforestation (seriously reducing rain water infiltration and soil moisture).

Various initiatives like community soil and water conservation, afforestation, establishment of closures, sustainable land management, promotion of climate smart agriculture, and habitat rehabilitation have been going on but their impacts have remained limited. The problems cited above require ecosystem restoration measures to build, improve or enhance the integrity, resilience, functions and services of ecosystems so that their contribution to the welfare of Eritrean societies is improved and sustained.

Target 2: By 2030, the conservation of selected biodiversity hotspots through area-based conservation methods is strengthened and at least four terrestrial and marine, coastal and island areas, accounting for 10% of the land and territorial waters of Eritrea are gazetted as legally protected areas; preparation will also be under way to establish four others as protected areas.

Setting aside effectively managed terrestrial and marine 'protected area', for the preservation of biodiversity has become a common policy to protect biodiversity throughout the world. Protected areas (PA) are essential to conserve critical habitats and protect species from extinction. The IUCN defines six categories of protected areas.

In the past, three areas - Yob, Gash-Setit and Nakfa - were set as wildlife reserves. In 1995, four areas – Semienawi Bahri, Gash-Setit, Riverine habitat along Gashs and Barka rivers, and the Buri Peninsula – were designated as priority areas for the establishment of gazetted protected areas by NEMP-E. Similarly, proposals were put forward to declare (1) Dahlak Area, (2) Sheikh Said and Dissie Islands, and (3) the coastal area of Buri and Irori as Marine Protected areas. The FAO Pre-Investment (1997) proposed 27 locations as potential protected areas, of which 14 sites were in the coastal, marine or island locations.

At present there are certain areas, which are set aside and treated as protected areas, de facto, but not formally gazetted yet. The main protected areas are:

1. Semeienawi-Debubwi Bahri Protected area is found mostly in Zoba Semeinawi Keih Bahri covering 110,000-ha (FWA);
2. Gash-Setit Elephant Sanctuary in Zoba Gash Barka covering an area of 44,270 ha (FWA); and
3. Buri-Irrori- Hawakil Islands, marine and coastal areas (154,000 ha).

There is also a proposal to establish 8 protected areas with a combined area of 391,972 ha. In addition to this about 244,000 ha of land is under community-managed closures. Some of the Zobas have also plans to establish protected areas. Another 197,000 ha are planned to be under community closures. For instance, Zoba Semienawi Keih Bahri plans to establish 7 protected areas, but some of them overlap with that of FWA, while Zoba Debub plans to establish 2 protected areas. In-situ (on-farm) conservation of land races is also very important and areas where in situ conservation of crop landraces could take place have also to be identified.

At present, there are no formally gazetted protected areas – terrestrial or marine. Protected Areas are still in the process of establishment. There is no management and governance structure for the PAs. There is no mechanism for benefit sharing for PAs. Recently, the "Directive to Determine the Establishment and Management of Protected areas, No. MLWE/02/2023" has been issued to establish and manage a network of marine and terreserial protected areas with clear mandates of the responsible institutions. Given the immense degradation, reduction, and fragmentation of habitat, and the reduction of species both in diversity and abundance

consequent upon habitat degradation, the establishment of gazetted protected areas and wildlife corridors remains an urgent national imperative.

Target 3: By 2030 the extinction of known threatened or near threatened flora, fauna, crop landraces and livestock breeds has been prevented, and their conservation status, particularly of those most in decline, will show significant recovery trends.

Species extinction is the major cause for the decline in genetic diversity. The causes of species declines and/or extinctions are complex, involving both direct effects related to damage and/or change of the habitat, and indirect effects such as losses of lower food-chain organisms. The decline in genetic diversity has adverse impacts on the long-term stability, adaptability and resilience of biodiversity, both at the species and ecosystem levels.

Due to incomplete study, it is difficult to state the number and type of species that have become extinct in the country, but species richness in the country has been greatly diminished. According to Proclamation 155/2006, 55 tree/shrub species and 23 wildlife face high risks of extinction. However, the number of species threaten with extinction seems to be higher. Northern Red Sea Zoba reported that 12 animal species, 4 bird species, 29 trees/shrubs are described as threatened. Similarly, Zoba Maekel listed three tree/shrub species that are not included in the Proclamation list as threatened**.** Vivero, Ensermu and Sebesebe (2005) have compiled a *Red list of endemic trees and shrubs of Ethiopia and Eritrea*, by gathering information on 135 (31 trees and 104 shrubs) endemic taxa that are either threatened or near threatened. Their list includes 17 taxa that are also found in Eritrea that are not included in the Proclamation 155/2006 list, (15 taxa are found in both countries and two taxa that are found only in Eritrea) (See Annex 1)

Out of the 597 terrestrial and sea/shore birds recorded for Eritrea, 6 are critically endangered, 11 are endangered, 23 are near threatened and 17 are vulnerebale. Some mammals like the Tora hartebeest (*Alecelaphus buselaphus tora*), which is native to Eritrea, Nubian wild ass (*Equus africanus africanus*) and Speke's gazelle (*Gazella spekei*) have not been observed recently. Both species are not included in the Proclamation 155/2006 list. Even those that are not listed as threatened exist in isolated places, separated by great distances. Discussion with key informants in selected Nues Zobas revealed that species that were once abundant in their areas have either disappeared or are rare or declining in number. Wildlife like the elephant (*Loxodonta Africana*), warthog (*Phacochoerus aethiopicus*), the endemic African wild ass (*Equus africanus somaliensis*), the Nubian ibex (*Capra ibex nubiana*), etc. also face extinction risks. Historically, wildlife like the Giraff (*Giraffe camelopardalis*), lion (*Panthera leo*), buffalo (*Syncerus caffer*), cheetah (*Acinonyx jubatus*), etc. are believed to have existed in Eritrea, but have not been observed in recent years.

The current level of harvesting of forest products is very high. Given the lack of affordable alternatives, there is still heavy and unsustainable dependence on biomass energy resources (firewood and charcoal), which leads to large areas being deforested. Timber is also legally and clandestinely harvested for construction, house and office furniture, handicrafts, farm and other implements, etc. Overgrazing of pasturelands is equally a serious problem.

The Red Sea is home to many endangered species including whales, dugongs, sharks and turtles, but the marine mammal fauna of the Red Sea and Gulf of Aden is not well known yet. For instance, there is inadequate information on the status of whale species in the Eritrean coast.

However, as in other parts of the Red Sea the population of whales are expected to be negatively affected by anthropogenic activities such as shipping, fishing gear entanglement, habitat degradation, and pollution. In the Red Sea, dugongs (*Dugong dugon*) are an iconic species and play a vital ecological role as grazers of seagrass. However, they face numerous threats to their survival, including habitat loss and degradation, entanglement in fishing gear, collision with boats, and pollution. Turtles are also iconic marine reptiles that play a significant ecological role in marine ecosystems. All of the sea turtles found in Eritrea are endangered. In addition to the risks that sea turtles face from habitat degradation, they are also collected for food and face risks as bycatch.

Eritrea's wide range of agro-ecology makes it a center of genetic resources for many cultivated crops, wild plants and domestic animals. However, Eritrea has been losing its distinctive genetic diversity due to unsustainable agricultural practices, leading to the disappearance of the unique genetic diversity that previously existed in the country. Moreover, climate change is also posing serious threat to gene- species- and habitat diversity of the country. Several pasture plant species growing wild and farmers' varieties of barley, sorghum, maize, finger millet and others face serious threat from climate change. Climate change has caused changes in crop preference (early maturing crops like barley and grass pea in lieu of sorghum or maize), and reduction in area cultivated with certain crops (eg. local, six-row barley varietiessuch as Kuento and Dessie). Imported wheat and potatoe varieties are being widely distributed to farmers, posing threats to local varieties. Wild relatives of cultivated crops are also getting rare due to overgrazing and conversion of grazing/forest lands to cultivation.

Wild leafy vegetables, which are important as source of food, also face threats from climate change and overgrazing. Wild vegetables like *Gynandropsis gynendra*, *Colocasia esculentum*, *Solanium indicum*, *Solanum villosum*, and *Solanum anguivii L*. locally known as Shebeni, Hamli Chaquit, Hamli Chegora and Hamli Alem respectively that were once abundantly available are hardly available at present. Crop pests and diseases also have damaging effects on the genetic variability within crops. They exert selection pressures in different crops leading to extinction of susceptible strains of the cultivated species.

There are also domestic animals that are unique to Eritrea such as the *Barka* cattle breed. However, the pure Barka cattle breeds that belong to Eritrea face various threats. Animal movement and uncontrolled inter-crossing, climate variability, feed shortage, unavailability of water for livestock and poor animal managements are among the factors for the loss of *Barka* cattle breed identity. Similarly, the introduction of chicks from abroad has significantly impacted local genetic pool of chicken species, and pure native chicken face serious risks of extinction or genetic contamination.

In general, the decline in genetic diversity has adverse impacts on the long-term stability, adaptability and resilience of biodiversity, both at the species and ecosystem levels. The current status of biodiversity, which is characterized by limited species, narrow genetic diversity, and few endemism calls for urgent management actions to halt and reverse loss of biodiversity in the country.

Target 4. Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, applying the ecosystem approach, while respecting and protecting customary sustainable use by local people and local communities.

The current level of harvesting of forest products in Eritrea is very high, which is mainly driven by dependence on biomass fuels. This is the main culprit for the widespread deforestation in the country. Off take is much higher than regeneration rates, mostly for firewood and charcoal making. A study in 1986 by CESSEN/Asnaldo showed a harvest rate of 1.47% of the stock (about 20% of the yield). Another study made in 1995 showed a harvest rate of of 2.4%-2.8% of the stock. Both figures are above the critical threshold of 1.25% of the stock recommended for harvest of fuelwood in Sub-Saharan Africa. In addition to timber, various non-wood forest products like Gum Arabic are also harvested. Overgrazing of pasturelands is equally a serious problem. The density and cover of grass in almost all grazing areas has been steadily declining. Trade in wildlife in Eritrea is limited or non-existent.

Globally, Eritrea is part of the East African region of crop genetic diversity, which is one of the eight global centers of diversity of cultivated plants. A number of crop species might have originated in Eritrea, where the wild ancestors and progenitors exist. Wild relatives of different crops are also known to exist in the country. Among them include wild relatives of sorghum, pearl millet, sesame, chick pea, vernonia, okra, watermelon and castor. There are also indigenous wild vegetables that have not been domesticated and can survive independently of human interventions. Some of these wild vegetables are being overharvested and face risk of extinction. The decline in such species also narrows the genetic diversity as interbreeding continues within the same type. Protection of wild species is very important; the genetic diversities can be used as raw material by plant breeders for the long-term development of crop species that are resistant to diseases and pests.

As far as FWA is concerned there is no formal measure in place with regards to the sustainable use and management of wild species. There are fines for illegal cutting of trees. Zoba and local administrations have also developed their own measures to tackle illegal cutting and overharvesting. However, the fines are insignificant compared to the benefits obtained from the sales of charcoal and fire wood. Eritrea is a member and signatory of the CITES. A National CITES legislation has been drafted and it is awaiting promulgation.

The current level of exploitation of marine resources seems to be not affecting the marine biodiversity. The maximum sustainable yield ranges up to about 80,000 metric tons per year, but currently only 13 % is utilized every year. However, local overexploitation of some stocks such as ornamental species, sea cucumber and sharks are evident. Trawling, a common fishing method involving dragging nets along the seafloor, has been recognized as a significant threat to marine biodiversity worldwide. Trawling does not only cause benthic habitat destruction, but also leads to biodiversity loss through alteration of species composition, declines in fish populations, and alteration in ecosystem functioning. Ineed, the surveys by the MoMR revealed high rate of discard from trawl fisheries.

There are a number of customary practices of sustainable use of biodiversity resources. The communities in the highlands have their own customary law to use the resources from community closures sustainably (eg. Debresina) or common forest products. The Kunama and Nara ethnic groups that live around Barentu have a legendary by-law known as “Awla” that

serves in protecting certain trees and shrubs that exist in *Debelina* area (around Barentu). The Afar people consider plants and wildlife part of their community and live in harmony with them. However, these traditional practices and laws have come under pressure due to increasing demands and forces external to local communities. Thus, most Eritrean plants and some wildlife and are not currently being used or managed sustainably. This calls for concerted action to ensure that they are managed sustainably for use by present and future generations.

Target 5: By 2030, an integrated national, cross-sectoral invasive alien species management programme is developed and implemented for the prevention of the introduction and establishment of new invasive alien species, and to identify, prioritize and control, and where possible eradicate the already introduced ones.

An invasive alien species (IAS) is an introduced, non-native plant, animal or any other living organism that spreads rapidly once established in its new environment with the potential to cause economic or environmental harm. The Eritrean ecosystem is under pressure by certain invasive plant and animal species. At present, there are more than 20 invasive alien floral and more than 4 faunal species in the country. Adugna and Woldesselassie (Nov. 2004) recorded 19 plant IAS (4 woody, 4 succulents and 11 herbaceous weeds), additional species have been discovered recently. Four of these species are fast spreading through multiple pathways causing damage to habitats and farmlands.

The mesquite tree (*Prosopis juliflor* and, *Prosopis chilensi*), endemic in South and Central America and the Caribbean, is fast spreading in the lowland areas of the country. The tree has deep tap root system, grows rapidly, tolerates aridity and salinity and fixes nitrogen. It may grow up to a height of 14m, produces compound leaves, with high tannin. It produces a large quantity of pods with high sugar content. On average, a mature tree may produce up to 40kg of pods per year with up to 60,000 seeds. It prohibits the growth of other plants through allopathic interaction. It is now present in all Zobas except Zoba Debub, and it has invaded all vegetation types except Closed Forests (Closed to Medium Closed Forest).

Lanthana camara is another IAS that is fast spreading as hedge and decorational plant. It forms extensive, dense and impenetrable thickets in forestry plantations, orchards, pasture land, waste land and in natural areas. In addition, it has allopathic effects on other plants.

The prickly pear which has four subspecies *Opuntia spp*. *(Opuntia ficus indica, Opuntia maxima, Opuntia subulata, Opuntia vulgaris, Opuntia delinii), and* whose fruits are edible, is also fast spreading. Although it is useful as source of food, feed and soil conservation in steep and degraded areas, its thick growth and dense ground cover tends to suffocate the growth of other plants.

Another invasive plant, though less damaging, is *Nicotina glauca* that bears small seeds similar to the tobacco plant (*Nicotina tabacum*). The plant contains nicotine and it is not consumed by livestock.

Several weeds like *Xanthium spp* (*Xanthium spinosum* and *X. strumarium*), *Tagetsminuta* (locally called Chenawi saeri), starbur (*Acanthospermun hispidium*, locally called Eshock Humera), shatter cane (*Sorghum halpensis*, locally called Ader), Witchweed (*Striga hermonthica*), wild oat on wheat are some of the invasive weeds that are fast spreading affecting both crop and grazing lands. Other herbaceous weeds, locally known as Abaeke harmaz, (*Senna*

abtisifolia L), Hamli Amhara, Hintut, Bilieta (in Sudan) and *Ocimum spp,* (Ane Beiney - me alone), an aggressive weed that grows in thick density in grazing areas, are also fast spreading.

The Indian house crow (*Corvus splendens*), Egyptian goose (*Alopochen aegyptiaca),* Rock Pigeon (*Colomba livia*), and House Sparrow (*Passer domesticus*) are alien avian species. The Indian crow preys upon the egg of other birds, seriously interfering with the breeding and reproduction cycles of the affected birds. Other pests like the white fly, *Trialeurodes vaporariorum,* fall army warm, and *Tuta absoluta* are alien species that are fast spreading in the agricultural ecosystems.

Invasive alien species are one of the most direct drivers of biodiversity loss and decline in genetic diversity through direct predation, introducing pathogens or by changing the composition of ecosystem structures making it difficult or even impossible for some indigenous species to thrive, and require urgent actions to control their spread through collaborative efforts.

Figure 26: Some invasive species in crop and grass areas. Left (Ocimum spp (Ane beyney), Center (Striga hermonthica (Gulhinta), and Right (Sorghum halpensis (Adar)

Target 6. By 2030, the level of pollution from all sources, inter alia, excess nutrients, pesticides, herbicides, heavy metals, oil spills and plastics is assessed and pollution from excess nutrients, pesticides and herbicides is prevented, controlled or minimized to levels that are not harmful to ecosystem function and biodiversity.

Pollution is one of the main direct drivers of biodiversity loss. Pollution can take various forms, but pollution from nutrients, such as nitrogen and phosphorus, pesticides and highly hazardous chemicals and plastics has been found to have particularly harmful impacts on the health of people, biodiversity and ecosystem functions and services.

In Eritrea, the main soil and water contaminants are associated with agriculture (chemical fertilizers, herbicides, pesticide, veterinary drugs, etc.). Excessive nutrients like nitrogen and phosphorous from the historic and ongoing application of chemical fertilizers can have toxic effects on biodiversity. The use of herbicides may affect some useful plants. Agrochemicals that are not used carefully cause harm to human beings, ecosystems, soil structure, and non-target useful organisms like honey bee and other pollinators.

In the Eritrean coast the main sources of pollution are land-based sources (e.g., urban and agricultural runoff) and marine-based sources (e.g., shipping and aquaculture). The types of

pollution affecting marine biodiversity, include nutrient pollution (e.g., nitrogen, phosphorus), chemical pollution (e.g., pesticides, heavy metals), plastic pollution, and oil pollution. One of the main impacts of marine pollution is habitat destruction in which coral reefs, seagrass beds and mangrove forests are degraded through sedimentation, eutrophication, and contamination. Pollution also causes species mortality. Discarded fishing gears, plastic bags and microplastics pose entanglement and ingestion risks to whales, dolphins and dugongs, leading to injury, suffocation, starvation and ultimate death.

In an effort to minimize pollution from agrochemicals, the MoA is promoting the use of organic and bio-fertilizers, and it has issued directives to restrict the use of inorganic fertilizers and pesticides. At present, the highest application of insecticide is associated with control of desert locust. Herbicides are also widely used to control weeds. What is even more worrisome is the smuggling of large quantities of herbicides and insecticides into the country from Ethiopia and the Sudan through the border in Gash Barka.

The impact of pollutants generated by industrial, small/medium enterprises and domestic activities may not be so serious for terrestrial biodiversity at present, but could have harmful impacts in the future. Discarded used oil and lubricants, pieces of metals and plastic are fast increasing. An encouraging development is the wide spread use of pit latrines that has made many villages open defecation free (ODF).

Target 7: By 2030, develop appropriate mitigation, adaptation and disaster risk management measures to reduce the impacts of climate change and ocean acidification on biodiversity and enhance the resilience of ecosystems.

Climate change affects biodiversity in many ways – floods, heat waves, forest fires, drought, etc. Vulnerable species, which mainly refers to species that dwell in degraded ecosystems, are most adversely affected by climate change. Thus, climate change impacts worsen the present status of biodiversity.

