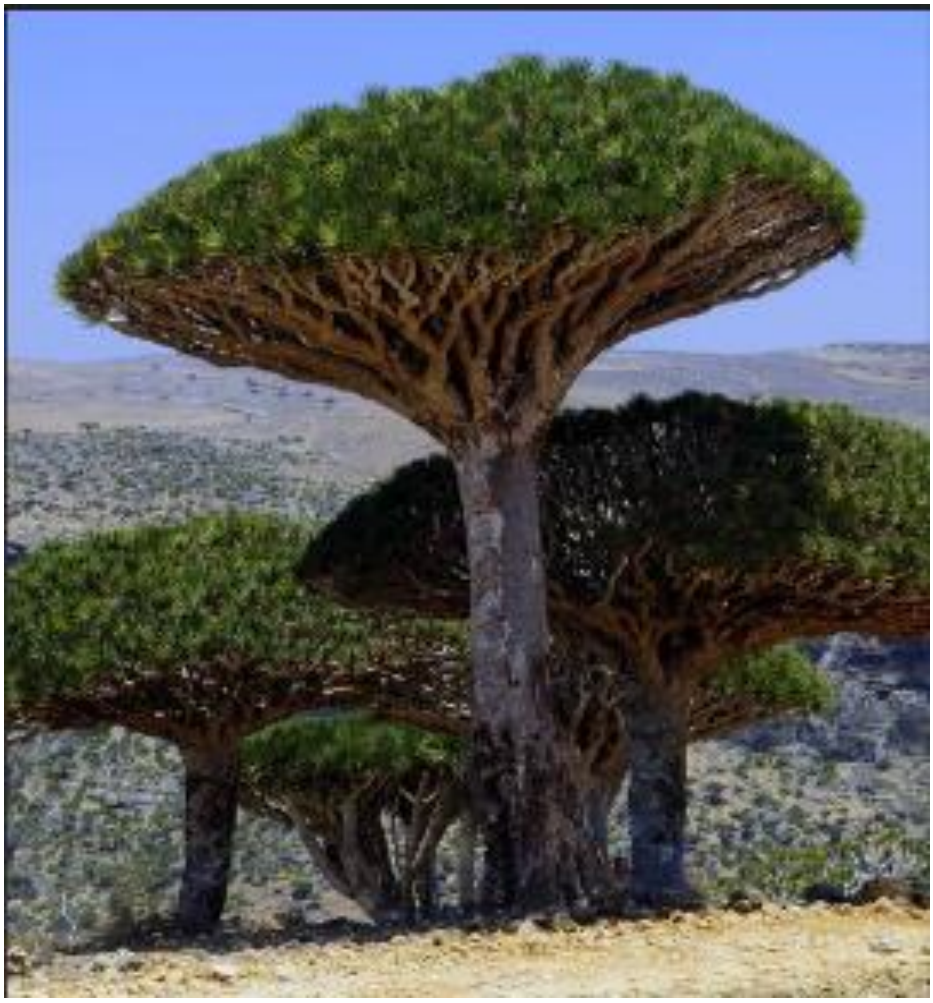
Republic of Yemen

Ministry of Water and Environment

Environment Protection Authority

National Biodiversity Strategy and Action Plan III (NBSAP III) for the Republic of Yemen

2025-2030



December, 2024

List of Acronyms

BII	Biodiversity intactness index
BMF	Bilateral and multilateral funding
CGs	Community groups
DNA	Deoxyribonucleic acid
DPS	Domestic public spending
EIA	Environmental Impact assessment
EMP	Environmental Management Plan
EPA	Environment Protection Agency
ENSO	El Niño Southern Oscillation
GALSUP	the General Authority of Lands, Survey and Urban Planning
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
ITCZ	Inter-Tropical Convergence Zone
IOD	Indian Ocean Dipole
IPCC	Intergovernmental Panel on climate Change
IUNC	Internation Union for Conservation of Nature
IWRM	Integrated Water Resource management
K-M GBF	Kunming-Montreal Global Biodiversity Framework
M&E	Monitoring and evaluation
MSAL	Ministry of Social Affairs and Labour
NAP	National Adaptation plan
NBSAP	National Biodiversity Strategy and Action Plan
NBS	National Biodiversity Strategy
NBAP	National Biodiversity Action Plan
NDCs	Nationally Determined Contributions
NTFPs	Non-timber forest products
ODA	Official Development Assistance
PAs	Protected Areas
UNCBD	United Nations Convention on Biological Diversity
UNDP	United Nations Development Program
RSCZ	Red Sea Convergence Zone
SLR	sea level rise
TEV	Total economic value
PES	Payment Ecosystem Services
WAVES	Wealth Accounting and valuation for ecosystem services