Climate change is occurring in Eritrea. According to the Second and Third National Communications (MoLWE, DoE, 2012 and 2018) mean maximum and mean minimum temperature increased by 1.85 ^{O}C and 1.64 ^{o}C respectively between 1961 and 2018, which is an average rate of 0.31^{O}C-0.27^{O}C per decade. The Third National Communication indicated that mean annual precipitation decreased by 17% -30% between 1900 and 2008, while the Second National Communication stated that the 1912-2005 rainfall data suggests that rainfall has been declining on the average by about 0.4 mm/year for the central and southern highlands. The rainy season has contracted from 4 months to 2-2.5 months. Frequent and protracted droughts, storms, floods, heat waves, and related climatic aberrations have their tolls in biodiversity. Forest and grassland habitats, mangroves, water resources, wildlife, agricultural and marine ecosystems in particular are vulnerable to climate change and variability.

Climate change has also profound effect on agrobiodiverity. Loss of farmers' crop varieties, including loss of the wild relatives of the cultivated crops due to climate change poses a major threat to Eritrea's crop production and crop genetic resource. Realizing the threats of climate change to agrobiodiversity, the MoA has been trying to promote climate smart agriculture. In spite of these initiatives, the adverse impacts of climate change on biodiversity are still huge.

The impact of climate changes has also been observed by frequent and more extensive coral bleaching in the shallow reefs of Eritrean Red Sea Coast, particularly when temperature exceed

30^0C for few weeks, a phenomenon observed globally since 1998. There is no information regarding ocean acidification, but increasing concentration of carbon dioxide could lead to acidification. Global warming also generates extreme weather conditions like cyclones which may inflict physical damage, sedimentation and disruption of marine ecological processes. The effect of climate change on other marine biodiversity is not documented except the incidence of mass fish death during the summer of 2023. The level of the sea is also increasing but there is no data on the actual increase in the mean sea level.

Various measures like afforestation and forest management, dam construction, establishment of closures and protected areas, dissemination of improved stoves, development of renewable energy sources, promotion of climate smart agriculture, etc. have been going on, but still stronger mitigation, adaptation and disaster risk reduction measures are required to enhance the resilience of ecosystems and human livelihoods to the impacts of climate change.

Target 8. By 2030, fair and equitable access and benefits sharing (ABS) that arise from the utilization of genetic resources, traditional knowledge and digital sequence facilitated and increased in accordance with applicable national legislation and international access and benefit-sharing instruments to genetic resources.

The sharing of benefits that arise from the utilization of genetic resources and associated traditional knowledge is one of the three objectives of the Convention on Biological diversity (CBD) and a key pillar for the success of its implementation. Eritrea is a signatory to Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, but so far there is no clear mechanism or legislation for ABS. The Land Reform Proclamation, No.58/1994, declares that all land is owned by the State and it grants citizens usufruct rights. Similarly, the Forest Conservation and Development Proclamation 155/2006, guarantees tree tenure rights of planters, but implementation guidelines have yet to be developed. Local communities that establish and manage closures have their own benefit sharing mechanisms which vary from community to community.

Eritrea has rich genetic biodiversity, including some endemic floral and faunal species, that can potentially be used for food, feed, medicine, cosmetics, research and education purposes. These resources can be shared with other users. However, apart from few resources shared as samples for research purpose and the resources that are traditionally used for medicinal purpose, no notable genetic resources are shared from Eritrea. A few of the valuable crop species, which exhibit various useful characters, have been used for crop improvement programs by international/regional research organizations through exchange of germplasm. Similarly, little is known about the traditional knowledge that is available in the different communities of Eritrea and needs to be adequately studied, documented, protected and sustainably utilized.

Likewise, there is little or no work done on the utilization of digital sequence information (DSI) in genetic resources and genotyping in Eritrea. With the advent of modern molecular tools, genotyping and next generation sequencing platforms, the unique genetic resources of plants (including wild and cultivated crops) and animals in Eritrea should be genotyped and sequenced for sustainable use and benefit sharing with other countries.

However, it is crucial to develop a national policy on indigenous knowledge and ethnobotany, particularly the use of medicinal and other untapped plant resources. This may also apply to crop/livestock genetic resources, particularly relating to species with special attributes like resistance to pest, drought, diseases, etc. before valuable genetic resources are plundered.

Development of a national policy on benefit sharing that is aligned with the Nagoya Protocol on Access and Benefit Sharing (ABS) will create greater legal certainty, clarity and transparency for both users and providers of genetic resources and associated traditional knowledge.

Target 9. By 2026, the mobilization of financial resources for the effective implementation of the National Biodiversity Strategy and Action Plan (2026-2030), from local and international sources is reinforced in accordance with the resource mobilization strategy.

The implementation of action plans relating to the selected targets will require substantial resources. One of the key areas that was not well addressed in NBSAP-2015 is the absence of resource mobilization and monitoring and evaluation plan. Thus, together with other means of implementation, an innovative resource mobilization and monitoring and evaluation plan has to be designed to mobilize adequate financial resources from domestic and international sources for effective implementation of the national biodiversity strategies and action plans. This implies that the DoE, MoLWE, will have to broaden and strengthen its relations with resource providers and enhance its efforts proactively to mobilize the resources required for the implementation of NBSAP (2026-2030). Moreover, regular consultation will have to be made with all concerned stakeholders on the outcome of the NBSAP project related to budgetary and implementation issues.

The resources required will have to be mobilized in a systematic and reliable ways. Thus, a separate resource mobilization strategy and action plan is prepared to guide the DoE in its resource mobilization efforts for the implementation of NBSAP. The goal of the resource mobilization strategy is to increase the resource base of the DoE and other relevant sectors so that it will be able to implement the NBSAP effectively and timely. The overall objective of the resource mobilization is to increase flow of resources from fund providers by enabling the DoE to adopt a clear, structured and systematic approach to soliciting, acquiring, utilization, management, reporting, monitoring and evaluating assistance from resource partners. The document has been prepared in a sequential order to clearly indicate the steps and approaches that will have to be undertaken for effective mobilization of resources. The strategy is expected to be instrumental in increasing the resource base of the DoE and other NBSAP implementing sectors so that there will be sustainable financing throughout the NBSAP (2026-2030) implementation period.

Target 10. By 2030, the capacity of institutions dealing with biodiversity is strengthened and scientific technology based and traditional knowledge related to biodiversity enhanced and the generated knowledge is shared, accessed and applied.

The implementation of national strategies and actions that are well aligned with the goals and targets of the Kunming-Montreal Global Biodiversity Framework will require commensurate technical and operational expertise and institutional capacity to effectively prioritize, plan, mobilize resources, and implement and monitor progress towards the objectives. It is thus important to conduct a thorough assessment of the capacities of the relevant stakeholder institutions to identify and evaluate capacity gaps with respect to revised NBSAP so that capacity development programs could be designed to enhance the abilities, resilience and effectiveness of actors and institutions involved in biodiversity conservation.

The field survey conducted by the NBSAP Updating Team revealed that all relevant institutions and stakeholder have serious capacity gaps (human, technical/infrastructural and financial) in several areas of biodiversity conservation and sustainable use of genetic resources. The FWA,

for instance, has insufficient staff. It has only 2 master's holders, about 10 BA/BSc holders, and about 15 diploma holders; it has few well-trained personnel in forestry and wildlife. Similarly, there is shortage of equipment at the Regulatory Department of the MoA. In general, there is urgent need for taxonomists, population biologists, ethno-botanists, geographical information systems (GIS), molecular tools, forest rangers, botanists, wildlife experts, ecology and biodiversity conservationists, wildlife DVM, foresters, wildlife scouts, landscape engineers, environmental policy analysts, monitoring and evaluation specialist, and biodiversity researchers. Traditional knowledge on biodiversity and its management has not been well studied and documented and it require due attention.

It is thus important to conduct a thorough assessment of the capacities of the relevant stakeholder institutions to identify and evaluate capacity gaps with respect to NBSAP (2026-2030) so that capacity development programmes could be designed to enhance the abilities, resilience and effectiveness of actors and institutions involved in biodiversity conservation.

Target 11. By 2030, at least one third of the population of Eritrea are aware of the values and importance of biodiversity and have the knowledge of the steps that they can take to conserve and/or sustainably use biodiversity/ecological resources.

One of the main shortcomings of NBSAP 2015 was the lack of concerted, regular and well-planned works on public awareness relating specifically to biodiversity. In fact, the NBSAP 2015 document was not widely shared, and relevant ministries and Zoba Administrations stated that they are not familiar with the document. There was no established forum for information sharing; hence there was insufficient knowledge about the NBSAP targets. In general, public awareness on the importance of biodiversity and the need for its conservation was fragmentary, unsystematic and unfocused. Even in places where guidelines for floral and faunal conservation exist, local communities tended to see them as interference in their livelihood foundations. Thus, there is a strong need for developing strategies and actions for building, nurturing and sustaining public awareness on the importance of ecosystem management and biodiversity conservation at local levels and convince local communities that they are the direct beneficiaries of ecosystem services.

Enhancing public awareness is crucial for promoting active voluntary participation of the general public in the conservation and sustainable use of biodiversity. Many local communities in Eritrea hold unique traditional biodiversity knowledge and traditional conservation regulations and practices. However, these traditional practices and knowledge are under heavy pressures and there are still misuses and abuses occurring in different part of the country. There is thus a need for buying-in public support for, and commitment to, the conservation and sustainable use of biodiversity through concreted and well-planned awareness programmes using various materials such as posters, leaflets, TV, radio, fact sheets and videos. The national education system of the country should also incorporate and integrate the conservation and sustainable use of biodiversity into their college and school curricula.

Target 12. By 2030, the involvement and participation of local communities, women, girls and disabled persons in the management of agricultural, terrestrial and marine biodiversity is promoted and encouraged through community-led, gender-inclusive approaches, ensuring that the right of local communities over land and resources is duly acknowledged and respected.

Local communities, especially women are the main users of ecological resources. Through their daily interactions with their environment, local communities develop a cultural and holistic understanding of nature. Local communities can bring unique indigenous knowledge and understanding of biodiversity that can contribute strongly and positively to the conservation and sustainable use of biodiversity. Thus, engaging with local communities in the conservation of biodiversity is important.

Involving and empowering communities in planning and management, especially the identification, implementation, adaptation of biodiversity conservation techniques, and using indigenous knowledge in identifying adaptaive practices could facilitate implementation of NBSAP. Acknowledging customary sustainable use of biodiversity by local communities is particularly useful. As stated above, there are a number of customary biodiversity regulations and sustainable use experiences.

Involving and empowering women and girls, children, youth and persons with disabilities in biodiversity conservation is equally important. Their inclusion does not only promote social equity, but also encourages them to actively contribute to biodiversity conservation. Women often play a vital role in managing natural resources and promoting sustainable agriculture, forestry and fisheries. The inclusion of women and girls must go beyond their mere participation in soil/water conservation and tree planting. They must have a say in all matters relating to ecosystem and biodiversity management. Thus, considering gender dimensions in biodiversity-related decision-making is crucial for positive outcomes for biodiversity and gender equality.

Target 13. By 2030, the capacity of biosafety and biotechnology techniques strengthen, the negative impacts of living modified organisms (LMOs) minimized and measures for the handling of biosafety and biotechnology risks implemented.

Biosafety measures are crucial for ensuring that living modified organisms (LMO) resulting from biotechnology are handled and used with the necessary safety precautions. LMO resulting from biotechnologies provide opportunities, but their use and release requires regulation, management and control of potential associated risks. New biotechnological developments such digital sequencing and molecular tools are providing more promising opportunities, but the concerns i.e. the potential adverse effects on environment and human health on these technologies and the LMO resulting from them are also increasing.

Biosafety measures are taken to regulate, manage and control the risks associated with the use and release of living modified organisms. These measures aim to contribute to the sustainable use and conservation of biological diversity. Participation in biotechnological research by developing countries that provide the genetic resources for such research would help empower them to address their own research needs. Equitable access to biotechnology and the benefits derived from their application could provide a powerful incentive for conservation.

8.6 Action Plans

To prevent species extinction and reduce the pressure on ecosystems, and ensure sustainable use of biodiversity resources, actions have to be taken now. However, it should also be realized that tackling biodiversity loss is indeed a daunting task. In designing what actions to take to conserve

biodiversity, resource availability, time, management capacity, etc. must be taken into account. Details of the proposed action plans for each target are provided in the *Table 13*. The action plan aims at protecting ecosystem integrity, conseving biodiversity and long-term sustainability. The table includes objectives, indicators, timelines, entities responsible for implementation, and budget required for effective implementation of each action plan.

As far as possible, the actions plans are aligned with the activities and programmes of line ministries, relevant authorities and corporations so that they can be easily mainstreamed into their plans and programmes. However, the action plan will require adequate budget and setting up appropriate institutional apparatus to ensure coordination and cooperation between different ministries and Zoba Administrations.

Table 13: List of objectives and priority actions for the thirteen NBSAP targets

Target 1: By 2030, 15% of the degraded terrestrial, coastal and marine ecosystems, and particularly those that provide essential services to livelihoods and well-being of people, are under restoration or rehabilitation through appropriate ecosystem restoration and management measures to enhance their resilience, integrity, structure and function; loss of natural habitats, degradation and fragmentation of ecosystems is at least halved and where feasible brought close to zero.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
1.1. Develop and approve National Ecosystem Restoration Plan	1.1.1. Conduct survey and mapping of terrestrial ecosystems using appropriate methods to identify priority habitats and ecosystems that require immediate protection and/or rehabilitation	2026 - 2027	Total area identified and prioritized for restoration	EMIC, MoMR, MoLWE, MoLG, FWA, MoA NHERI, Local Communities	Remote sensed images	500,000
	1.1.2. Integrate habitat/ecosystem mapping with land use/landcover mapping based on inherent ecological qualities and use	2026 - 2030	National land use/land cover maps	MoLWE, MoLG, FWA, MoA, NHERI, Local Communities	Map reports and map description	200,000
	1.1.3. Develop National Ecosystem Restoration Plan	2026	National Ecosystem restoration Plan in place and operational	MoLWE, MoLG, MoA, Local Communities	Plan document	100,000
	1.1.4. Adopt ecosystem restoration plan, with relevant guidelines in all Zobas, sub Zobas and Local Authorities	2026	Total area under restoration	MoLWE, MoLG, MoA, NHERI, Local Communities	Zoba reports	30,000
	1.1.5. Develop and implement relevant restoration and rehabilitation projects	2027 - 2030	Number of ecosystem restoration projects developed	MoLWE, MoA, ,MoLG, FWA, NHERI, Local Communities	Project completion reports	300,000

1.2. Increase the proportion of forest managed for rehabilitation and nature preservation in each Zoba	1.2.1. Develop a comprehensive national policy framework on forestation that is integrated with exisiting policy and existing guideline to ensure that forestation programmes are in tune with site-specific ecological conditions	2026-207	National forest policy framework developed or improved and integrated with exisiting policy and guidelines	FWA, MoLWE, MoA, MoLG, MoMR, NHERI, Local Communities	National policy framework document	100,000
	1.2.2. Encourage and support people to plant multi-purpose, drought resistant indigenous trees and nurture them to maturity; Increase supply of native tree species seedlings	2026-2030	No of trees planted and/or area covered;	FWA MoLWE, MoLG. MoMR, MoA, Local Communities	Annual reports	5,000,000
	1.2.3. Ensure or guarantee long-term land and tree tenure rights of people over forested lands;	2026-2030	Changes in total area of land under sustainable community forest management	MoLG, FWA, MoLWE, MoA, MoMR, Local Communities	Annual reports	100,000
	1.2.4. Expand area under closures in selected hotspots for natural regeneration	2026-2030	Changes in the total area and status of key biodiversity hotspots under regeneration	FWA, MoLG, MoLWE, MoA, Local Communities	Remote sensed images	500,000
	1.2.5. Improve natural forest management	2026-2030	Area of natural forest properly managed	FWA, MoLG, MoLWE, MoA, local Communities	Remote sensed images	100,000
	1.3.1. Support local Watershed Committees by preparing guidelines on management of sensitive/fragile ecosystems	2026 - 2027	Guideline in place and used	MoA, FWA, MoLWE, MoLG, Local Communities	Guidelines issued	100,000

1.3. Improve capacities and capabilities of local communities to implement sustainable practices that support the conservation of biodiversity	1.3.2. Increase access to electricity by rural population by developing renewable energy resources	2026-2030	Changes in access to electricity improved by 7-10% base line	MoEM; MoLG	Annual reports	12,000,000
	1.3.3. Disseminate energy efficient stoves (Mogogo Adhanet, tandur, etc.)	2026 - 2030	No. and type of improved stoves disseminated	MoA, NUEW, MoLWE, MoLG, MoEM, FWA, Local communities	Annual reports	1,500,000
	1.3.4. Increase access to LPG by expanding LPG storage, filling stations, distribution facilities and LPG bottles in rural areas	2026-2030	% of rural households with access to LPG (increased by 5%)	MoEM; MoLG	Annual reports	4,000,000
	1.3.5. Promote biogas at household level	2026-2030	Number of households with biogas digesters (1000 households)	MoA, MoEM, MoLG	Annual report	350,000
	1.3.6. Strengthen and support sustainable land management practices	2027 - 2030	Number of villages under SLM	MoA, MoLWE, MoLG, FWA, Local communities	Annual reports	500,000
	1.3.7. Promote agroforestry in farmlands, rangelands and home steads	2027-2030	No. of farmers practicing agroforestry	MoA, FWA, MoLG, MoLWE Local communities	Annual reports	140,000
	1.3.8. Develop community fuel wood plantation	2026 - 2030	No. of community wood plantations	FWA, MoLWE, MoA, MoLG, Local communities	Project progress or completion reports	60,000
	1.3.9. Restrict expansion of settlements/resettlements to fragile ecosystems or natural forests	2026 2030	Change in settlement patterns	MoLG, MoA, MoLWE, FWA	Settlement programme reports	60,000

	1.3.10. Promote sustainable grazing/browsing practices in fragile ecosystems	2026 - 2030	Total area under sustainable grazing/browsing practice	MoA, MoLWE, MoLG, FWA, Local communities	Annual reports	150,000
1.4. Build capacity for enforcement of regulations	1.4.1. Review and update penalties for illegal tree cutting, and other environmental offences as stipulated in Proclamation 155/2006	2026	Updated penalty structure operational; Changes in level of infringements	FWA, MoLWE, MoLG, MoJ, MoA	Reviewed penalty document	30,000
	1.4.2. Operationalize a Legal Unit within the Forestry and Wildlife Authority, to effectively sue offenders.	2026	Legal Service Unit operational	FWA, MoLWE, MoJ	FWA report	50,000
	1.4.3. Train and empower law enforcement officers and forest rangers.	2026-2030	No. training provided; No. of participants	FWA MoLWE, MoJ	FWA Training report	150,000
1.5. Create mechanisms for effective collaboration in biodiversity conservation and decision-makings	1.5.1. Promote collaboration between relevant government institutions and local communities in the use and adoption of conservation management	2027	No. of joint meetings	FWA, MoA, MoLG, MoMR, MoLWE,	Annual reports	10,000
	1.5.2 Promote collaboration among government agencies	2027 - 2030	No. of joint meetings	FWA, MoA, MoLG MoMR, MoLWE,	Annual reports	5,000
1.6. Protect and restore critical coral reef, seagrass,	1.6.1. Map and identify key coral reef, seagrass, and mangrove areas to prioritize sites for conservation.	2027 - 2028	Area of coral reefs, mangroves and seagrass meadows mapped	MoMR, MoLWE, EMIC, MoLG, NEHRI	Maps	150,000

and mangrove areas in the Eritrean coast of the Red Sea.	1.6.2. Initiate coral reef restoration programs.	2028	Area of degraded reefs restored	MoMR, NEHRI, MoLWE, MoLG,	Restoration programme report	100,000
	1.6.3. Implement restoration projects to rehabilitate degraded mangrove areas	2028-2030	Area of degraded mangrove forests restored	MoMR, MoLWE, MoLG	Restoration project progress or completion report	50,000
1.7. Mitigate human-induced threats to coral reef, seagrass, and mangrove ecosystems	1.7.1. Strength and enforce regulations to ensure that fisheries activities do not negatively impact coral reef and seagrass meadows	2027 - 2030	Decreased No. of violations	MoMR, MoLWE, MoJ, MoLG	Violation reports	150,000
	1.7.2. Review and enforce regulations to ensure that coastal development projects do not negatively impact coral reef, seagrass and mangrove areas	2027 - 2030	No. of new projects conducing EIA	MoMR, MoLWE, MoFND, MoLG	MoMR reports	50,000
1.8. Enhance scientific research and monitoring on the status of terrestrial, marine and agricultural ecosystems	1.8.1. Conduct research on the resilience of terrestrial, marine and agricultural ecosystems	2026-2030	No. of scientific papers published	MoA, MoLWA, FWA, MoMR, MoLG, NHERI	Published papers	500,000
	1.8.2. Establish long-term monitoring program to assess the status of terrestrial, marine and agricultural ecosystems	2026-2030	No. of monitoring sites established	MoA, MoLWA, FWA, MoMR, MoLG, NHERI	Published papers	500,000
Total						**27,535,000**

Target 2: By 2030, the conservation of selected biodiversity hotspots through area-based conservation methods is strengthened and at least four terrestrial and marine, coastal and island areas, accounting for 10% of the land and territorial waters of Eritrea are gazetted as legally protected areas; preparation will also be under way to establish four others as protected areas						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
2.1. Initiate implementation of the directives for establishment of protected areas	2.1.1. Establish at least four terrestrial and marine areas that include endangered species and biodiversity hotspots as gazetted protected areas	2026 - 2027	No. and total area of gazetted protected areas; Change in legal status of protected areas	MoMR, FWA MoLG, MoLWE;	Technical and Financial Reports	400,000
	2.1.2. Establish a body responsible for the management or administration of protected areas as per the directive for the establishment of protected areas	2026	Responsible body established and and functional at PA sites	MoMR, FWA, MoLG, MoLWE	FWA and MoMR reports	100,000
	2.1.3. Develop a plan to ensure the declaration of 10% of the terrestrial and marine areas as protected areas	2027-2028	Plan for establishment of protected areas in place	MoMR, FWA, MoLG, MoLWE	Action plans, Annual Reports	60,000
	2.1.4. Develop management plans and governance structures for all declared protected areas	2027-2028	Management plan and structure in place and operational	MoMR, FWA, MoLG, MoLWE	Management plan document	100,000
	2.1.5. Identify and prioritize additional areas that will be declared as protected areas in the future, including OECMs	2029-2030	No. and total area of identified and prioritized areas to be established as protected areas and OECMs	MoMR, FWA, MoLG, MoLWE	Technical and Financial Reports	100,000

	2.1.6. Develop a standard or guideline for evaluating the management effectiveness of protected areas	2028	No. of standards or guideline developed	MoMR, FWA, MoLG, MoLWE	Technical and Financial Reports	30,000
2.2. Strengthen national and local capacity in the governance and management of protected areas	2.2.1. Identify the human, management, technical, infrastructural and financial requirements to establish gazetted protected areas.	2026	Resource requirements identified	MoMR, FWA, MoLG, MoLWE	Technical and Financial Reports; Partners' report	20,000
	2.2.2. Develop the capacity of relevant institutions to design, implement and manage protected areas	2026-2028	No. of training conducted; No. of equipment /materials supplied; Changes in No. of human resources recruited and trained;	MoMR, FWA, MoLG, MoLWE	Technical and Financial Reports; Budget documents	300,000
2.3. Mobilize local communities for habitat and species protection in	2.3.1. Undertake community awareness campaigns on the benefits of protected areas	2027-2030	No. of awareness programmes undertaken	MoMR, FWA, MoLG, MoLWE, MoI, MoE Local communities, NUEW, NUEYS	Annual Reports	50,000
	2.3.2. Develop mechanism for sharing benefits derived from protected areas by local communities	2027	Benefits sharing mechanismin place; In-cash or in-kind benefits received by communities	MoMR, FWA MoLG, MoLWE, MoI, MoE, MoA, MoT Local communities, NUEW, NUEYS and the Disabled…..	Annual Reports	30,000

protected areas	2.3.3. Engage communities, NUEW and NUEYS in identifying and resolving human-animal conflicts	2027-2030	No. of community engagements in conflict resolution	MoMR, FWA MoLG, MoLWE, MoI, MoE, MoA, MoT Local community, NUEW, NUEYS and the Disable	Technical and Financial Reports	70,000
	2.3.4.Provide compensation and develop alternative livelihoods for communities whose land is put under protected area systems	2027-2030	No. of households compensated and/orprovided withalternative livelihoods	MoMR, FWA MoLG, MoLWE, MoA, MoFND, MoT Local community, NUEW, NUEYS and the Disabled	Annual Reports Technical and Financial Reports	5,000,000
Total						**6,260,000**

Target 3: By 2030 the extinction of known threatened or near threatened flora, fauna, crop landraces and livestock breeds has been prevented, and their conservation status, particularly of those most in decline, has shown significant recovery trends.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
3.1. Develop and deliver management actions for threatened species	3.1.1. Conduct regular biodiversity surveillance to identify distribution and migration of threatened animal species	2026-2030	Trends in the status of the protected species and distribution map of threatened animal species	FWA, MoMR, MoA, MoLWE, NHERI	Map and Assessment reports	200,000
	3.1.2. Improve taxonomic knowledge of species	2026 – 2030	List of newly identified taxa	MoLWE FWA, MoMR, MoA, NHERI	National Database of Flora and Fauan Database	200,000
	3.1.3. Identify species that are highly threatened and prepare Red List category as per IUCN standard	2027 - 2028	Change in number and nature of threats and Red List Index	MoA, MoLWE, FWA, MoMR, NHERI, MoLG	Annual report; Updated IUCN Red List	200,000
	3.1.4. Develop and implement species-specific threat response management/conservation plans and programmes for species identified as highly threatened	2028 - 2030	No. of management plans developed	MoA, MoLWE, FWA, MoMR, MoLG, NHERI	Managemnt plans developed	300,000
	3.1.5. Develop legal notice/directive to protect threatened species	2028	Legal notice/directive legislation drafted and promulgated	MoLWE, MoMR, FWA, MoA, MoJ, MoLG, NHERI	Annual report	50,000

	3.1.6. Strengthen and promote traditional/indigenous species and ecosystem conservation practices and attitudes	2026 - 2030	Incorporation of traditional conservation practices in national conservation programmes	FWA, MoA, MoLG, MoLWE, MoMR, NHERI, Local community/ CBOs	Conservation programme documents	150,000
3.2. Establish species rehabilitation centers and carry out rehabilitation of high-risk species	3.2.1. Select site and establish National Centre for Wildlife Rehabilitation and Orphanage	2027 - 2029	No. of operational national center for wildlife rehabilitation established	FWA, MoA, MoMR, MoLWE, MoLG,	Map and Annual reports	1,000,000
	3.2.2. Select appropriate site and establish botanical garden for threatened native plants for ex situ revival	2027 - 2029	No. of operational botanical garden established	FWA, MoA, MoLWE, MoLG, NHERI	Map and Annual reports	250,000
	3.2.3. Strengthen or start work towards genetic conservation of rare native wildlife and plant species	2028 - 2030	No. of genetic materials collected and conserved	MoA, FWA, MoLWE, MoMR, MoLG, NHERI	Gene bank reports	300,000
	3.2.4 Conduct survey on status of domestic animal genetic resources of Eritrea	2026 - 2027	No. of animal genetic resources identified	MoA, CLC, MoLG MoLWE, NHERI	Field survey reports	100,000
	3.2.5 Conduct survey on the status of crop genetic resources (landraces and wild progenitors)	2026 - 2027	No. of crop genetic resources identified and documented	MoA, CLC, MoLG MoLWE, NHERI	Field survey reports	100,000
	3.2.6. Conduct genetic characterization of domestic animals, crops, rare native wildlife and plant species	2027 - 2029	No. of plant and animal genetic resources characterized and conserved	MoA, FWA, MoLWE,MoMR, NHERI,	Annual reports; Published research reports	200,000

3.3 Develop capacity building programs on conservation of rare, endangered and threatened species	3.3.1 Strengthen the institutional capacity in conserving endangered and threatened crops, animals and range plant species	2027 - 2028	Changes in conservation infrastructure or facilities	MoA, CLC, FWA, MoLWE, MoLG	Annual reports	200,000
	3.3.2 Conduct training to technical staff on conservation and management of endangered and threatened crops, animals and range plant species	2027 - 2030	No. of training sessions conducted; No. of personnel trained	MoA CLC, FWA, NHERI MoLWE, MoLG	Training reports	60,000
	3.3.3 Conduct training programs on community-based biodiversity conservation management	2027-2029	No. of training sessions conducted; No. of personnel trained	MoA, MoMR, FWA, NHERI, MoLWE, MoLG, CLC Local community/ CBOs	Training reports	25,000
	3.3.4 Establish crop and animal germplasm regeneration facility	2027	No. of regeneration facilities established	MoA, FWA, NHERI	Annual reports	50,000
	3.3.5 Strengthen Gene Bank laboratories and germplasm storage facilities	2027 - 2030	Changesin quantities and qualities of germplasm storage facilities	MoA, NHERI	MoA reports	50,000
3.4. Strengthen the conservation of marine megafauna	3.4.1. Engage with local fishing communities and trawl fishers to adopt sustainable fishing practices that minimize bycatch.	2027 - 2030	No. of fishing communities engaged in sustainable fishing practices	MoMR, MoLG, Local community/ CBOs	MoMR report	30,000
	3.4.2. Establish community-led conservation groups that actively participate in megafauna conservation and habitat	2027	No. of conservation groups established	MoMR, MoLG, Local communities, NUEW, NUEYS	MoMR report	50,000

	protection.					
	3.4.3. Implement regular monitoring programs to assess megafauna populations and health.	2027 - 2030	No. of monitoring assessments	MoMR, NHERI	MoMR reports	100,000
3.5 Develop management strategy for conservation and sustainable exploitation of sea cucumber	3.5.1. Develop and enforce catch quotas and size limits for sea cucumber harvesting.	2026 - 2030	Changes in sea cucumber catch	MoMR	MoMR reports	30,000
	3.5.2. Establish seasonal and area-based closures to allow sea cucumber populations to recover.	2027 - 2028	No. of closures established	MoMR, NHERI	MoMR reports	30,000
	3.5.3. Promote and implement aquaculture initiatives to reduce pressure on wild populations.	2027 - 2030	No. of sea cucumber aquaculture projects	MoMR, MoLG	Project reports	50,000
	3.5.4. Conduct baseline studies to assess the population size, distribution, and health of sea cucumber species in the Red Sea.	2027	Baseline surveys conducted	MoMR, NHERI	Baselein report	100,000
	3.5.5. Establish a long-term monitoring program to track sea cucumber populations, harvest levels, and habitat conditions.	2027 – 2030	Monitoring programme established	MoMR, NHERI	MoMR reports, NFC	50,000
	3.5.6. Conduct research on the ecological roles of sea cucumbers and the impacts of environmental changes on their population.	2027 - 2029	No. of research projects	MoMR, MoFND, NHERI	Published research reports; Research manuscripts	50,000
Total						**3,925,000**

Target 4. Ensure that the use, harvesting and trade of wild species is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, applying the ecosystem approach, while respecting and protecting customary sustainable use by local people and local communities.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost(USD)**
4.1. Minimize pressure on forest resources	4.1.1. Promote the use of environment-friendly substitutes or alternatives for forest products, particularly for biomass fuels	2027 - 2030	Change in proportion of substitute materials used as alternative to forest resources; changes in levels of exploitation towards or away from sustainable harvest	MoEM, FWA, MoA, MoLG, MoLWE, MoFND, NHERI	Annual reports; Participatory survey assesssments	500,000
	4.1.2. Minimize forest conversion	2026 - 2030	Percent of terrestrial, fresh water and marine ecological regions conserved by protected areas or OECM	FWA, MoA, MoMR, MoLWE, MoLG,	Annual reports;	30,000
	4.2.1. Improve natural forest management	2027 - 2030	Proportion of area under sustainable forest managment	FWA, MoA, MoLG, MoLWE	Maps, satellite imageries, and Annual reports	50,000
	4.2.2. Minimize the occurrences of forest fire	2026 - 2030	No. of forest fire incidents per year	FWA, MoLG, MoLWE, MoA	Annual reports	50,000

4.2. Ensure sustainable use of wild species	4.2.3. Revise and enact regulations related to sustainable use of wild species	2028 - 2030	No. of regulations issue/revised	FWA, MoA, MoMR, MoLWE, MoLG	Published regulations	30,000
	4.2.4. Ensure that non-wood forest products are harvested in non-damaging ways	2026 - 2030	Proporation of non-wood producted harvested in a non-damaging way.	FWA, MoA, MoLG, MoLWE,	Annual reports	50,000
	4.2.5. Monitor the regeneration or replacement rate of the widely harvested wild species both marine and terrestrial	2028 - 2030	Chnages in regereneration rates	FWA, MoA, MoMR, MoLG, MoLWE	Annual report	100,000
	4.2.6. Manage rangelands within their carrying capacities	2027 - 2030	Proportion of rangelands managed within their carrying capacity	MoA, CLC, FWA, MoLWE, MoLG	Annual report	100,000
	4.2.7. Ensure that permits for use of wild species are issued as per the guideliens of FWA, Proclamation 155/2006 and Fisheries Proclamation (1998/ 2003/2014)	2027 - 2030	Proportion of permits issued as per Proclamation 155/2006	MoA, FWA, MoLG, MoLWE,	Annual reports	30,000
4.3. Assess the status of wild plant/crop genetic species	4.3.1 Conduct survey to determine the status of all plant genetic resource/crop wild relatives for conservation in Eritrea	2027	No. of surveys conducted and number of species identified	MoA, FWA, MoLWE, MoLG, NHERI	MoA and HAC survey reports	150,000

and ensure their conservation	4.3.2 Collect, characterize and conserve the indigenous crops and wild crop relatives	2027	No. of species collected, characterized and conserved	MoA, FWA, MoLWE, MoLG, NHERI	NARI report	50,000
4.4 Reduce the genetic erosion of wild plant /crop species	4.4.1 Regenerate and maintain the most widely used wild crop/plant species	2027 - 2030	No. of crop and plant species regenerated and maintained	MoA, FWA, MoLG, NHERI	NARI report	20,000
	4.4.2 Conduct regular assessment of the crop diversity and crops under risk of extinction	2027-2030	No. of assessments conducted	MoA, MoLG, NHERI Local communities	Assessment Reports	50,0000
4.5 Utilize of wild plant species in crop improvement	4.5.1 Transfer desired or unique qualities from wild relatives to cultivated crops to improve and safeguard crop production and productivity	2027 - 2030	No. of improved varieties produced	MoA, FWA, MoLG, NHERI	NARI report	50,000
	4.5.2 Domesticate, popularize and create marketing platforms for wild vegetables to enhance food security	2028 - 2030	No. of wild vegetable species domesticetd and marketed	MoA, MoLG, NUEW, NUEYS	MoA report	20,000
4.6. Minimize bycatch of vulnerable	4.6.1. Conduct a baseline survey to identify key areas with high bycatch rates and species most at risk.	2027	No. of survey conducted	MoMR, NHERI, NFC	MoMR survey reports	50,000
	4.6.2. Introduce and promote the use of bycatch reduction devices (BRDs) in trawl fisheries.	2028 - 2029	Proportion of trawlers with BRD	MoMR, NFC, Fishers	BRDs installed	50,000

marine species	4.6.3. Monitor the effectiveness of seasonal closure of trawl fisheries in protecting the spawning grounds	2027 - 2030	No. of monitoring surveys	MoMR, NFC, NHERI	MoMR monitoring report	20,000
4.7. Enhance the knowledge of artisanal fishers in sustainable fishing practices	4.7.1. Compile traditional knowledge on resource management practices of the coastal communities	2027 - 2028	No. reports compiles	MoMR, MoLG, Fishing Communities	MoMR Annual report	50,000
	4.7.2. Provide training and capacity-building programs for fishers on sustainable fishing practices.	2027 - 2030	No. of educational materials developed and number of fishers trained	MoMR, MoLG	MoMR Annual report	50,000
4.8. Improve data collection and analysis for fisheries management	4.8.1. Assess the impact of trawling on the non-target species and the marine environment	2027 - 2028	No. of assessments	MoMR, NFC, Fishers, NHERI	Assessment reports	50,000
	4.8.2. Train and involve artisanal fishers in fisheries data collection	2027 - 2030	No. of fishers involved in data collection	MoMR, MoLG	Annual report	10,000
	4.8.3. Analyse the time series fisheries catch and effort data to assess the status of the fish stock	2027 - 2028	No. of assessment	MoMR, NHERI	Catch and effort summary reports	20,000
	4.8.4. Introduce adaptive management strategies based on the results of analysis	2028 - 2029	No. of adaptaion measures introduced	MoMR	Annual report	20,000

4.9. Improve enforcement of regulations related to trawling.	4.9.1. Deploy satellite tracking systems (VMS) on board trawling vessels to monitor compliance with no-trawling zones.	2027 - 2030	No. of fishing vessels with VMS system	MoMR, ENF	Annual Report	100,000
	4.9.2. Increase patrolling and surveillance in critical habitats and marine protected areas (MPAs) in collaboration with the Eritrean Naval Force	2028 - 2030	No. of patrols conducted	MoMR, ENF	Annual patrol reports	50,000
	4.9.3. Revise and enforce penalties for illegal trawling activities.	2028 - 2030	No. of penalties and violations recorded	MoMR, ENF	Annual reports	20,000
	4.9.4. Train enforcement agencies (MCS) and local communities (Fisheries Cooperatives) on how to respond to illegal fishing activities.	2027 - 2030	No. of people trained	MoMR, NFC, ENF, Fishers	MoMR Training report	50,000
4.10. Collaborate with neighbouring countries to protect the Red Sea's marine biodiversity.	4.10.1. Support the establishment of a regional task force for coordinating conservation efforts and sharing of data.	2028	Establishment of the task force	MoMR, All Red Sea coastal states	Minutes of the taskforce	10,000
	4.10.2. Harmonize fishing regulations and enforcement across Red Sea countries.	2029 - 2030	No. of join enforcement measures	MoMR, NHERI	Regional annual report	50,000
Total						**2,330,000**