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Minister's Foreword

The Third National Biodiversity Strategy and Action Plan for Yemen marks a critical milestone in the nation's commitment to preserving biodiversity while striving for sustainable utilization that contributes to economic development. This document represents a cohesive effort to address Yemen's unique biodiversity despite the various environmental challenges, including the impacts of climate change, habitat destruction, and species extinction, which threaten the nation's ecological and economic stability. Biodiversity is not merely an environmental concern but a cornerstone for ensuring the well-being of future generations and maintaining Yemen's rich cultural and natural heritage.

The strategy underscores the dual approach of protecting biodiversity while fostering community engagement and awareness of the value of natural resources. It aims at mainstreaming biodiversity considerations into national planning frameworks, emphasizing the importance of environmental governance, policy coherence, and capacity building to address pressing issues effectively.

A key aspect of this strategy is its alignment with international frameworks, particularly the Kunming-Montreal Global Biodiversity Framework. This ensures Yemen's efforts to contribute to global biodiversity conservation while tailoring actions to local contexts. The plan includes actionable targets and measurable outcomes, which will require robust monitoring, reporting, and adaptive management to ensure progress.

Collaboration is at the heart of this initiative. The success of the strategy hinges on coordinated efforts among government entities, local communities, researchers, civil society organizations, and international partners. Strengthening partnerships and mobilizing resources are paramount to successful implementation of this plan and overcoming challenges, particularly Yemen's economic and political constraints.

Funding remains a significant hurdle. Yemen's limited financial capacity, exacerbated by ongoing conflict and economic instability, underscores the need for sustained international financial and technical support. Without such backing, the ambitious goals of this strategy cannot be realized.

We are deeply grateful to the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), and the Secretariat of the Convention on Biological Diversity for their unwavering support. Our appreciation extends to the national advisory team, international experts, and all stakeholders whose insights have been instrumental in shaping this strategy.

This strategy aims to serve as a practical tool, enabling Yemen to safeguard its biodiversity and build resilience against environmental and developmental challenges. We call upon all stakeholders to commit to its implementation and contribute to a unified effort for a sustainable and prosperous environmental future.

Eng. Tawfeq A.A. Al-Sharjabi
Minister of Water and Environment

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Executive summary

Yemen is highly endowed with diverse ecosystems constituting agroecosystems, deserts, marine, coastal, forests and wetland ecosystems. These ecosystems have high biological diversity (biodiversity) ranging from avian, fish, mammals to anthropoids. High species diversity in the country is due to its geographical strategic location at a juncture of three major biogeographic regions, the Pale-arctic, Afro-tropical and oriental regions. It is the greenest country in the Arabian Peninsula, with the green cover constituting approximately 4.6% of the country land mass.

Yemen ecosystems' contribution to the national economy and community livelihoods is highly significant. The ecosystems' contribution is through provision, regulation, support and cultural functions. In 2012, the economic value of the key ecosystems was estimated at USD 287,829 million. In 2015, it was estimated that over 15 million Yemenis were directly dependent on ecosystems for sustenance.

An assessment of the status of the key ecosystems in the country reveals that there is widespread degradation for almost all the ecosystems. The ecosystem degradation is evident from deforestation (mangroves and forest), coastal, wadis and terrace erosion, pollution of the wetland ecosystems and destruction of the coral reefs. Similarly, species such as large mammals, avians and fish are being illegally hunted, traded and harvested at an unprecedented rate. There are various factors that contribute to widespread ecosystems degradation and species loss such as: armed conflicts, unsustainable production processes, land use changes, climate change, invasive species, widespread pollution and illegal trade. These factors are fuelled by underlying aspects mainly poverty, weak institutional capacity to enforce existing policies and Acts, market distortions due to externalities and perverse economic incentives amongst others.