Target 5: By 2030, an integrated national, cross-sectoral invasive alien species (IAS) management programme is developed and implemented for the prevention of the introduction and establishment of new invasive alien species, and to identify, prioritize and control, and where possible eradicate or manage the already introduced ones.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
5.1. Identify and create awareness on status and impact of IAS on natural habitats and agro-biodiversity	5.1.1 Carry out survey on the status, impact and risk of IAS on biodiversity and ecosystems	2026 - 2027	No. of survey reports; total area affected by IAS	MoA, FWA and NHERI, MoLG	Remote sensed images; field supervision reports; MoA, FWA reports	200,000
	5.1.2 Conduct awareness on the threat of IAS to biodiversity and ecosystems	2026 - 2030	No. of public meeting and gathering on IAS awareness raising organized	MoA, FWA, MoLG, MoLWE, MoMR, MI	MoA, FWAReport	50,000
5.2. Control and/or manage the introduction of new and expansion of introduced IAS	5.2.1 Establish an IAS Control Unit within the Ministry of Agriculture, Ministry of Marine Resources, and Forestry and Wildlife Authority	2026 - 2027	IAS Units within Forestry and Wildlife Authority, MoA, MoMR established,	MoA, FWA, MoMR	Annual reports,	100,000
	5.2.2. Staff and equip the IAS unit	2026-2027	No. of staff and equipment	MoA, MoMR, FWA	Annual Reports	90,000
	5.2.3. Conduct research on how to control or manage IAS	2027 - 2030	No. of research projects on IAS conducted	MoA, FWA, MoMR and NHERI, MoLG	Annual Report	150,000
	5.2.4. Develop and implement guideline on control and manageme of IAS	2027 - 2030	National guideline on IAS	MoLWE, FWA, MoA, MoMR,MoLG, Local Community/CBOs, NHERI	Annual reports; Management plan documents	50,000

	5.2.5. Develop and implement a Management Plan to control/manage the introduced IAS	2026 - 2030	National IAS Control and Management Strategy/Program in place; Change in presence, location, area and No. of invasive plants and animals	MoLWE, FWA, MoA, MoMR,MoLG, Local Community/CBOs, NHERI	Annual reports; Field supervision reports; Managemnt paln reports	250,000
5.3. Prevent spread of IAS to Protected Areas	5.3.1 Ensure that protected areas are not invaded by harmful IAS	2027-2030	Protected areas free from IAS; Rate of IAS spread	MoLWE, FWA, MoA, MoMR, MoLG, Local Community/CBOs,	Annual reports; Protected area management reports; Baseline reports	120,000
	5.3.2 Eradicate IAS stands from protected areas where they occur	2027-2030	Changes in the level of infestation by IAS in protected areas	MoLWE, FWA, MoA, MoMR, MoLG, Local Community/CBOs,	Protected areas management plan reports; Baseline report;	150,000
5.4. Identify and manage entry points and pathways of IAS	5.4.1 Identify and manage actual and potential pathways of IAS	2027 - 2030	Changes in rate of IAS establishment	FWA, MoA, MoMR, MoLWE, , MoLG, Community/CBOs,	Annual reports; Field survey reports; Management plan reports; Baseline reports	50,000
	5.4.2 Strengthen surveillance and quarantine measures at suspected entry points	2026 - 2030	Number of IAS introduction events	MoLWE, FWA, MoA, MoMR,MoLG, Local Community/CBOs,	Annual reports; Management reports; Baseline reportS	100,000
Total						**1,310,000**

Target 6. By 2030, the level of pollution from all sources, inter alia, excess nutrients, pesticides, herbicides, heavy metals, oil spills and plastics is assessed and pollution from excess nutrients, pesticides and herbicides is prevented, controlled or minimized to levels that are not harmful to ecosystem function and biodiversity						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
6.1 Strengthenthe knowledge on the impact of pollution risks by agrochemicals, marine litters, heavy metals and oil pollution	6.1.1 Conduct assessment of the level of pollution by agrochemicals, heavy metals and oil spills	2026-2027	No. of surveys conducted	MoA, MoMR MoLWE, CLC, MoLG, NHERI	Assessment report	80,000
	6.1.2 Conduct awareness raising programs targeting stakeholders on the impact of pollution on biodiversity	2027-2030	No. of awareness programs organized	MoLWE, MoA, MoMR, MoLG, MoI, MoH	Annual report	50,000
	6.1.3 Develop and implement a programme for gathering land and marine litter	2026-2030	No. of cleaning campaigns	MoLWE, MoMR, MoLG, MoA, FWA, Local communities NUEW, NUEYS	Annual reports	65,000
	6.1.4 Conduct continuous inspection and monitoring of pollution caused by agrochemicals, plastic litter and other pollutants in farming, terrestrial and coastal areas	2027 - 2030	No. of inspections conducted	MoLWE, MoMR, MoLG, MoA, FWA	Inspection Report	70,000
	6.2.1 Promote the use of organic fertilizers, bio-pesticide or Integrated Pest Management	2026 - 2030	Changes in the use of environment-friendly organic fertilizers and biopesticides	MoA, MoLG, CLC, MoMR, Farming communities	Annual reports	60,000

6.2. Minimize and regulate pollution due to agro-chemicals and plastic litters	6.2.2 Provide nation-wide training to farmers on sustainable, climate smart agricultural (CSA) practices	2026-2030	No. of training sessions; No. of trainees	MoA, MoLG, Farming communities	Training reports	100,000
	6.2.3. Produce enough amount of organic fertilizers and organic pestcides to be used by farming communities	2026-2030	Changes in the quantity of organic fertilizers and organic pesticide produced	MoA, MoMR, MoTI, MoLG, MoFND,	Annual reports	300,000
	6.2.4. Prepare guideline on the appropriate use of organic fertilizer and organic pesticides in local languages	2027	No. of guidelines prepared and translated into local languages	MoA, MoMR, MoLG	MoA reports	50,000
	6.2.5 Reduce the use of inorganic fertilizers and pesticides	2026-2030	Changes in the use of inorganic fertilizers and pesticides	MoA, MoLG, CLC, Farming communities	MoA reports	30,000
	6.2.6 Control and regulate entry of inorganic agrochemicals including livestock drugs	2026-2030	% reduction in the entry of inorganic agrochemicals and livestock drugs	MoA, MoLG, CLC, MoFND, MoTI, Farming communities	Annual reports	30,000
	6.2.7. Control the entry of non degradable, single use plastic, and promote use of biodegradable packing items	2026-2030	Changes in the quantity of non degradable plastic waste in	MoLWE, MoMR, MoFND, MoTI, MoLG,	Annual reports	50,000

			public areas			
6.3. Strengthen the policy on the control and inspections of all pollutants	6.3.1. Revise and implement regulations on plastic and other types of pollution	2026-2030	% reduction on the use of plastic	MoLWE, MoLG, MoA, MoMR	Annual reports	20,000
	6.3.2. Review the inorganic agrochemical policy (legal notice No 114/2006) on the disposal of expired agro-chemicals and agro-vet medicines	2028	Reviewed policy	MoA, MoLWE, MoLG, MoJ	Legal notice	20,000
Total						**925,000**

Target 7: By 2030, develop appropriate mitigation, adaptation and disaster risk management measures to reduce the impacts of climate change and ocean acidification on biodiversity and enhance the resilience of ecosystems						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
7.1 Assess and increase knowledge and information on impacts of climate change on biodiversity	7.1.1 Assess climate change and its impact on biodiversity	2026-2030	No. of surveys on impact of climate change on biodiversity	MoLWE, FWA, MoA, MoMR, NHERI	Assessment report	150,000
	7.1.2 Conduct regular monitoring of ecosystem health.	2027-2030	No. of assessments conducted on the status of ecosystem health	MoLWE, FWA, MoA, MoMR, NHERI	Monitoring reports	100,000
	7.1.3 Conduct awareness raising and communication materials on impact of climate change on biodiversity	2027-2030	No. of awareness programmes developed	MoLWE, MoA, MoMR, MoLG, FWA, MoEM	Annual report; Programme reports	40,000
	7.1.4 Review NAPA for inclusion of biodiversity consideration in climate change adaptation programmes	2028	No. of action plans related to biodiversity in the reviewed NAPA	MoLWE, MoA, MoMR, MoLG, FWA,	Reviewed NAPA	20,000
7.2 Strengthen capacity and research on the impacts of	7.2.1 Enhance the capacity of relevant institutions to explore the impacts of climate change on biodiversity	2026-2030	No. of capacity building programmes developed	MoLWE, MoA, MoMR, MoLG, FWA, MoFND, NHERI	Annual reports; Programme reports	100,000
	7.2.2 Collaborate with national, regional and international research institutions to study the impacts of climate change on biodiversity.	2027-2030	No. of collaborative studies	MoLWE, MoA, MoMR, FWA, MoEM, NHERI and international institutions	Collaboration reports; Memoranda of Agreements	50,000

climate change on biodiversity and ecosystem	7.2.3 Conduct research on how to reduce the impacts of climate change on biodiversity particularly on drought, global warming, coral bleaching, and ocean acidification.	2027-2030	No. of publications in scientific journals; No. of adaptaion and/or mitigation measures recommended	MoLWE, MoA, MoMR, FWA, NHERI	Publications; research manuscripts	200,000
7.3 Develop appropriate mitigation, adaptation and disaster risk management measures and policies on climate change	7.3.1 Establish a long-term climate change monitoring and early warning system and prepare a national climate disaster risk management plan	2026-2030	No. of monitoring and early warning system established	MoLWE, MoA, MoMR, FWA, NHERI	Monitoring report	150,000
	7.3.2 Identify and promot the use of climate change resilient crops, domestic animals, trees and shrubs	2027-2030	No. of climate resilient crops, trees and animals identified	MoA, FWA, MoLWE, NHERI,	MoA and FWA reports	50,000
	7.3.3 Adopt and implement national disaster risk prevention strategies and framework for disaster risk reduction on biodiversity	2028-2030	No. of prevention strategies and framework adopted	MoLWE, MoA, MoMR, FWA	Annual report	100,000
	7.3.4. Design and implement conservation measures specifically for climate change sensitive species	2028-2030	No. of conservation measures designed	MoLWE, MoA, MoMR, FWA	Annual report	75,000
Total						**1,035,000**

Target 8. By 2030, fair and equitable access and benefits of sharing (ABS) that arise from the utilization of genetic resources, traditional knowledge and digital sequence information (DSI) facilitated and increased in accordance with applicable national legislation and international access and benefit-sharing instruments to genetic resources and assess the risks of biotechnology products.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost(USD)**
8.1. Assess and document indigenous knowledge on medicinal plants, wild vegetables, fruits, tubers as well as resins	8.1.1. Conduct survey on ethno-botanical and indigenous knowledge in Eritrea	2027-2028	No. of surveys conducted and documented.	MoA, MoH, FWA, MoLG, MoLWE, NHERI	Field survey reports	75,000
	8.1.2. Compile a list of plants with medicinal value and their current status, including list of persons with knowledge of medicinal plants	2029-2030	National list of medicinal plants and persons knowledgable on medicinal plants documented	MoA, MoH, FWA, MoLG, MoLWE, NHERI	National List	40,000
8.2 Create awareness on the importance of Access and Benefit Sharing of genetic resources	8.2.1 Conduct workshops on Nagoya Protocol and international treaty on plant genetic resources for food and agriculture	2027-2028	No. of workhops conducted	MoLWE, MoA, NHERI, NUEW, NUEYS, MoLG, Farming communities	Workshop report	50,000
	8.2.2. Conduct awareness raising programs for communities on the use of genetic resources and benfit sharing	2027-2030	No. of awerness programs conducted	MoA, MoLWE, MoLG, FWA, MoI, Farming communities	Annual Report	150,000

8.3 Access to genetic resources by the public facilitated	8.3.1 Promote access to flora and fauna database by the public	2027-2030	No. of people accessing the flora-fauna database	MoLWE, MoA, MoMR, MoLG	Data base access record and reports	60,000
	8.3.2. Establish community based seed banks	2027-2029	No. of community seed banks established	MoA and NHERI	MoA report	70,000
8.4. Conduct research and develop human capacity regarding ABS	8.4.1 Conduct research on wild vegetable, medicinal plants, fruits, tubers as well as resin	2027-2030	No. of research projects on wild vegetable, medicinal plants, fruits, tubers & resins	MoA, NHERI, FWA, MoLG, MoH,	Research Project reports	150,000
	8.4.2 Provide training for experts and decision-makers on access and benefit sharing of genetic reources	2027-2028	No. of training organized and number of people trained.	MoA, NHERI, FWA MoLWE, MoLG, MoH,	Training reports	50,000
8.5 Development of a legal framework and protocols concerning access and benefit sharing for genetic resources	8.5.1 Develop a national framework on access and benefit sharing of genetic resources	2027	No. of policy/guideline in place	MoLWE, MoA, FWA, MoLG	Annual reports	30,000
	8.5.2 Endorse and implement national framework on access and benefit sharing of genetic resources	2028-2030	National policy/ guideline on ABS implemented	MoLWE, MoA, FWA, MoLG	Annual reports	40,000
Total						**715,000**

Target 9. By 2026, the mobilization of financial resources for the effective implementation of the National Biodiversity Strategy and Action Plan (2025-2030), from local and international sources is reinforced in accordance with the resource mobilization strategy						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
9.1. Establish a NBSAP Resource Mobilization Committee	9.1.1. Identify capable members for the Resource mobilization task team	2026	Resource mobilization task team members identified	MoLWE, MoFND, MoLG, MoA, MoMR, FWA	Annual reports, Assessments and reviews	10,000
	9.1.2. Contact and secure consent of each selected member and formally launch the task team	2026	Task team established	MoLWE, MoFND, MoLG, MoA, MoMR, FWA	DoE reports	20,000
	9.1.3 Arrange meeting of members and give briefings on task	2026	Meeting arranged and briefings given	MoLWE	Committee Reports	10,000
9.2. Build capacity in programme/project formulation and resource mobilization	9.2.1. Assess capacity to formulate projects/programmes in line with the requirements of funders	2026	Capacity assessed; capacity gaps identified	MoLWE, MoFND, MoLG, MoA, MoMR, FWA	National partnership report; Technical and financial reports	35,000
	9.2.2. Organize training to address capacity gaps in projects/programme formulation, resource mobilization, risk management, financial regulations, relevant policies, reporting obligations, monitoring	2026-2027	No. of training organized	MoLWE, MoFND, MoLG, MoA, MoMR, FWA	National partnership reports; Technical and financial reports	50,000

	requirements, etc. of the country and funder counterparts					
9.3. Identify resource needs and potential resource providers	9.3.1. Identify resource needs	2026	Resource needs identified	MoLWE, MoFND, MoLG, MoA, MOMR, FWA	Technical and financial reports	20,000
	9.3.2. Prepare a list of potential resource providers	2026-2027	List of potential resource providers prepared;	MoLWE, MoFND, MoLG, MoA, MOMR, FWA, MoEM	Technical and financial reports;	10,000
	9.3.3. Create a resource provider database	2026-2030	Database created	MoLWE	Annual reports; Management reports; Project reports	20,000
	9.3.4. Profile each potential member in terms of resources, terms, criteria and relevance for funding	2026-2030	Profile for funding in place	MoLWE, MoFND	Annual reports; Management reports Profile of funders	10,000
	9.3.5. Prepare a priority list of selected resource providers	2026-2030	Priority list prepared	MoLWE, MoFND,	Annual reports, Management reports; List of prioritised funders -	10,000
	9.3.6. Prepare communication and advocacy packages for consulting with and/or engaging potential fund providers	2026-2030	Communication and advocacy packages prepared	MoLWE, MoFND,	Annual reports, Management reports; Communication materials	30,000

	9.3.7. Prepare strategic documents that outline key objectives, targets, vision, mission programmes and action plans to buy-in the interest of partners and attract funding	2026-2027	Effective strategic documents prepared	MoLWE, MoFND,	Annual reports, Assessments and reviews Management reorts Strategic docuemnst	50,000
	9.3.8. Familiarize technical and managerial staff with major funder profiles to forge fruitful communication and cooperation	2026-2029	No. of staff familiarized with funder profiles	MoLWE, MoFND,	National partner ship reports Technical and Financial reports	30,000
9.4. Search out for reliable partners to broaden funding sources and build stronger partnership using concept notes and project proposals	9.4.1. Prepare prioritized concept notes, full project/programme documents to share with potential funding partners	2026-2028	Concept notes prepared	MoLWE, , MoA, MoMR, FWA , MoEM	National partner ship reports; Managemnt technical and financial reports	20,000
	9.4.2. For each concept note or project proposal, identify and screen each potential funders and collect information on them, including their preferred funding modalities	2026-2028	Project proposals identified and screened	MoLWE, MoFND,	National partner ship reports; Managemnt technical and financial reports	30,000
	9.4.3. Reach out to funding sources and send concept notes and project proposals to resource partners for funding.	2026-2029	No. of concept notes and project proposal submitted	MoLWE, MoFND,	National partner ship reports; Managemnt technical and financial reports	20,000

	9.4.4. Create linkage partnership and communication forum to continuously engage funders	2027-2030	Partnership and communication created	MoLWE, MoFND,	National partner ship reports	30,000
	9.4.5. Prepare and sign memoranda of agreements with resource funders.	2026-2030	No. of memoranda finalized;	MoLWE, MoFND,	National partner ship reports; Managemnt reports, MoU	30,000
9.5. Ensure achievements of outputs and outcomes of ongoing projects/programmes to boost credibility and legitimacy	9.5.1. Register and code all funded projects in the data base created	2026-2030	No. of funded projects registered and coded; Changes in avialbilty and timeliness of funds	MoLWE, MoFND	National partner ship reports Managemnt reports; Project documents	10,000
	9.5.2. Acknowledge the contribution of funders in writing with thanks and appreciation	2026-2030	Acknowledgem ent letters to funders	MoLWE, MoFND,	Project reports; Annual reports; Acknowledgement letters	10,000
	9.5.3. Maximize delivery of outputs/outcomes	2026-2030	No. of outputs and outcomes achieved	MoLWE, MoFND, MoA, MoMR, MoLG, FWA, MoEM	National partner ship reports Technical and Financial reports	20,000
	9.5.4. Use funds in accountable and transparent ways	2026-2030	No. of audit reports	MoLWE, MoFND, MoA, MoMR, MoLG, FWA, MoEM	National partner ship reports Project audit and financial reports	10,000

	9.5.5. Provide regular financial and progress reports as per the requirements of funders	2026-2030	No. of financial and progress reports	MoLWE, MoFND, MoA, MoMR, MoLG, FWA, MoEM	National partner ship reports Managemnt technical and financial reports	10,000
	9.5.6. Prepare completion reports for the funded projects as per the requirements of funders.	2028-2030	Complete reports prepared	MoLWE, MoFND, MoA, MoMR, MoLG, FWA, MoEM	National partner ship reports Managemnt technical and financial reports	100,000
	9.5.7. Ensure reports are submitted in a timely manner following the reporting requirements and procedures of project funders.	2026-2030	No. of reports submitted in time	MoLWE, MoFND, MoA, MoMR, MoLG, FWA, MoEM	National partner ship reports Managemnt technical and financial reports	10,000
	9.5.8. Share challenges, experiences and lessons with funders	2029-2030	Challenges, experiences and lessons shared	MoLWE, MoFND, MoA, MoMR, MoLG, FWA, MoEM	National partner ship reports Managemnt reports; Project completion reports	20,000
9.6. Develop and maintain credible and robust information and reporting system	9.6.1. Devise instruments and procedures for data collection, analysis and reporting	2026-2030	Instruments and procedures devised	MoLWE, MoA, MoMR, FWA, MoEM , NHERI	Annual reports; Developed instrucmnet and procedures	30,000
	9.6.2. Conduct dissemination workshops	2028-2030	No. of workshops conducted	MoLWE, MoA, MoMR, FWA, MoEM , NHERI	Annual reports; Workshop reports	30,000