Whilst there is widespread ecosystems degradation and species in the country, from time immemorial, the Yemenis have traditional sustainably managed their ecosystems to ensure optimal and non-declining flow of ecosystems functions and services. Some of the traditional ecosystem's management included the Mahjeer rangeland management systems.

Furthermore, the government of Yemen has taken initiatives to protect, conserve and sustainably utilise its vital ecosystems. This includes the development of robust and comprehensive legal framework. The country has various Decrees and Laws. At the center of the Decrees and the Law is the Environment Protection Law No 26 of 1996 which established EIA.

Another critical step taken by the country to strengthen its national efforts of conserving and protecting its natural assets was ratification the United Nations Convention on Biological Diversity (UNCBD) in 1996. Consequently, over the years, Yemen has devotedly developed, submitted and operational its NBSAP. The country developed its NBSAP I in 2007-2017 and the NBSAP II 2011-2020 with robust and high level national strategic activities. In December 2022, CBD party members endorsed the K-M GBF and collectively agreed to update their existing NBSAPs by aligning their national targets and goals to the GBF targets. This undertaking, thus aimed at fulfilling the party members decision to update the NBSAP II into NBSAP III.

Consequently, the country's NBSAP is a living document which is updated quinquennially following the CBD amendments and based on intensive stakeholders' consultations processes and lessons learned from the previous NBSAP.

Lessons learnt from the previous NBSAP

The previous NBSAP was implemented between 2017 and 2020. During this implementation period, the country faced various challenges, the main one being armed conflicts. NBSAP II coincided with the country's armed conflict which started in 2015 and is still on-going. The major impact of the war on the NBSAP implementation was to shift priority from the strategy to the conflict resolution. Consequently, all the resources were channeled away from NBSAP implementation to the armed conflicts. Secondly, the armed conflict has stripped away the environmental governance and weakened the institutional capacity in the country to conserve and protect biodiversity.

Some of the key lessons learnt are as follows:

- Stakeholder involvement in the implementation of the NBSAP. Implementation of the previous NBSAP, lack community and private stakeholder participation.
- Communicating the NBSAP implementation, the roles and responsibilities of the stakeholders. Implementation of NBSAP II revealed a somber lack of NBSAP communication to the stakeholders within the line-ministries and other stakeholders.
- Monitoring and evaluation of the NBSAP is essential and form the basis for lessons learned which is critical for improving the country biodiversity management.
- A dedicated database for information storage and management. Effectively, without a dedicated database, it is impossible to undertake M&E as there is no data on the indicators.
- Adequate funding for the implementation of the NBSAP. This lesson has resulted on the emphasis of developing NBSAP III financing strategy.

NBSAP updating process

The NBSAP updating followed COP Decision 15/6, which calls for party members to revise their existing NBSAP by ensuring that their national targets are addressing and contributing towards each of the goals and targets of the K-M GBF. In line with the K-M GBF, the updating process involved aligning the existing NBSAP II targets to the K-M GBF targets. This involved stakeholders' consultation. Taking into account the fact that environment-economy is a closed system, an *all-of-Government and all-of-society* approach was adopted in the consultation process.

Vision

The Goy NBSAP vision is *ecosystems and their diversity are fully restored, conserved, protected and properly valued to ensure optimal flow of functions and services to support the Yemen national economy and Yemenis livelihoods*

NBS strategic pathways

Based on consultation with stakeholders and in line with the K-M GBF, 6 strategic pathways have been identified to achieve the country's biodiversity vision. These pathways have outcomes and output as highlighted below.

1. Urgent conservation and restoration need to halt extinction of species

   Outcome 1: well restored functioning ecosystems supported by effective PA management

   Outcome 1.2: increase PA coverage with improved management and operational effectiveness

2. Promote communities access and equitable benefit sharing from biological resources and contribution to national economy

   Outcome 2: improved access and equitable benefit sharing of biological resources to the communities

3. Safeguard ecosystem integrity through sustainable uses and reduced anthropogenic pressure

   Outcome 3: Sustainable use of ecosystems and their diversity

4. Guarantee adequate resources means to support implementation of the biodiversity conservation

   Outcome 4: Adequate resources for NBSAP III implementation

5. Use of appropriate economic instruments to create an enabling environment for sustainable use

   Outcome 5: A conducive environment for sustainable ecosystem management

6. Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

Outcome 6: good governance in ecosystem and biodiversity management

A strategy by its nature constitutes a set of high-level achievable activities. Subsequently, under each pathway and corresponding outcome, high level activities and targets have been identified.

Budget and resource mobilization

Implementation of NBSAP III will require financing approximately US$ 500 million, which equites to US$100 million annually. Financing will be mobilized from various sources mainly domestic funding both public spending, private sector, and the community participation. Domestically, revenue will be raised through various avenues such as PES schemes, user's fees, Polluter pays, green bonds and Public Private Partnerships. Furthermore, financing will be mobilized internationally from both multilateral and bilateral funding sources.

Implementation plans and needs

NBSAP III will be implemented between 2025 and 2030 and hence 5-year term which can be considered medium term. The success of the NBSAP III will depend on the level of mainstreaming across the different sectors. Furthermore, key to the success will be collaboration and coordination amongst the stakeholders involved. It is also fundamental that communication on the implementation of the NBSAP is sustained throughout the implementation phase.

The key to successful NBS implementation is mainstreaming across all the key economic sectors national plans and decision-making processes. This will ensure that once the economic sector plans and decisions are implemented, the NBS activities will automatically be implemented.

Some of the key supporting elements for the NBSAP implementation include

- Capacity building for NBS implementation
- Adoption of appropriate technologies
- Stakeholder engagement and communication
- Strengthening Institutional Arrangements and collaborations

Finally, M&E is a critical component of NBSAP III. The results-based monitoring framework is proposed which is based on the measuring the achievements of the project outcomes. For M&E to be undertaken, it is necessary that a central storage facility for data storage and management is developed. The data storage facility should be accessible to all the stakeholders for purposes of depositing the data. M&E will be undertaken quarterly and annually basis throughout the project duration. The outputs from the M&E will consist of initial report, quarterly, annually, mid-term and final revaluation reports.

1.0. Introduction

Yemen is a country that is endowed with highly diverse ecosystems that commands equally highly diverse flora and fauna. High species diversity in the country is due to its geographical strategic location at a juncture of three major biogeographic regions, the Pale-arctic, Afro-tropical and oriental regions. These ecosystems and their biodiversity support millions of livelihoods and the national economy. For instance, by 2015, it was estimated that approximately 15 million Yemenis were directly dependent on the ecosystems for their livelihoods. The country's diverse ecosystems provide vital services of provision, regulation and supporting the national economy and the community livelihoods. Protecting and conserving the country ecosystems is paramount to both the national economy and the Yemenis livelihoods as they provide live supporting services.

Yemen ratified the United Nations Convention on Biological Diversity (UNCBD) in 1996 and has strived to protect its biodiversity as evident from its robust and comprehensive legal framework which constitutes presidential decrees and Laws. Furthermore, in line with the CBD requirements, Yemen has devotedly developed, submitted and operational its National Biodiversity Strategy and action Plans over time. The country developed its NBSAP I in 2007-2017 and the NBSAP II 2011-2020 with robust and high level national strategic activities. However, NBSAP II implementation has been faced with significant challenges because of decade long armed conflicts in the country.

In December 2022, CBD party members endorsed the Kunming-Montreal Global Biodiversity Framework (K-M GBF) and collectively agreed to update their existing NBSAP by aligning their national targets and goals to the GBF targets. This undertaking, thus aimed at fulfilling the party members decision to update the NBSAP II into NBSAP III

This NBSAP III, thus, sets the tone for continued biodiversity conservation in Yemen by aligned the country's targets to the K-M GBF targets and goals. It is developed with the overall objective of halting and reversing biodiversity loss in the country, promoting sustainable use and ensure fair access and equitable sharing of benefits from the utilization of genetic resources.