	9.6.3. Prepare brief reports that show real results of concluded projects	2029-2030	Briefing reports prepared; Changes in sustainability of funding	MoLWE, MoA, MoMR, FWA, MoEM	National partner ship reports; Briefing reports	10,000
	9.6.4. Prepare end of project brochures, leaflets, posters to be distributed to resource partners and CBD.	2030	No. of project brochures leaflets, posters prepared and distributed	MoLWE, MoA, MoMR, ,FWA, MoEM ,	Managemnt reports; Prepared brochures	20,000
Total						**715,000**

Target 10. By 2030, the capacity of institutions dealing with biodiversity conservation is strengthened and scientific technology based and traditional knowledge related to biodiversity enhanced and generated knowledge shared, accessed and applied.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
10.1. Institutional (infratrusctural, human and skills) capacity gaps identified	10.1.1. Develop capacity needs assessment methodology	2026	Number and type of assessment tools developed and used	MoLWE, MoA, MoMR, MoLG, FWA,	Annual reports, -Assessments and reviews -Management plan -Baseline report -Project reports and reviews -Reports and supervision missions	10,000
	10.1.2. Identify institutional, technological, technical and human capacity gaps in biodiversity conservation	2026-2027	No capacity gaps identified	MoLWE, MoA, MoMR, MoLG, FWA,	Capacity Assessment reports	50,000
	10.2.1. Develop and implement human capacity-building programmes in biodiversity	2026-2030	No., qualification and area/specialty of trained man power	MoLWE, NHERI, MoA, MoMR, MoLG, FWA,	Institutionsal Training reports	500,000
	10.2.2 Develop and strengthen national infrastructural capacity for	2026-2030	Type and quantity of material procured	MoLWE, NHERI, MoA, MoMR, MoLG, FWA, MoFND	Institutionsal Annual reports,	200,000

	biodiversity conservation					
10.2. Capacity in biodiverisrty conservation enhanced	10.2.3. Provide on the job training in biodiversity and ecosystem conservation to public sector staff such as rangers, extension agents, etc	2026-2030	No. and type of training offered	MoLWE, NHERI, MoA, MoMR, MoLG, FWA, MoFND	Institutionsal Training reports	200,000
	10.2.4. Conduct training programs on community-based management for crop landraces and indigenous animal breeds	2026-2030	No. and type of training offered	MoA, FWA, MoLG, Farming communities	Institutionsal Training reports	150,000
	10.2.5. Conduct training programs on community-based management for terrestrial. and marine biodiversity conservation	2026-2030	No. and type of training offered	MoMR, MoLG, MoLWE, MoA, local communities' representatives	Institutionsal Training reports	150,000
	10.3.1 Establish an Environment Unit in relevant ministries as per Proclamation No. 179/2017	2026	No. of Environmental Unit established	MoA, FWA, MoMR, MoT, MoEM, MoTC, MoTI	Annual reports	50,000

10.3. Institutional capacity in biodiversity issues strengthened	10.3.2. Strengthen the capacity of the Environment Unit in relevant institutions	2027	No. of staff in the Environment Unit	MoA, FWA, MoMR, MoT, MoEM, MoTC, MoTI, MoLG	Institutional Annual reports, ;	60,000
	10.3.3 Conduct a workshop to assess and improve national biodiversity management programme	2027 and 2029	No. of papers presented; No. of participants	MoLWE, MoA, FWA, MoMR, MoLG, NHERI	Workshop proceeding	100,000
	10.3.4. Forge partnerships with regional and national research institutions	2027-2030	No. of MoU signed; No. joint research ventures conducted	MoLWE, MoA, FWA, MoMR, MoLG, NHERI, International Research Organizations related biodiversity	Institutional annual reports	50,000
Total						**1,520,000**

Target 11. By 2030, at least one third of the population of Eritrea are aware of the values and importance of biodiversity and have the knowledge of the steps that they can take to conserve and/or sustainably use biodiversity/ ecological resources.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
11.1. Raise awareness of biodiversity using prioritized environmental messages	11.1.1. Develop biodiversity outreach programmes and communication system to engage people in biodiversity conservation and decision-making	2027-2029	Communication work plan developed	MoLWE, FWA, MoMR, MoA,MoE,MoFND,, MoLG, MoI, NHERI, Local community/CBOs, private sectors	Institutional reports; Communication action plans,	50,000
	11.1.2. Prepare and disseminate communities-targeted biodiversity knowledge and information in local languages	2027-2030	No. of biodiversity messages prepared dissiminated	FWA, MoLWE, MoMR, MoA,MoE,MoFND, MoLG, MoI, NHERI, Local community/CBOs, private sectors	Institutional reports; Communication action plans; Awareness materials (leaflets, brochures, posters), Media(News papers, television, radio) broadcasting	100,000
	11.1.3 Organize Community social forums for biodiversity awareness raising	2026-2029	No. of awareness platforms created	MoLWE, FWA, MoMR, MoA, MoE, MoFND, MoLG, MoI, Local community/CBOs, private sectors	Reports, -News papers, Television, Radio broadcasting	30,000
11.2. Mainstream biodiversity	11.2.1. Integrate environmental sustainability, including biodiversity protection, into	2027-2030	Biodiversity topics in school curricula	MoE, FWA, MoLWE, MoMR, MoA, MoLG, MoI,	Institutional Reports	50,000

conservation into the national curricula	the national education system			NHERI, Local community/CBOs,		
	11.2.2. Align the aims of the Global Citizenship Education (GCED) and Education for Sustainable Development (ESD) with NBSAP goals.	2027-2028	No of GCED lessens aligned	MoE, FWA, MoLWE, MoMR, MoA, MoFND, MoLG, MoI, NHERI, Local community/CBOs,	Institution reports, -SDGs voluntary reports; NBSAP progress reports	30,000
11.3. Promote biodiversity stewardship	11.3.1. Ensure that outdoor recreation programmes include biodiversity considerations (ecotourism)	2026-2030	Biodiversity guideline for outdoor recreation in place	MoLWE, MoMR, MoA, MoE, MoFND, FWA, MoLG, MoI, MoT, Local community/CBOs, private sectors	Annual reports; NBSAP progress reports	30,000
	11.3.2. Ensure that urban sanitation programs include biodiversity considerations	2026-2030	Biodiversity guideline for urban sanitation in place	MoLG, Urban Municipalities, community/CBOs, private sectors	Urban Municipalities' reports	50,000
	11.3.3. Train and/or orient small and large business to reduce their impacts on biodiversity	2027-2030	No. of businesses trained; Number of social groups representatives engaged	MoLWE, FWA, MoMR, MoA, MoE, MoFND, MoLG, MoI, NHERI, MoT, Local community/CBOs, private sectors	Annual reports, Training matrials	70,000
Total						**410,000**

Target 12. By 2030, the involvement and participation of local communities, women and girls in the management of agricultural, terrestrial and marine biodiversity is promoted and encouraged through community-led, gender-inclusive approaches, ensuring that the right of local communities over land and resources is duly acknowledged and respected.						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost(USD)**
12.1. Pomote participation of local communities, including women, girls, and vulnerable persons, in biodiversity conservation decision-making	12.1.1. Foster sense of collective responsibility by explaining the benefits of biodiversity to local communities.	2027-2030	No of meetings conducted with local communities' represntatives	MoLWE, MoLG, NUEW, NUEYS, MoA, MoMR, FWA,	Institutional reports, and strategic/action plans	60,000
	12.1.2. Empower local committees (like the Watershed Committees) to be able to act by themselves in biodiversity conservation	2027-2030	Existence of community-based biodiversity management systems	MoLWE, FWA, MoA, MoLG, NUEW, NUEYS, Local Committees	Institutional reports, media (News papers, Television, Radio)	30,000
	12.1.3. Support local communities to carry out biodiversity-related projects	2027-2030	No Projects carried out	MoLWE, MoLG, MoA, NUEW, NUEYS, Local Committees	Institution reports; project progress report	200,000
	12.1.4. Ensure participation of women in biodiversity related decision making.	2026-2030	Proportion of women participating in decision making	MoLWE, MoLG, NUEW, NUEYS, Local Committees	Annual reports; minutes of meetings	10,000
	12.1.5 Ensure participation of youth in biodiversity related decision making.	2026-2030	Proportion of youth representation in biodiversity decision making	MoLWE, MoLG, NUEW, NUEYS, Local Committees	Annual reports;	10,000

12.2. developed mechanisms for effective participation of local communities in biodiversity conservation and decision-making	12.2.1. Create Kebabi Biodiversity/ Environmental Committees to organize awareness raising and conservation actions in their localities.	2027-2029	No. of meeting by the committees with the local community	MoLG, MoLWE, MoA, MoMR, FWA, NUEYS, NUEW,	Institutional reports	130,000
	12.2.2. Create Community Social Forums (Youth and Women Biodiversity Forums) for regular exchange of ideas, and information on biodiversity conservation.	2027-2030	No. of Women, Youth and Girls Biodiversity Forum established	MoLG, MoLWE, MoA, MoMR, FWA, NUEYS, NUEW	Institutional reports, media (Newspapers, Television, Radio)	30,000
	12.3.3. Ensure membership of women, girls and disabled persons in Watershed Committees	2026-2030	% of women, sirls and disabled person in watershed committees	MoLG, MoLWE, MoA, MoMR, FWA, NUEYS, NUEW, Local watershed committees	Institutional reports, media (Newspapers, Television, Radio)	20,000
Total						**490,000**

Target 13. By 2030, the capacity of biosafety and biotechnology techniques strengthened, the negative impacts of LMOs minimized and measures for the handling of biosafety and biotechnology risks implemented						
Objective	**Priority Actions**	**Time frame**	**Performance Indicators**	**Implementing Institutions**	**Source of information**	**Cost (USD)**
13.1. Revise / update the National Biosafety Framework, strategy and action plan	13.1.1. Assess the status of biosafety, biotechnology and risk of the transgenic products(GMOs/LMOs) for the environment and human health at national level	2026-2027	Assessment conducted	MoLWE, MoA, MoH, MoTI, MoTC, MoMR,FWA, NHERI	Assessment reports	100,000
	13.1.2 Assess the implementation status of the national biosafety frameworks (NBF)	2026-2027	National Biosafetly Framework assessed	MoLWE, MoA, MoH, MoTI, MoTC, FWA,MoMR, NHERI	Assessment reports	30,000
	13.1.3 Empower the biosafety relevant institutes to exercise supervision and handling of transgenic products (GMOs/LMOs), modern biotechnology and its products	2026-2027	No. of personnel trained in supervision and handling of transgenic products	MoLWE, MoA, MoH, MoTI, MoTC, FWA, MoMR, NHERI	Training reports	30,000
13.2 Enhance public awareness on sharing and accessing biosafety-related information	13.2.1. Conduct training on Biosafety clearing house (BCH)	2027-2028	No. of people trained and training materials prepared	MoLWE, MoA, MoH, MoTI, MoTC, FWA,MoMR, NHERI	Training reports	50,000
	13.2.2 Create public awareness on the concept, importance and risk of modern biotechnology, biosafety and their products (GMOs/LMOs)	2027-2030	Changes in the level of awareness on biosafety; awareness materials produced	MoLWE, MoA, MoH, MoTI, MoTC, FWA, MoMR, NHERI, MoI	Annual reports	50,000

13.3 Strengthen the capacity of biosafety and biotechnology handling techniques	13.3.1 Develop human capacity for molecular and genotyping techniques, handling of modern biotechnology and its products	2027-2029	No. of trained staff in biosafety and modern molecular tools	NEHRI, MoLWE, MoA MoMR, MoH, MoTI, MoTC, FWA,,	Training report	250,000
	13.3.3 Strengthen/upgrade the national laboratories capacity in modern biotechnology, digital sequencing and genotyping techniques	2027-2028	Changes in quality and/or quantity of facilities on biotechnological and digital sequencing laboratories	NHERI, MoLWE, MoA, MoMR, MoH, MoTI, MoTC, FWA	Mangement and equipment invertory record reports	350,000
13.4 Develop effective and operational biosafety mechanism measures and legislation	13.4.1 Establish a national management body for biosafety	2027	Management body established	MoLWE, MoA, MoMR, MoJ, FWA, MoH, NEHRI, MoH, MoTI, MoTC , FWA,,	Biosafety Management body reports	10,000
	13.4.2 Establsih National Biosafety Database	2027-2030	National Biosafety Database Established	MoLWE, MoA, MoMR, FWA, MoH, NEHRI, MoH, MoTI, MoTC , FWA,	Annual database report	30,000
	13.4.3 update and develop operational guidelines for biosafety	2027	Operational biosafety guidelines updated and developed	MoLWE, MoA, MoMR,MoJ, FWA, MoH, NEHRI, MoH, MoTI, MoTC , FWA,	Annul reports	30,000
Total						**930,000**
GRAND TOTAL (ALL TARGETS)						**48,100,000**

9. IMPLEMENTATION, RESOURCE MOBILIZATION, MONITORING AND EVALUATION PLANS

9.1. Implementation Arrangements

Effective implementation of the revised and updated NBSAP will require commitment collective action, cooperation and coordination among the relevant institutions – line ministries, Zoba and Sub-Zoba administrations, local communities and CBOs. To ensure that action plans are properly mainstreamed to the routine programmes and activities of the relevant institutions, an implementation framework is suggested.

The implementation framework entails the establishment of a National Steering Committee under the MoLWE, with members drawn from the relevant ministries, authorities and CBOs. The main task of the National Steering Committee will be to oversee and monitor the overall implementation of NBSAP (2026-2030) within the period specified. The National Steering Committee will identify the key stakeholders for the actions plans, establish a biodiversity platform for consultation and communication among them, design a working relationship among them, plan public awareness and sensitization programmes, plan and organize trainings, and ensure that NBSAP (2026-2030) is adequately mainstreamed into the programmes of the relevant institutions.

The National Steering Committee will be supported by the Biodiversity Coordinator, Resource Mobilization Task Team and a Scientific and Research Team. The National Biodiversity Coordinator will follow and coordinate the day-to-day activities relating to the implementation of NBSAP. The coordinator will play a key role in liaisoning with stakeholders, Scientific and Research Team, Resource Mobilization Task Team and Zoba Administrations. He/she will ensure that the recommendations, suggestions and plans made by the National Steering Committee are implemented and followed. The Scientific and Research Team will conduct research on terrestrial, marine and agricultural biodiversity to improve understanding and knowledge of Eritrean biodiversity and update data and information on status, threats and trends of biodiversity of the country. The information generated will feed continually into NBSAP. The Zoba and Sub-Zoba Administrations will monitor the implementation of NBSAP in their respective administrative areas. The Resource Mobilization Task Team will proactively engage with biodiversity funding agencies to mobilize adequate resources for the effective implemnation of NBSAP (2026-2030).

One of the main shortcomings of NBSAP-2015 was its limited circulation among the relevant institutions. Most of the line ministries and Zoba Administrations had no knowledge or information about NBSAP-2015. Thus, the National Steering Committee will have to make sure that NBSAP (2026-2030) is widely circulated and known to all officials, administrators and experts. Preferably, NBSAP (2026-2030) would be launched in a national workshop, where all stakeholders express their support to the action plan and ascertain their commitments to carry out their respective responsibilities. During the workshop, the importance of mainstreaming NBSAP into the programmes and activities of institutions and collaborative work should be emphasized, and a workplan for the whole process is agreed upon. The workshop will have to be widely covered by the mass media. The agreed task and time frame will serve as benchmarks to measure implemention progress of the targets and actions. The stakeholders should agree to submit bi-annual reports to the MoLWE, which will compile the report and organize annual meetings to assess the implementation progress. The annual meetings will assist in monitoring and evaluating the progress of the work pln.

Immediately after the national workshop, awareness and sensitization programmes regarding NBSAP (2026-2030) and its implementation should be conducted at regional (zonal) levels. The awareness programmes should further be promoted through the media, in public

meetings, and by distributing printed awareness or promotional materials. The relevant institutions should raise the awareness of their staff and constituents by informing the relevant bodies about the objectives of NBSAP (2026-2030) and its implementation plan. The roles and responsibilities of each constituency should be communicated to the concerned stockholders so that they can develop a collective sense of ownership.

9.2. Resource Mobilization

Implementation of the NBSAP (2026-2030) will require internal and external resources. The total amount required for the 2026-2030 period is USD 48,100,000.00, of which 67% will be mobilized from external resources. This implies that the MoLWE, MoA, MoMR, MoLG, MoFND, and other main stakeholder institutions must broaden and strengthen their relations with resource providers and enhance their efforts proactively to mobilize the resources required for the implementation of the NBSAP. In order to ensure that the implementation of the NBSAP stays on track, and reaches its fullest potential, it will also require regular monitoring and periodic evaluations through a systematic process of continuous assessment. The MoLWE through the DoE is responsible for supporting for resource mobilization, monitoring and evaluation.

In view of this, the MoLWE has developed a companion document on Resource Mobilization, Monitoring and Evaluation Plan (RMMEP) to guide resource mobilization efforts for the implementation of NBSAP (2026-2030), and monitor the implementation progress. The document outlines the overall goal, objectives, principles, strategies, criteria, questions and actions with respect to mobilizing the resources required for the implementation of NBSAP (2026-2030), and the processes that need to be followed for effective and unbiased evaluation. The document is conceived in two parts: Resource Mobilization Plan, and Monitoring and Evaluation Plan. The document has been prepared in a sequential order to clearly indicate the steps and approaches that will have to be undertaken for effective mobilization of resources, monitoring and evaluation

The Resource Mobilization Plan part of the RMMEP the road map of the DoE (MoLWE) for the 2026-2030 period and beyond. It draws attention to the specific steps and tasks that the DoE will have to accomplish to mobilize successfully the resources. Its main goal is to mobilize adequate resources and broaden the resource base of the DoE and other main stakeholders in a systematic and structured way. The Resource Mobilization Plan enables the DoE and its collaborating stakeholders to follow a clear and structured approach to mobilizing (soliciting, acquiring, utilization, monitoring and managing of financial inflows) adequate resources from internal and external resource partners for the implementation of the NBSAP (2026-2030). By improving the availability of resources, the Resource Mobilization Plan is expected to contribute towards timely, efficient and effective implementation of NBSAP.The Resource Mobilization Plan fully recognizes the challenges of resource mobilization and tries to chart out the best path and efforts required for successful resource mobilization.