1.1. Biodiversity and its important

As a starting point, it is important to define biodiversity, ecosystems and their relationship. These terminologies will be used throughout this strategy and it is critical that they are understood. Biodiversity, which is shortened from biological diversity, is the variety of living organisms (species) on earth, including flora, fauna, bacteria and fungi. It is generally measured as the number of species living in a defined locality. Biodiversity entails three main components namely:

- Genetic diversity is the gene pools of the species in the locality. It is defined by the species Deoxyribonucleic acid (DNA). The genetic diversity of the species is important for species resilience from disease outbreaks. High levels of genetic diversity reduce the vulnerability of species to disease outbreaks. If genetic diversity is low, species become vulnerable to extinction from the disease outbreak. This is also important for crops. It is thus critical that genetic diversity is maintained for all the species (flora and fauna).
- Species diversity measures the number of different species in a particular locality and the relative abundance of each species. The more different species in a locality, the greater will be diversity. Species diversity thus entails amphibians, bacteria, birds, fungus lizards, mammals, plants, etc.
- Ecological diversity is the variability of habitats or the ecosystem. Ecological diversity deals with both biological and non-biological resources with the main drivers being precipitation and temperature. Thus, ecological diversity is a combination of genetic and species diversity and their interactions in a defined habitat.

An interaction between the species and ecological diversity defines an ecosystem. Consequently, an ecosystem is a defined area where flora and fauna, fungus, bacteria and other organisms interact together in an organized manner to form a life. The determinant being weather (precipitation and temperature). Ecosystems can be categorized into distinct groups being marine, aquatic (freshwater) and terrestrial.