9.3. Monitoring and Evaluation

The Monitoring and Evaluation Plan primarily aims at assessing and documenting the successes and failures, strengths and weaknesses of the implementation of NBSAP (2026-2030) and the Resource Mobilization Plan by tracking the resource mobilization strategies and actions as well as the indicators relating to the implementation of each of the targets and their corresponding strategic actions. Monitoring and Evaluation (M&E) of a programme/project is a continuous management function used to assess whether or not progress is being made in fulfilling programme/project objectives and targets, to identify impediments to implementation and to gauge programme/project impacts (both negative and positive). The M&E Plan contains a description of the steps, methods and approaches, tools

and activities required to gather, organize and analyse relevant progress and performance data on the set indicators.

Both monitoring and evaluation processes will enhance the effectiveness and efficiency of NBSAP implementation and enable remedial actions to be taken if and when it is running off course. Evaluation and monitoring is important for a number of reasons such as:

- Assessing whether NBSAP (2026-2030) is achieving/has achieved the planned goals and targets or not;
- Identifying whether resources were efficiently converted into activities, outputs and outcomes or not during implementation;
- Highlighting whether or not NBSAP (2026-2030) is sustainable and meaningful to the overall goal of biodiversity conservation, primary stakeholders, participants and local communities;
- Identifying impediments to implementation and taking remedial actions in time
- Assuring funders that progress is being made as planned; and
- Reconsidering measures, actions, costs, timeliness, risks, management processes, reporting procedures, in the context of emerging or changing issues.

By collecting data and comparing them with milestones, and by identifying the weaknesses and strengths, opportunities and challenges of implementation, monitoring and evaluation will inform the NBSAP management team for early decision-making. As an enabling activity, monitoring and evaluation generates findings that are timely, credible, relevant and objective to inform the management on constraints to implementation, take remedial actions in time, make optimum use of opportunities, reorient the focus, and adapt to emerging issues and changing contexts.

In Eritrea, monitoring and evaluation of any project during implementation is required for all projects. According to the National Environmental Assessment Procedures and Guidelines, the DoE (MoLWE) is responsible for monitoring and evaluation at Government level as part of environmental management programme for the country. Project owners and managers are also responsible for monitoring and evaluation at project level. Project owners are obliged to conduct Environmental Impact Assessment (EIA) as well as monitoring requirements and report the results of monitoring to the DoE or its representatives at agreed intervals.

Implementation of NBSAP will be monitored regularly to ensure that progress towards the targets is steady. Monitoring and evaluation will use a participatory and consultative approach. During monitoring and evaluation, regular consultation will take place with implementing entities, institutions, stakeholders and local communities. Mid-term implementation will be verified on the ground through field visits to Zobas and primary target biodiversity hotspots. An integrative approach will be used to assess the alignment of NBSAP with the policies and action plans of key line ministries, Zoba administrations and primary stakeholders. The suitability of the management structure of NBSAP (2026-2030) for participatory, efficient and effective implementation will further be examined. The constraints to the implementation of NBSAP in the context of institutional and human capacity and external forces at different levels (national, Zoba, local), will be identified and highlighted. The commitment of the partners/stakeholders to NBSAP objectives, level of their involvement and mainstreaming in their policy and in implementation and adherence to work plans will further be examined. A knowledge-based approach will be used to assess the achievements while a socio-economic approach will be used to assess the benefit that the local communities are getting as a result of the implementation of NBSAP. To ascertain that monitoring and evaluation is performed effectively, the DoE will prepare a timeline for monitoring and evaluation.

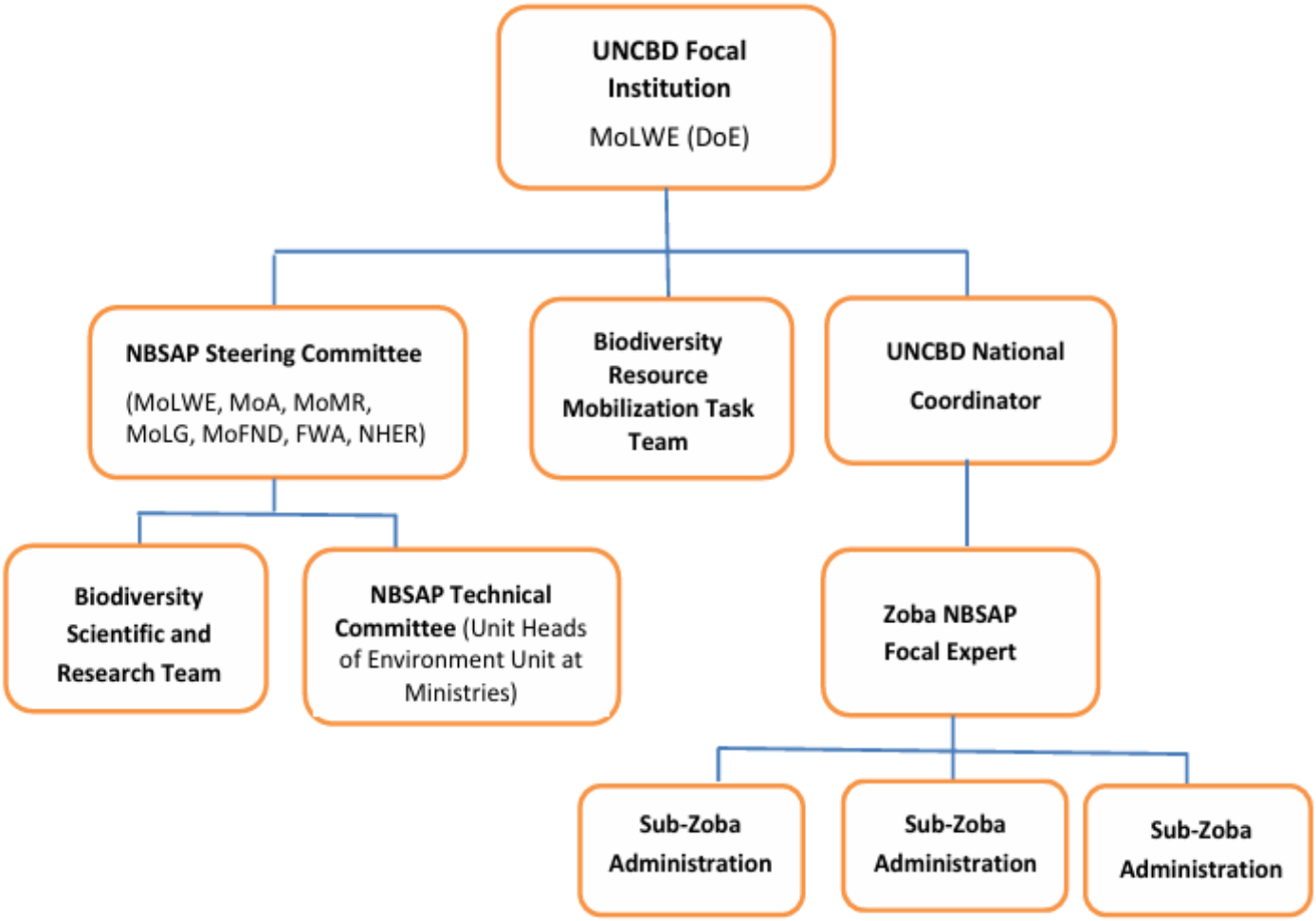

Figure 27 NBSAP Institutional Implemntaion Structure

10.ANNEXES

Annex 1. List of endemic trees and shrubs that are threatened or near threatened

No.	Sceintific Name	Family	Distribution	Remarks
1	*Acacia bavazzanoi*	Leguminosae	Ethiopia and Eritrea	A woodland tree species grows at altitudes of 1350-2400 m.
2	*Acacia venosa*	Leguminosae	Ethiopia and Eritrea	A shrub that grows at altitudes of 1900-2400 m.; found in west Eritrea
3	*Barleria grandis*	Acanthaceae	Ethiopia and Eritrea	occurs in woodland habitats along river valleys at altitudes of 1600-1800 m.
4	*Becium grandiflorum*	Lamiaceae	Ethiopia and Eritrea	This shrub grows in mountain bushand, pastures and rocky slopes at 1600-3100 m.
5	*Hibiscus hochstetteri*	Malvaceae	Ethiopia and Eritrea	A shrub of upland bushland, growing at 1000-1800 m.
6	*Lavandula erythraeae*	Lamiaceae	Only in Eritrea	This shrub is only known by the type collected at Mount Lesa.
7	*Maytenus parviflora subsp. eritreana*	Celastraceae	Only in Eritrea	This species of shrub grows in bushland, often on steep slopes, at altitudes of 1400-2000 m.
8	*Maytenus serrata*	Celastraceae	Eritrea and Ethiopia	A shrub of rocky or grassy slopes growing at 1650-2250 m.
9	*Otostegia tomentosa subsp. tomentosa*	Lamiaceae	Ethiopia and Eritrea	A shrub of montane bushland, growing at altitudes of 2000-3000 m.
10	*Phagnalon quartinianum*	Asteraceae	Ethiopia and Eritrea	A shrub of river valleys and montane slopes, growing at altitudes of 1900-2200 m.
11	*Rhus glutinosa subsp. glutinosa*	Anacardiaceae	Ethiopia and Eritrea	A shrub of forest margins and evergreen scrub, growing at altitudes of 1800-3300 m. location?/
12	*Rhynchosia erythraea*	Leguminosae	Ethiopia and Eritrea	A shrub that has a fragmented population. It grows in grassland or bushland at 1000-2000 m.
13	*Satureja punctata. subsp. ovata*	Lamiaceae	Ethiopia and Eritrea	A shrub of rocky slopes at altitudes of 1800-3700 m.
14	*Taverniera schimperi*	Leguminosae	Ethiopia and Eritrea	A shrub of bush and woodland growing along the Setit river and Blue Nile gorge, at altitudes of 1000-1300 m.
15	*Vigna debanensis*	Leguminosae	Ethiopia and Eritrea	A shrub that grows in grassland and woodland vegetation at 1600-2200 m.
16	*Leucas abyssinica*	Lamiaceae	Ethiopia and Eritrea	A shrub of mountain bushland, rocky slopes, high grassland and forest edges, found at 1300-2600 m.
17	*Lippia adoensis.*	Verbenaceae	Ethiopia and Eritrea	A shrub that is common in disturbed areas and at forest margins, growing at 1900-2450 m.

Source: Jose Luis Vivero, Ensermu Kelbessa and Sebsebe Demissew (2005)

Annex 2. List of regionally endemic birds of Eritrea

No.	English Name	Scientific Name	Habitat
1	Abyssinian Slaty Flycatcher	*Melaenormis chacalatinus*	Woodland forest edges; alt. 1800 – 3200 m.
2	Abyssinian woodpecker	*Dendropicos abyssinicus*	Variety of woodlands, euphorbia, juniper and acacia; alt. 1300-3250 m.
3	Banded Barbet	*Lybiu sundatus*	Variety wooded habitat; alt. 450-2700 masl
4	Black-winged Lovebird	*Agapor nistarata*	Woodlands and forests in highlands alt. up to 2750 m.
5	Rüppels' Black Chat	*Myrmecocichla melaena*	Riverine gorges and cliffs; alt. 1800-2800 m.
6	Thick-billed Raven	*Corvus crassirostis*	Montane habitats; alt. 1200-3000 m.
7	White-Backed Black Tit	*Parusleu conotus*	Wooded highlands and Juniper forest; alt. 1800 – 3000 m.
8	White-billed Starling	*Onychagnathus albirostris*	Cliffs and rocky gorges; alt. 2300-300 m.
9	White checked Turacco	*Tauraco leucotis*	Forest and woodlands; alt. 900 – 3000 m.
10	White collard Pigeon	*Columba albitroques*	In villages and rocky areas, feeding in grasslands; alt. 1800-3000 m.
11	White-throated Seedeater	*Seinus xantholaemus*	Dry open scrub; alt 900-2500 m.
12	White-winged Cliff Chat	*Myrmecocich lasemirufa*	Mountain gorges and rochy slopes; alt. 1500-2500 m.
13	Rouget's Rail	*Rougetius rougetii*	Damp meadows, reservoirs, and water courses
14	Wattled Ibis	*Bostrychia carunculata*	Around reservoir, irrigated fields and wetlands

Source: Ghebrehiwet Medhanie (2016).

Annex 3. List of Some Threatened Bird Species in Eritrea

A. List of threatened Birds in Avibase and Birdlife Checklists for Eritrea			
No.	**Scientific name**	**Common name**	**Global status (IUCN red list)**
1	*Arenaria interpres*	Ruddy Turnstone	NT
2	*Aythya nyroca*	Ferruginous Duck	NT
3	*Aquila heliaca*	Eastern Imperial Eagle	VU
4	*Aquila nipalensis*	Steppe Eagle	EN
5	*Aquila rapax*	Tawny Eagle	VU
6	*Ardeotis arabs*	Arabian Bustard	NT
7	*Aythya ferina*	Common Pochard	VU
8	*Bucorvusa byssinicus*	Abyssinian Ground Hornbill	EN
9	*Calidris alpine*	Dunlin	NT
10	*Calidris ferruginea*	Curlew Sandpiper	NT
11	*Circus macrourus*	Pallied Harrier	NT
12	Clanga clanga (previously Aquila clanga)	Greater Spotted Eagle	VU
13	*Embereza cineracea*	Cinereous Bunting	NT
14	*Falco cherrug*	Saker Falcon	EN
15	*Falco concolor*	Sooty Falcon	VU
16	*Geronticus eremita*	Northern Bald Ibis	EN
17	*Glareola nordmanni*	Black-winged Pratincole	NT
18	*Gypaetus barbatus*	Bearded Vulture (Lammergeir)	NT
19	*Gyps africanus*	White backed vulture	CR
20	*Gyps rueppelli*	Ruppell's Vulture	CR
21	*Haematopus ortralegas*	Eurasian Oystercatcher	NT
22	*Lanius Senator*	Woodchat Shrike	NT
23	*Limosa lapponica*	Bar-tailed Godwit	NT
24	*Limosa limosa*	Black-tailed Godwit	NT
25	*Necrosyrtes monachus*	Hooded Vulture	CR
26	*Neophron percnopterus*	Egyptian Vulture	EN
27	*Numenius arquata*	Eurasian Curlew	NT
28	*Oxyura maccoa*	Maccoa Duck	VU
29	*Phalacrocorax nigrogularis*	Socotra Cormorant	VU
30	*Phoenicopterus minor*	Lesser Flamingo	NT
31	*Polemaetus bellicosis*	Martial Eagle	EN
32	*Rougetius rougetti*	Rouget's Rail	NT
33	*Rynchops flavirostris*	African Skimmer	NT
34	*Sagittarius serpentarius*	Secretary Bird	EN
35	*Streptopelia turtur*	European turtle dove	VU
36	*Terathopius ecaudatus*	Bateleur	EN
37	*Torgo stracheliotus*	Lapped-faced Vulture	CR
38	*Trigonoceps occipitalis*	White-headed vulture	CR
39	*Vanellus gregarius*	Sociable Plover	CR
B. **List of threatened Birds in Avibase Checklists for Eritrea only**			
1	*Acrocephalus arundinaceus*	Basra Reed Warbler	EN

2	*Bulweria fallax*	Jouanin's Petrel	NT
3	*Chelictinia riocourii*	Scissor-tailed Kite	VU
4	*Circaetus beaudouini*	Beaudouin's Snake Eagle	VU
5	*Falco vespertinus*	Red-footed Falcon	VU
6	*Gallinago nigipennis*	Great Snipe	NT
7	*Gypse rueppelli*	Ruppell's Griffon	CR
8	*Numerius tenuirostris*	Slender-billed Curlew	CR
9	*Pluvialis squatarola*	Black-bellied Plover	VU
C. **List of threatened Birds in Birdlife Checklist (Factsheet) for Eritrea only**			
1	*Ephippiorhynchus senegalensis*	Saddle-billed Stork	NT
2	*Gallinago media*	Great Snipe	NT
3	*Pluvialis squatarola*	Gray Plover	VU
4	Rynchops flavirostris	African Skimmer	EN
D. **Nationally threatened with extinction**			
1	*Ardeotis arabs*	Arabian Bustard	Threatened with extinction
2	*Agapornis taranta*	Black-winged Love Bird	Threatened with extinction
3	*Struthio camelus*	Common Ostrich	Threatened with extinction
4	*Sagittarius serpentarius*	Secretary Bird	Threatened with extinction
5	Rougetius rougetti	Rouget's Rail	Threatened with extinction

Sources: Birdlife International (2025); Avibase (2025); GoSE, Proclamation No. 155/2006.
NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered.

Annex 4. Some important cultivated plant genetic resources of the Eritrean Center of Origin/Diversity

S.N	Crop/Common Name	Scientific Name
1	Barley	*Hordeum vulgare*
2	Caster bean	*Ricinus communis*
3	Chick pea	*Cicer arietinum*
4	Finger millet	*Eleusine coracana*
5	Lentil	*Lens culinaris*
6	Okra	*Abelmoschus esculentus*
7	Pearl millet	*Pennisetum glaucum*
8	Safflower (Suf)	*Carthamus tinctorius*
9	Sesame	*Sesamum indicum*
10	Sorghum	*Sorghum bicolor*
11	Taff	*Eragrostis tef*
12	Grass pea	*Lathyrus sativus*
13	Fenugreek	*Trigonella foenum graecum*
14	Rape seed	*Brassica junacae*

Source: DoE, MoLWE, (2025)

Annex 5. Area of cultivation, crop production and productivity of field crops, vegetable and fruit crops in 2022, in Eritrea

No	Crop Type	Area Cultivated (ha)	Production (Tons)	Productivity (ton/ha)
1	Sorghum	229,455	157,529	0.7
2	Pearlmillet	62,568	19,154	0.3
3	Maize	10,055	4,685	0.5
4	Fingermillet	22,466	9,969	0.4
5	Barley	27,511	24,367	0.9
6	Wheat	40,857	41,874	1.0
7	Taff	35,442	26,449	0.7
8	Hanfez	6,101	3,553	0.6
Total Cereals		**434,455**	**287,579**	**0.7**
9	Fieldpea	5,562	2,950	0.5
10	Chickpea	11,524	9,967	0.9
11	Vetch	2,941	2,008	0.7
12	Horse bean	6,472	4,585	0.7
13	Faba bean	160	48	0.3
14	Haricoat bean	3,676	789	0.2
15	Lentil	1,661	623	0.4
Total Pulses		**31,996**	**20,970**	**0.7**
16	Linseed	1,901	804	0.4
17	Sesame	32,489	19,609	0.6
18	Nueg	10	2	0.2
19	Fenugreek	367	204	0.6
20	Groundnut	5,043	3,031	0.6
Total Oil Crops		**39,810**	**23,650**	**0.6**
21	Tomato	3,479	63,979	18.4
22	Pepper	1,601	13,484	8.4
23	Potato	2,222	34,064	15.3
24	Onion	4,547	90,006	19.8
25	Okra	589	2,989	5.1
26	Pumpkin	281	4,775	17.0
27	Hot pepper	1,306	2,207	1.7
28	Cabbage	852	15,323	18.0
29	Swiss chard	527	7,512	14.2

30	Lettuce	702	5,929	8.5
31	Carrot	227	2,752	12.1
32	Squash	243	3,301	13.6
33	Watermelon	308	5,405	17.5
34	Garlic	246	1,425	5.8
35	Sweet potato	5	117	24.6
Total Vegetables		**17,134**	**253,268**	**14.8**
36	Orange	2,005	29,239	14.6
37	Lemon	311	6,400	20.6
38	Mandarin	42	954	22.9
39	Banana	1,241	42,256	34.0
40	Papaya	192	3,171	16.5
41	Mango	204	3,452	16.9
42	Guava	294	3,709	12.6
43	Apple	36	75	2.1
44	Grape	17	140	8.2
45	Peach	45	193	4.3
46	Coffee	52	3	0.05
47	Date palm	94	243	2.6
Total Fruit Production		**4,533**	**89,834**	**19.8**

Source: MoA, (2023), Annual Crop Production Report .

Annex 6. Number of crop accessions conserved in the division of plant genetic resources at NARI

No.	Crop Name	Scientific Name	Number of accessions	Biological status
1	Okra	*Abelmoschus esculentus*	8	Wild
2	Kenaf	*Abelmoschus manihot*	3	Wild
3	Amaranthus	*Amaranthus graecizans*	51	Wild
4	Groundnut	*Arachis hypogaea*	44	Landraces
5	Brassica	*Brassica spp*	68	wild
6	Mustard	*Brassica carinata*	2	landrace
7	Canola	*Brassica napus*	1	Improved cultivar
8	Chickpea	*Cicer arietinum*	57	Landrace
9	Chickpea	*Cicer cuneatum*	15	Wild
10	Molekia	*Corchorus trilocularis*	19	Wild
11	Cucumber	*Cucumis melo*	1	Wild
12	Cynodon	*Cynodon dactylon*	1	Wild
13	Desmanthus	*Desmanthus glandulosus*	1	Wild
14	Melon	*Cucumis melo*	1	Wild
15	Desmodium	*Desmodium dichotomum*	1	Wild
16	Finger millet	*Eleusine coracana*	112	Landrace (110), wild (2)
17	Taff	*Eragrostis tef*	109	Landrace (105), Wild (4)
18	Cotton	*Gossypium herbaceum*	11	Landrace
19	Niger Seed	*Guizotia scabra*	1	landrace
20	Sunflower	*Helianthus annuus*	1	Wild
21	Barley	*Hordeum vulgare*	311	Landrace (310), Wild (1)
22	Lablab	*Lablab purpureus*	1	Wild
23	Grass pea	*Lathyrus sativus*	57	landrace
24	Vetch	*Lathyrus sphaericus*	11	wild
25	Lentil	*Lens culinaris*	20	Landrace
26	Linseedl	*Linum usitatissimum*	36	Landrace
27	Lolium	*Lolium temulentum*	4	Wild
27	Lotus	*Lotus corniculatus*	22	Wild
28	Malva	*Malva parviflora*	45	Landrace (1), Wild (44)
29	Chamomila	*Matricaria chamomilla*	5	Wild
30	Medicago	*Medicago lupulina*	4	Wild
31	Medicago	*Medicago orbicularis*	3	Wild

32	Medicago	*Medicago orbicularis*	4	Wild
33	Medicago	*Medicago polymorpha*	19	Wild
34	Pearl millet	*Pennisetum glaucum*	201	Landrace
35	Common bean	*Phaseolus vulgaris*	115	Landrace (114), Wild (1)
36	Field pea	*Pisum sativum*	42	landrace
37	Brnhayo	*Raphanus raphanistrum*	56	Wild
38	Sesame	*Sesamum indicum*	69	Landrace (67), Wild (2)
39	Setaria	*Setaria spp*	10	Wild
40	Solanium	*Solanum nigrum*	27	Wild
41	Tomato	*Solanum Spp*	9	Wild
42	Sorghum	*Sorghum bicolor*	722	Landrace (720), Wild (2)
43	Trifolium	*Trifolium spp*	31	Wild
44	Fenugreek	*Trigonella foenum-graecum*	23	Landrace
45	Bread Wheat	*Triticum aestivum*	187	Landrace
46	Durum Wheat	*Triticum turgidum*	116	Landrace
47	Emmer Wheat	*Triticum dicoccon*	5	Landrace
48	Broad Bean	*Vicia faba*	147	Landrace (145), Wild (2)
49	Vicia	*Vicia sativa*	8	Wild
50	Cow pea	*Vigna unguiculata*	51	Landrace (37), Wild (14)
51	Maize	*Zea mays*	197	landrace

Source: NARI 2024, Division of Plant Genetic Resource report, Halhale, Eritrea

Annex 7. List of major crop landraces and their status in Eritrea,

No.	Sorghum *(Sorghum bicolour)*			**Pearl millet** *(Pennisetum glaucum)*	**Wheat** *(Triticum spp.)*	**Barley** *(Hordeum vulgare*)	**Taff** *(Eragrostis tef)*	**Maize** *(Zea mays)*	**Finger millet** *(Eleusine coracana)*	**Sesame** *(Sesamum indicum)*
1	Abarcha	18. Embulbul	35. Koden	1. Jengeren	1. Amharay	1. Abat	1. Barkay	1. Araele	1. Abat	1.**Hirhir**
2	Adene	19. **Estif**	36. Korekora	2. Deda	2. Canada	2.Abedaray	2. **Ele**	2. Arkebe	2. Aregihe tsaeda	2. Abu Sita
3	**Ajebsidi**	20. Fetereta	37**. Letemhret**	3. Kunama	3. **Felasit**	3. Atena	3. Felema	3. Asgodom	3.Chengeray	3. Tegil
4	**Aklamoy**	21. **Gunseber**	38**. Mahajen**	4. Gudumay	4**. Guanda**	4. Atsa	4. Keih Taff	4. Berih	4. Fensho	4. Kefif
5	Dira	22. **Ghimbilu**	39. Segurtay	5. Shera berta	5. Gulay	5. Demhay	5. Sergien	5. Chenger	5. Keih	5. **Deda**
6	Alhiya	23. Habarat	40**. Senadr**	6. Merda berta	6. Habesha	6. **Dessie**	6. Taff hagai	6. Keih	6. Tsaeda	6. **Baria**
7	Amal	24. Hameray	41. Shieb	7. Tikaberta	7. Keiho	7. Habesha	7. Taff hamle	7. Keren	7. **Tselim**	7.Abuleben
8	Anseba	25. Hartsetsa	42**. Shifun**	8. Tosho	8. **Kenya**	8.Kontsebe	8. Tsaeda Taf	8. **Shagiya**	8. Waliye	8.Abunaam
9	Bader	26. Hijeri	43. Tetron	9. Deda	9. **Mana**	9. **Quento**	9. Wafai	9.Shashemene		
10	Duruta	27. **Hile**	44**. Ugana**	10. Zibedi	10. **Quadrati**	10. Qulih	10.Chenger	10. Tsaeda		
11	Bariyay	28. Hiriray	45. Wedi Aker	11.Hashishay	11. **Quenito**	11. Shirya		11. **Wedi Lbab**		
12	Bazenay	29. Hugurtay	46.Wedi Arba	12.Mebred	12. **Rueso**	12. Tirke		12.Wedi Susa		
13	Embulbul	30. **Amige**	47. Wedi Ferej	13**.Shileti**	13. Tsaeda	13. Tsaeda				
14	Chimro	31. Kileaentu	48. Wedi Halibay	14**. Alewa**	14. **Tselimo**	14. Tsaria				
15	Dagnew	32. Kina Ara	49. Zerei Mehari	15**. Delakda**	15. Tselim chireu	15. Tselim				
16	Daguya	33. Kinabiba	50. Wedi susa	16. Bariyay		16. Yeha				
17	Deber	34. Kinadirga	51. Zengada	17. Tokriray						

Source: NARI, 2024. Division of Plant Genetic Resource report, Halhale, Eritrea
Key: landraces in bold are either endangered or extincted

Annex 8. List of experts who participated during the field survey

Zoba Semienawi Keih Bahri, Office of Land and Agriculture, Massawa (HQ)			**Date: 6/8/2024**
No	**Name**	**Institution**	**Position/Job Description**
1	Tesfit Gherezgier	Agriculture and Land	A/DG Dep. of Agriculture and Land
2	Huruy Yohannes	Agriculture and Land	Director of Soil and Water conservation
3	Solomon Weldemichael	Agriculture and Land	Director of agri. infrastructure
4	Samuel Asefaw	Division of Environment	Division Head
5	Habtom Berhane	Davison of water Resources	Division Head
6	Mebrahtom Tecleab	Agriculture and Land	Staff
7	Redae Kidane	Agriculture and Land	Staff
8	Dawit Angesom	Agriculture and Land	Staff

Zoba Anseba, Office of Land and Agriculture, Keren (HQ)			**Date: 12/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Gebremeskel Tewelde	Agriculture & Land, Keren	Head, Agriculture & Land
2	Semere Teklesenbet	Regional Inspectorate, Keren	Seed inspector
3	Kibra Gebremeskel	Crop Production	Head Crop Production
4	Engineer Zeray Nor	Soil, Water and Irrigation	Soil, Water and Irrigation expert
5	Kesete Tesfatsion	Forestry & Wildlife, Anseba	Head, Forestry & Wildlife
6	Dr Teklemariam	Veterinary	Head, Veterinary Science
7	Tesfamariam G. hiwet	MLWE	Head, Environment
8	Mehary Fitsum	Fishery Development	Division Head
9	Solomon B.	Fishery Development	Extension Unit Head
Zoba Anseba, MoA Sub-Zoba Hagaz			**Date: 12/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1.	Eyob Tesfay	MoA	Head, MoA Sub-Zoba Hagaz
2.	Selhadin Ismaiel	NARI	Research Head, Sub zoba Hagaz
3.	Kaleab Debesay	MoA	Crop Expert
4.	Tsehaye Gebremedhin	MoA	Meat and Milk Products expert
5.	Mohamed Abdella	MoA	Assistant Animal Expert
6.	Teklay Fishaye	MoA	Head, Forestry
7.	Amir Sleman	Farmer	Farmer
8.	Hasen Yasin	Farmer	Farmer
9.	Osman Mohamed	Farmer	Farmer
10	Abdella Idris	Farmer	Farmer
11	Abduselam Ibrahim	Farmer	Farmer
Zoba Anseba, MoA Sub-Zoba Hamelmalo			**Date: 13/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Musie Gebremeskel	MoA, Sub zoba, Hamelmalo	Staff
2	Sium Andebrhan	MoA, Sub zoba, Hamelmalo	Staff

3	Drar Mohamed Adem	MoA, Sub zoba, Hamelmalo	Staff
4	Tibletse Eyob	Admin Sub-Zoba Hamelmalo	Adminstration Head
5	Merhawit Kiflezghi	NUEW, Sub zoba	Staff
6	Fatna Ali	NUEW, Sub zoba	Head
7	Yasin Adem	Kebabi Administration	Head
8	Osman Mohamed	Eritrean Police of Hamelmalo	Staff
9	Elyas Yemane	MoH, Sub zoba, Hamelmalo	Staff
10	Medhane woldegergis	MoH, Sub zoba, Hamelmalo	Staff
11	Arefa Mohamed	MoE, Sub zoba, Hamelmalo	Staff
12	Yasin Mohamed	Wazentet, Kebabi Administration	Head
13	Mohamed Idris	Admin Sub-Zoba Hamelmalo	Head, Social Service
14	Fatna Yasin	NUEYS	Staff
15	Amir Mohammed	PFDJ	Staff
16	Jabir Ibrahim	Admin Sub-Zoba Hamelmalo	Economic Development
17	Amna Mohamed	Zuron, Kebabi Admin	Staff
18	Ibrahim Idris	Wazentet, Kebabi Administration	Farmer
19	Mohamed Ker Humed	Wazentet, Kebabi Administration	Farmer
20	Musa Omer	Wazentet, Kebabi Administration	Farmer
21	Abdurhman Mohamed nur	Wazentet, Kebabi Administration	Farmer
22	Mahmud Jabir	Wazentet, Kebabi Administration	Farmer
23	Rahya Asenay	Wazentet, Kebabi Administration	Farmer
24	Seadiya Sied	Wazentet, Kebabi Administration	Farmer
25	Idris Nur	Admin Sub-Zoba Hamelmalo	Farmer
26	Osman Ali	Admin Sub-Zoba Hamelmalo	Farmer
27	Semira Mohamed	Admin Sub-Zoba Hamelmalo	Farmer
28	Mahmud Sleman	Zuron, Kebabi Administration	Farmer
29	Mahmud Osm	Zuron, Kebabi Administration	Farmer
30	Hamednur Ismael	Zuron, Kebabi Administration	Farmer
31	Mehamed Nur	Genfelom, Kebabi Administration	Farmer
32	Mehamed Idris	Genfelom, Kebabi Administration	Farmer
33	Hamed Salhi	Genfelom, Kebabi Administration	Farmer
Zoba Gash Barka, Office of Land and Agriculture Barentu, (HQ)			**Date: 14/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Abubeker Osman	Admin Zoba Gash Barka	DG Agriculture and Land
2	Woldemariam Debretsion	MoA Livestock Development	Staff
3	Tesfay Negash	MoA, Planning and Statistics	Staff
4	Habtom Gebrezghabher	Division of Environment	Unit Head
5	Abraha Gebreamlak	Division of Environment	Division Head
6	Goitom Hailemichael	MoA,Crop development	Division Head
7	Seare Abraham	Zonal Regulatory Services	Expert
8	Mehanish Goitom	Forestry and Wildlife	Expert
9	Fisha Zereabruk	Zonal Regulatory Services	Expert
10	Kibrom teklemariam	MoA Livestock Development	Unit Head
11	Zereabruk Tekle	Division of Water Resource	Division Head

12	Negasi Habtemichael	Agronomy	Unit Head
13	Awet Isak	Strategic Information	Unit Head
14	Abdelrezak Idris	Fishery Development	Unit Head
15	Mekonen Wolday	Fishery Development	Head administration and Finance
16	Daniel Frezghi	Irrigation Development	Division Head
Zoba Gash Barka MoA, Sub-Zoba Haycota			**Date: 14/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Teshome Medhane	MoA Sub Zoba Haycota	Head MoA Sub zoba
2	Yasin Alijime	FWA	Sub zoba Unit Head
Zoba Gash Barka, MoA Sub-Zoba Goluj			**Date: 14/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Negasi Sereke	MoA, Sub_oba	Crop expert
2	Akbaliat Andemariam	MoA, Sub-Zoba	Meat and Milk Development Expert
3	Jeifer Sereke	MoA, Sub-Zoba	Personnel
4	Tesfazghi Redei	MoA, Sub-Zoba	Staff
5	Yohannes Yosief	NARI	Fruit expert
6	Yosief Samsom	NARI	Plant Protection expert
7	Hailemariam Mekonen	NARI	Crop expert
8	Meharena kelati	Goluj	Farmer
9	Melake Mehari	Goluj	Farmer
10	Mahmud Idris	Goluj	Farmer
11	Berhane Tesfagergish	Goluj	Farmer
12	Giday Haile	Goluj	Farmer
13	Abdu Agar	Goluj	Farmer
14	Ibrahim Ahmed	Goluj	Farmer
15	Semere Iyasu	Goluj	Farmer
16	Humedali Abe	Goluj	Herder
17	Salih Shengebay	Goluj	Herder
18	Alihaj Mahmud	Goluj	Herder
Zoba Maekel, Office of Land and Agriculture, Asmara (HQ)			**Date: 19/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Asrat Haile	Zoba Maekel Administration	A/DG of Agr. & Land
2	Abel Woldegabir	Agriculture and Land	Coordinator SWC and
3	Teklay Berhane	Forestry and Wildlife	Staff
4	Abraham Teklu	Forestry and Wildlife	Staff
5	Abraham Araya	Agriculture and Land	Crop Development expert
6	Amanuel Haile	Agriculture and Land	Animal Resource expert
7	Ghirmay Tecleab	Division of Water Resource	Division Head
8	Filimon Samsom	Division of Environment	Division Head
9	Esaw Tikui	Fisheries Development	Staff
Zoba Maekel, MoA, Sub-Zoba Serejaka			**Date: 20/08/2024**
SN	**Name**	**Institution**	**Position/ Job description**
1	Abraham Berhane	MoA	Head MoA Sub-Zzoba

2	Desale Tsegay	MoA	Head Crop Protection
3	Musie Gilay	MoA	Staff
4	Melake Mhreteab	MoA	Fruit and Vegetable Expert
5	Ukbay Semere	MoA	Agronomist (Crop Expert)
6	Esaias Russom	MoA	Staff
7	Tesfagabir Mebrahitu	MoA	Forestry and Wild life Expert
8	Awelker Ali	MoA	Animal Resource Expert
9	Efrem Zereayacob	Farmer	Farmer
10	Fitsum Mussie	Farmer	Farmer
11	Fishatsion Tekea	Farmer	Farmer

Zoba Debub, Zoba Administration Office			**Date: 04/09/2024**
No	**Name**	**Institution**	**Position/ Job description**
1	Hon. Habteab Tesfatzion	Zoba Administration	Zoba Administrator
2	Yemane Abay	Agriculture and Land Department	Director General
3	Dr. Okubazghi Kiefle	Livestock Resources Division	Division Head
4	Teclu Berakhi	Crop Development Division	Division Head
5	Teclehaimanot Zeray	Horticulture Division	Division Head
6	Tekie Teclemichael	Environment Division	Division Head
7	Okubay Kidane	Office of the Administrator	Staff
8	Mekonen Ghirmay	Fishery Development	Head
9	Ghebremicahel Berhe	Forestry and Wildlife Branch Office	Head
10	Ghebremedhin Andeberhan	Regulatory Division	Division Head
Forestry and Wildlife Authority , HQ Office, Asmara			**Date: 24/07/2024**
No	**Name**	**Institution**	**Position/ Job description**
1	Mussie Asmelash	Forestry	Expert
2	Mussie Robel	Forestry	Division Head
3	Simon Negusse	Wildlife	Expert
4	Mogos Efrem	Forestry	Expert
Regulatory Services Department, Department Office, Asmara			**Date: 23 & 26/07/2024**
No	**Name**	**Institution**	**Position/ Job description**
1	Tekleab Mesghena	Regulatory Services Department	Director-General
2	Kidane Yohannes	Agrochemical Reg. Div.	Expert
3	Tesfahiwet Ghebretnsae	Animal Resource Reg. Division	Division Head
4	Said Nuredin	Plant Resource Regulatory, Division	Divison Head
5	Bereket Hailezghi	Wildlife and Forestry Unit	Unit Head
6	Yakob Yohannes	Natural Reseource Reg. Divi.	Division Head
Agricultural Extension Division (AED), MoA Head Office, Asmara			**22/07/2024**
No	**Name**	**Institution**	**Position/ Job description**
1	Semere Amlesom	Agricultural Extension Department	Director-General
2	Samson Fesshatzion	Agro-engineering Unit	Unit Head

3	Yacob Tesgay	Agronomy	Planner
4	Yosief Zielo	Agro-engineering Unit	Agro-engineering
5	Simon Kefela	Agro-engineering Unit	Agro-engineering
6	Kahsay Negash	Crop and Animal Production Division	Division Head
7	Ermias Asmelash	Horticulture Unit	Unit Head
8	Ghenet G/her	Crop Production Unit	Unit Head
9	Dr. Yonas Woldu	Animal Production Division	Division Head
10	Misghena Ketema	Planning and Statistics Division	Division Head
11	Hienok G/Hiwet	Animal Production Unit	Unit Head
National Union of Eritrean Women (NUEW), Head Office, Asmara			**Date: 3/12/2024**
No	**Name**	**Institution**	**Position/ Job description**
1	Asmerom Goitom	NUEW	Environment expert
2	Emuna Saleh	NUEW	Head, International Relations
3	Tieba Kindya	NUEW	Head, PFDJ unit
4	Yohana Tewelde	NUEW	Staff
National Union of Eritrean Youth and Students (NUEYS), Head Office, Asmara			**Date: 3/12/2024**
No	**Name**	**Institution**	**Position/ Job description**
1	Saleh Ahmedin	NUEYS	Chairperson
2	Daniel Eyasu	NUEYS	Staff
3	Helen Amine	NUEYS	Staff

Annex 9. List of Participants of the Consultation Workshop on Marine Biodiversity held in Massawa at the Meeting Hall of the Ministry of Marine Resources **on 31st July 2024**

No	Full Name	Name of Organization	Position in Institution
1	Abdu Adem	NFC	Quality Manager
2	Abraham Tadesse	MoMR, Human Resource Department	Director
3	Adonay Huruy	MoMR, Project Management Office	Director
4	Aklilu Tsehaye	Zoba Semienawi Bahri Fisheries Office	Director
5	Alexsander Guitsie	Zoba Semienawi Bahri Fisheries Office	Monotring and Eavlaution Officer
6	Andemichael Hidru	MoMR, Marine Fisheries Development	Fisheries Inspection Unit Head,
7	Awet Yemane	MoMR, Marine and Environment Research Division	Research Coordinator
8	Hagos Zerom	MoMR, Marine and Environment Research Division	Member of Habitat Unit
9	Hanna Mussa	Zoba Semienawi Bahri Fisheries Office	Unit Head of Artisanal Fishery
10	Henok Tesgai	MoMR, Marine Fiseries Developmwent Department	Member
11	Huruy Tekle	MoMR, Marine Fiseries Regulatory Department	Member
12	Ibrahim Mohammedali	Fisherman	Fisherman
13	Ibrahim saleh	MoMR, Cooperative Services Unit	Unit Head
14	Lemlem Habte	NUEW	Head, Massawa Nues Zoba
15	Lidya Weldu	MoMR, Environmental Managemnt Unit	Unit Head
16	Melat Fessahaye	MoMR, Marine and Environmental Research Division	Monitoring and Evaluation Officer
17	Misgna Tesfai	Marine Fiseries Development Department	Director
18	Mussie Alemseged	MoMR, Public Relations and Documentation Division	Head of Knowledge Management Unit
19	Samuel Bruno	Fisherman	Fisherman
20	Semere Adisu	MoMR Public Relations and Documentation Division	Head of Knowledge Archives Unit.
21	Tekle Mengstu	Office of the Minister	Director
22	Teklehaimanot Beraki	MoMR, Marine and Environmental Research Division	Director
23	Temesgen Gebremeskel	College of Science	Lecturer
24	Temesgen Hadera	ENF, Training Officer	Head
25	Tesfai Teklehaimanot	MoMR, Marine Fisheries Regulatory Department	Member
26	H.E. Tewelde Kelati	MoMR,	Minister of MoMR
27	Yasin Adem	Eritrean Diving Center.	Director
28	Yonas Berhane	Zoba Semienawi Bahri	Personnel
29	Dr. Zekeria Abdulkerim	College of Science	Assoct. Professor

Annex 10: List of participants in the National Workshop on Eritrea's Updated National Biodiversity Strategy and Action Plan (NBSAP 2026-2030)

Venue: National Confederation of Eritrean Workers **Date**: 30 June-01 July 2025

No.	Name	Area of Specialization	Institution	Position of Institution
1	Abiel Weldegabir	Project Coordinator	MOA-Maekel	Head of Irrigation
2	Abraham Teklu	Forestery	Forestry & Wildlife Agency	Head of Branch
3	Adel Osman	Environment	MoLWE	Unit Head
4	Aleksander Gebretinsae	Marine Biology	Zoba Semienawi Keih Bahri	Planning & Budget
5	Ali Idris Bishan	Driver	Anseba	Driver
6	Aman Saleh	Marine Science	MoLWE	Director
7	Amanuel Medhaere	Genetics	NARI	Director
8	Andeberhan W/Yohannes	Forestry &Water Conservation	FWA	Director
9	Andemikael Solomon	Economic Development (Community mobilization expert)	MoLG	Director-General
10	Bereket Berhe	Marine environment	Zoba Semienawi Keih Bahri	Unit Head
11	Bereket Hailezghi	Natural Resource Regulatory	MoA	Expert
12	Dr. Ghirmai Tesfamariam	Economics	CBSS	Academic HoD
13	Dr. Mihreteab Gebreyohannes	Geography	CBSS	Academic HoD
14	Dr. Solomon Kibreab	Biology	MCoS	Instructor
15	Dr. Teklezghi Tekie	Vet. Medicine	MOA Gash Barka	Director Animal Resources
16	Dr. Weldetinsae Tewelde	Geography	CBSS	Associate Dean
17	Dr. Woldeislasie Okubazzgi	Forest Ecology	HAC	Associate Professor
18	Efrem Kiflemariam	Biodiversity	MoLWE	Unit Head
19	Estifanos Bain	Agro-forestry/Biodiversity	MoLWE	Director
20	Filmon Samson	Land Resources	Maekel	
21	Filmon Samson	Environment	DOE- Maekel	
22	Ghirmai Abrha	Cartography	Forestry & wildlife Agency	Branch Head
23	Goitom Semere	Soil and Water Conservation	Gash Barka	Unit Head
24	Habtom Ghebremichael	Environmental/Expert	MoLWE	Expert
25	Hagos Zerom Habte	Marine Resources	NRS	Research (expert)
26	Hanna Fitwi	Biology	MoA	RSD
27	Hienok G/hiwet	Livestock Production	MOA, AED	Unit Head
28	Kesete Tesfatsion	Forest & Wild life	Anseba	Unit Head
29	Kifle Solomon	Land use/GIS	MoLWE	Unit Head

30	Lidia Isaac	Biodiversity	MoLWE	Expert
31	Medhanie Weldemichael	Environment Expert	MoLWE	Expert
32	Mehasho Goitom	Forest & Wild life	Gash Barka	Expert
33	Mihreteab Gebremedhin	Hydro-meteorology	MoLWR	Unit Head
34	Okubamicael Solomon	Forest & Wild life	Debub	Unit Head
35	Prof. Woldeamlak Araia	Agronomy	HAC.	Dean
36	Robel Kibrom	Chemical Engineering	Dep.of Enviornment	Unit Head
37	Robiel Yohannes	Plant Protection	MOA-Maekel	RSDRI
38	Russom Teklay	Ecology	MCS	Dep.of Biology
39	Samuel Abraha	Genetic Resources	NARI	Head quarter
40	Semere Aror	Water quality	WRD	Expert
41	Semere Tesfagergish	IT	MoLWE	IT
42	Semere Yohannes	Environment expert	N/R/SEA	Branch head
43	Siem Eyasu Misgina	LAW	MoT	Legal Service
44	Sinit Simon	Biodiversity	MoLWE	Expert
45	Solomon Haile	Forestry	N/Red Sea	Branch Head
46	Solomon Weldemichael	Agriculture	MoA-BRS	Director
47	Teclehaimanot Zerai	Soil/Water Conversation	Debub	Branch Head
48	Tekehaimanot Beraki	Aquatic bioresources	MoMR	Director of Marine and Environemnt. Research Division
49	Tekiae Teklemichael	Environment	Debub	Director
50	Teklezghi Teke	Vet. Medicine	Gash Barka	Director, Animal Resources
51	Teklu Beraki	Crop Production	Debub	Director
52	Tesfai G/hiwot	Renewable Energy	Maekel	Director
53	Tesfai Ghebrehiwot	Energy	DOE Eritrea	Director
54	Tesfalem Zere	Marine environment	Zoba Semienawi Keih Bahri	Unit Head
55	Tesfamariam Arefe	Marine Science	NRS	Researcher
56	Tesfamariam G/hiwot	Endowment Expert	Anseba	Branch Head
57	Tesfamicael Abrha	Fishery	Zoba Semienawi Keih Bahri	Unit Head
58	Tesfamichael O/gba	Marine Environment	Zoba Semienawi Keih Bahri	Unit Head
59	Yohannes Teclemariam	Marine Biologyt	MoLWE	Expert
60	Yosief G/Yesus		DoE	Unit Head
61	Zenawi Tesfabrhan	Crop Production	Gash Barka	Unit Head
62	Zerai Sultan	Agroforestry/Forestry	MOA, AED	Expert
63	Dr. Tesfamicahel Abraha	Biotechnology	HAC	Department Head (Asst. Prof.; Core Consulatant)
64	Dr. Zekeria Abdulkerim	Marine Biology	MCoS	Instructor (Assoct.Prof; Core Consultant)
65	Prof. Zemenfes Tsighe	Geography	NHERI	Director (Core consultant and Team Leadertant)

Annex 11: Programme of the National Workshop on the Eritrea's Updated National Biodiversity Strategy and Action Plan (NBSAP 2026-2030)

Venue: National Confederation of Eritrean Worker (NCEW) **Date:**30 June and 01 July, 2025

Day One: 30 June 2025			
Time	Activity	Presenter	Moderator
8:00-8:20	Registration	NHERI	
8:20-8:25	Introduction (Welcoming Remarks)	Ato Estifanos Bein	
8:25-8:35	Opening Speech	Ato Kibrom Asmerom, A/DG, DoE	Ato Estifanos Bein
8:35-9:00	Overview of the Consultancy Work	Prof. Zemenfes Tsighe	
9:00-9:30	Marine Biodiversity	Dr. Zekeria Abdulkerim	Ato Teklehaimanot Beraki
9:30-10:00	Agricultural Biodiversity	Dr. Tesfamichael Abraha	
10:00-10:30	Tea Break + Group Photos		
10:30-11:00	Terrestrial Biodiversity	Prof. Zemenfes Tsighe	
11:00-12:00	Discussions on Presentations		
12:00-12:30	National Biodiversity Targets and their Justifications	Dr. Tesfamichael Abraha	Ato Mussie Robel
12:30-2:00	Lunch Break		
2:00-2:30	Biodiversity Action Plans (Brief Review of NBSAP 2015 + Summary of NBSAP (2026-2030))	Dr. Zekeria Abdulkerim	
2:30-3:30	Discussions on Targets and Action Plans		
3:30-4:00	Resource Mobilization, Monitoring and Evaluation and Implementation Plan (RMMEIP)	Prof. Zemenfes Tsighe	Ato Andemichael Solomon
4:00-4:30	Discussions on RMMEIP		
4:30-5:00	Formation of Discussion Groups		
5:00	Tea Break and End of Day One		
Day Two: 01 July 2025			
8:30-10:30	Group Discussions		Dr. Tesfamchael Abraha
10:30-11:00	Tea Break		
11:00-12:00	Presentation by Groups and Discussion		
12:00 -12:10	The Way Forward	Prof. Zemenfes Tsighe	Ato Estifanos Bein
12:10 -12:20	Closing Remarks	Ato Kibrom Asmerom, A/DG, DoE	
12:20	Lunch and End of Day Two		

Annex12: List of Participants of the Validation Workshop of the Eritrea's Updated National Biodiversity Strategy and Action Plan (NBSAP 2026-2030)

Venue: National Confederation of Eritrean Workers (NCEW) **Date:** 26 September 2025

No.	Name	Area of Specialization	Institution	Position in Institution
1	Andemikael Solomon	Economic Development (Community mobilization Expert)	MoLG	Director-General
2	Abraham Teklu	Forestry & Wildlife	FWA, Zoba Maekel	Branch Head
3	Adel Osman	Environment Expert	DoE, MoLWE.	Unit Head
4	Aman Saiol	Biodiversity	DoL, MoLWE,	Director
5	Amanuel Mahdere	Genetics	MoA, NARI	Director
6	Berket Hailezghe	Ecologist	RSD, MoA-	Unit Head
7	Binega Mengesha	Land use	MoLWE	Head of Branch
8	Efrem Kiflemariam	Biodiversity	DoE,MoLWE	Unit Head
9	Estifanos Bein	Agro-forestry/Biodiversity	DoE, MoLWE	Director, Biodiversity
10	Habtom G/Her	Land Resources and Environment	Zoba Gash Barka	Unit Head
11	Habtom Ghebremichael	Environment Expert	DoE, MoLWE/	Expert
12	Hagos Ghebremariam	Regional Inspectorate,	Zoba Gash Barka	Director
13	Hanna Fetwi	Biology	RSD, MoA	Expert
14	Hienok G/hiwet	Animal production	MoA	Unit Head
15	Idris Meki	Environment	Zoba Debubawi Keih Bahri	Unit Head
16	Kibrom Asmerom	Organic Chemistry,	MoLWE	A/Director-General
17	Kifle Solomon Fisshaye	Land use/GIS	MoLWE	Unit Head
18	Lidia T/haimanot	Environment	MoLWE	Unit Head
19	Mehansho Goitom	FWA	Zoba Gasah Barka	Unit Head
20	Mehreteab G/Yohannes	Geography	College of Education and Language Studies, Adi keih	Head of Department
21	Merhawi Amanuel	Environment	DoE MoLWE	IT
22	Meriem Ibrahim	Political Science	NUEYS	Unit Head
23	Michael Berhane	Soil and Water Conservation	AED, MOA-	Director
24	Michael Hailegerghish	Agronomy	MoLG	Branch Head
25	Michael Tekie	Agricultural Extension	Zoba Semienawi Keih Bahri	Director-General
26	Mulubrhan G/Yohannes	Chemistry	MoLWE, Zoba Maekel	Director
27	Mussie Robel	Forestry	FWA	Director
28	Nezehty Abbay	Forestry	MoA, NARI	Unit Head
29	Okabamichael Solomon	Forestry & Wildlife	Zoba Debub	Unit Head

	Araya			
30	Samson Habte	FWA	Zoba Debubawi Keih Bahri	Unit Head
31	Samuel Abraham	Genetic Resources	MoA	Unit Head
32	Semere Tesfagiorgish	IT	MoLWE	IT expert
33	Semere Yohannes	MoLWE	Zoba Semienawi Keih Bahri	Branch Head
34	Semere Zaid G/Medhin	Land & Water Management.	HAC	Lecturer
35	Senay Gebru	Marine Science	MoMR	Team Leader
36	Siem Eyasu Misgina	Law	MoJ	Legal Service
37	Sinit Simon	Biodiversity	DoE, MoLWE	Expert
38	Solomon Haile	Forsetry	Zoba Semienawi Keih Bahri	Branch Head
39	Tekehaimanot Beraki	Aquatic Bio-resources	MoMR	Director of Marine and Environemnt. Research Division
40	Tekie Teklemicael	Chemistry	Zoba Debub	Director
41	Teklu Beraki	MOA	Zoba Debub	Director
42	Tesfamariam G/hiwet	Environment	Zoba Anseba	Environment Unit Head
43	Tesfamichael O/Ghi	Marine Science	MoMR	Unit Head
44	Tseggai Teamrat	Land Resources	DoL, MoLWE	Director-General
45	Yacob Yohannes	Biology	MoA	Advisor
46	Yohannes Teclemariam	Biodiversity	DoE, MoLWE	Expert
47	Yonatan Guesh	Photograph expert	MoLWE	Public Relations
48	Zienawi Okubeab	Plant Protection	Zoba Anseba	Unit Head
49	Tesfamicahel abraha	Biotechnology	HAC	Assistant Professor (Core Consulatant)
50	Zekeria Abdulkerim	Marine Biology	College of Science	Associate Professor(Core Consulatant)
51	Zemenfes Tsighe	Geography	NHERI	Professor (Core Consulatant and Team Leader)

Annex 13: Pogram of the Validation Workshop on Eritrea's Updated National Biodiversity Strategy and Action Plan (NBSAP 2026-2030)

Venue: National Confederation of Eritrean Worker (NCEW) **Date:** 26 September 2025

Time	Activity	Presenter	Moderator
8:00 - 8:30	Registration	NHERI	
8:30 - 8:35	Introduction (Welcoming Remarks)	Ato Estifanos Bein	
8:35 - 8:45	Opening Speech	Ato Kibrom Asmerom, A/Director-General, Department of Environment	Ato Estifanos Bein
8:45 - 9:05	Overview of the NBSAP Updating Process	Prof. Zemenfes Tsighe	
9:05 - 9:25	State of Marine Biodiversity	Dr. Zekeria Abdulkerim	Ato Mussie Robel
9:25 - 9:45	State of Agricultural Biodiversity	Dr. Tesfamichael Abraha	
9:45 – 10:10	State of Terrestrial Biodiversity	Prof. Zemenfes Tsighe	
10:10 - 10:30	Tea Break + Group Photos		
10:30 - 11:00	Discussion on Presentations		
11:00 - 11:30	National Biodiversity Targets and Their Justifications	Dr. Tesfamichael Abraha	Ato Henock G/Hiwet
11:30 – 12:00	National Biodiversity Action Plans: Brief Review of NBSAP 2015 and Summary of NBSAP (2026-2030)	Dr. Zekeria Abdulkerim	
12:00 – 12:20	Resource Mobilization, Monitoring and Evaluation, and Implementation Plan (RMMEIP	Prof. Zemenfes Tsighe	
12:20 – 12:50	Discussions on Presentations		
12:50 – 13:00	Closing Remarks		Ato Estifanos Bein
13:00 -	Lunch		

Annex 14: Members of the NBSAP (2026-2030) Consultancy Team

No.	Name	Telephone	Specialization	Role
1	Professor Zemenfes Tsighe	+291(0)7163987	Geography	Core Consultant and Team Leader
2	Dr. Zekeria Abdulkerim	+291(0)7230305	Marine Biology	Core Consultant
3	Dr. Tesfamichael Abraha	+291(0)7126617	Biotechnology	Core Consultant
4	Adel Osman	+291(0)7313276	Environment	Technical Assistant/Expert
5	Amanuel Mahdere	+291(0)7180770	Genetics	Technical Assistant/Expert
6	AndemiKael Solomon	+291(0)7140463	Economic Development (Community mobilization expert)	Technical Assistant/Expert
7	Bereket Hailezghi	+291(0)7621150	Ecology	Technical Assistant/Expert
8	Efrem Kiflemarian	+291(0)7258603	Biodiversity	Technical Assistant/Expert
9	Hienock G/Hiwet	+291(0)7209276	Animal Production	Technical Assistant/Expert
10	Kifle Solomon	+291(0)7235468	Land use/GIS	Technical Assistant/Expert
11	Mussie Robel	+291(0)7140359	Forestry	Technical Assistant/Expert
12	Teklehaimanot Beraki	+291(0)7730668	Aquatic Bioresources	Technical Assistant/Expert

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