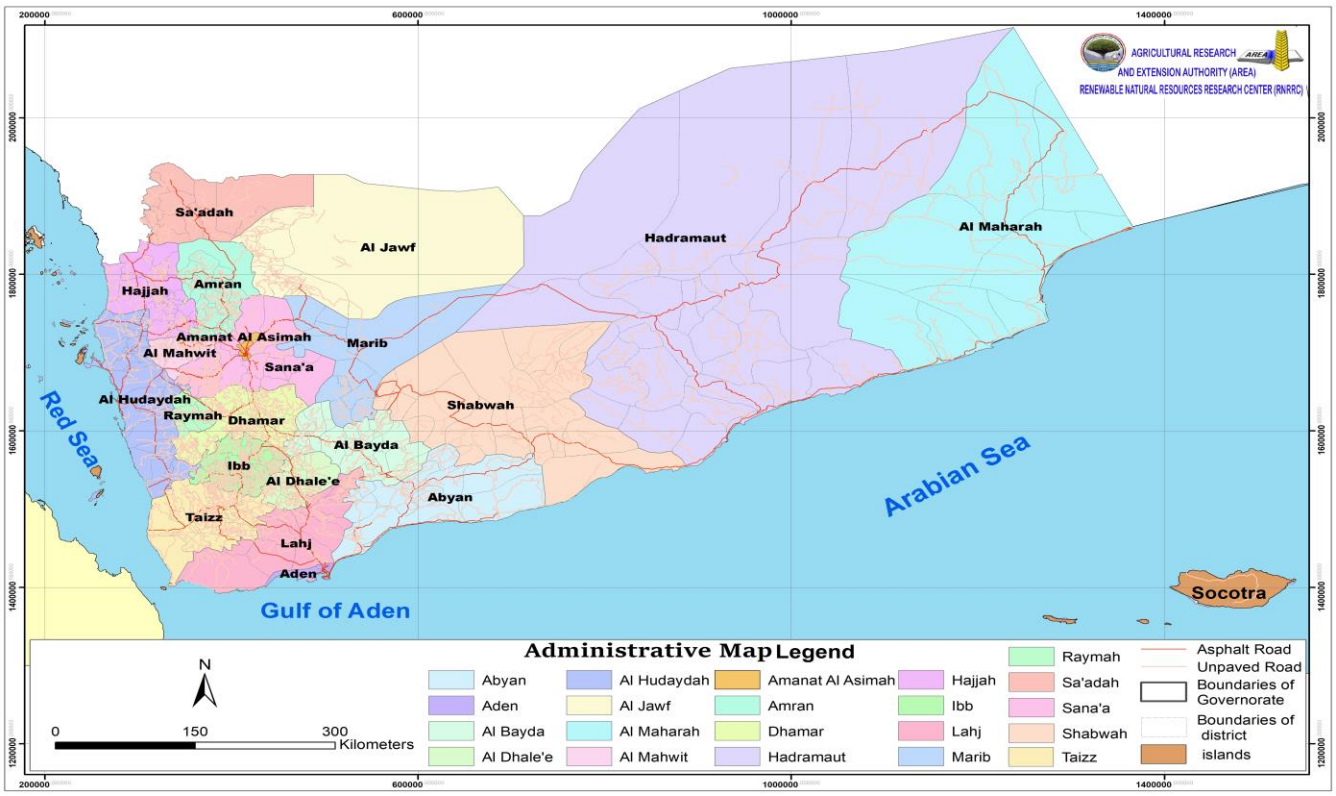
1.1.1. Biodiversity role and importance

Biodiversity is critical for human survival as it provides life supporting services. It provides various functions and services such as **provision** (food, timber, medicine etc), **regulation** (Oxygen, absorb pollutant, climate regulation, soil erosion control, floods and storms, soil formation), **support** (soil formation and nutrition, food production) and **cultural/recreational and education** services. Without biodiversity, there will not be life on earth. The importance of biodiversity in human survival is evident from the environment-economy relationship which is defined as a closed-system, with the economy totally dependent and taking place within the environment. The environment through its species diversity provides all raw materials, life supporting services and production and consumption processes. At the same time, the environment is a waste sink and provides waste assimilative capacity for the waste generated.

2.0. National context

2.1. Location and physical features

Yemen is a Middle Eastern country, with a land surface area (the mainland) of 527,970 km^2 that consists largely of mountains and desert terrain. It is located at the southern end of the Arabian Peninsula between 12°00′ to 19°00′N latitude and longitude 41°50′ to 54°33′E. The country is administratively divided into 21 governorates (provinces). In addition to the mainland, there are over 180 islands; the largest of these are Socotra in the Arabian Sea and Kamaran in the Red Sea. It is bordered to the north by Saudi Arabia, to the East by Oman, and to the South and West by a 2,252 km coastline along the Gulf of Aden, Arabian Sea and the Red Sea (Map 1).



Map 1: Administrative map of Yemen
Source: RNRRC, 2022.

The country is characterized by five major land systems:

1) a hot and humid coastal Tihama plain, 30-60 km wide, along the Red Sea and the Gulf of Aden;
2) the Yemen Highlands, a volcanic region with elevations between 1,000 and 3,600 m parallel to the Red Sea coast, and with temperate climate and monsoon rains;
3) the dissected region of the Yemen High Plateaus and the Hadramawt - Mahra Uplands, with altitudes up to 1,000 m;
4) the Al-Rub Al-Khali desert interior, with a hot and dry climate; and
5) the islands, including Socotra in the Arabian Sea and more than 112 islands in the Red Sea.

The Red Sea is a semi-enclosed basin (Sofianos and Johns, 2015) that contains more than a thousand of islands (Rasul, et al.,2015). Out of the 186 islands that are controlled by Yemen, there are about more than 121 islands located in the Yemeni Red Sea waters (NPA 2023; EPA 2004; NAGI et al 2021) .most of which are salt and coral islands, such as the islands of the Midi, Al-Luhaya and Kamaran

archipelago, while the volcanic islands are spread southwest of Kamaran Island to Bab Al-Mandab, and the Gulf of Aden is characterized by about 13% of the Islands. The islands are volcanic in formation, the most important of which are the Islands of Aden and Bir Ali. The islands of the Socotra Archipelago, which constitute 3% of the total number of Yemeni islands, are considered oceanic in their geographical location, granitic and limestone in their geological formation.

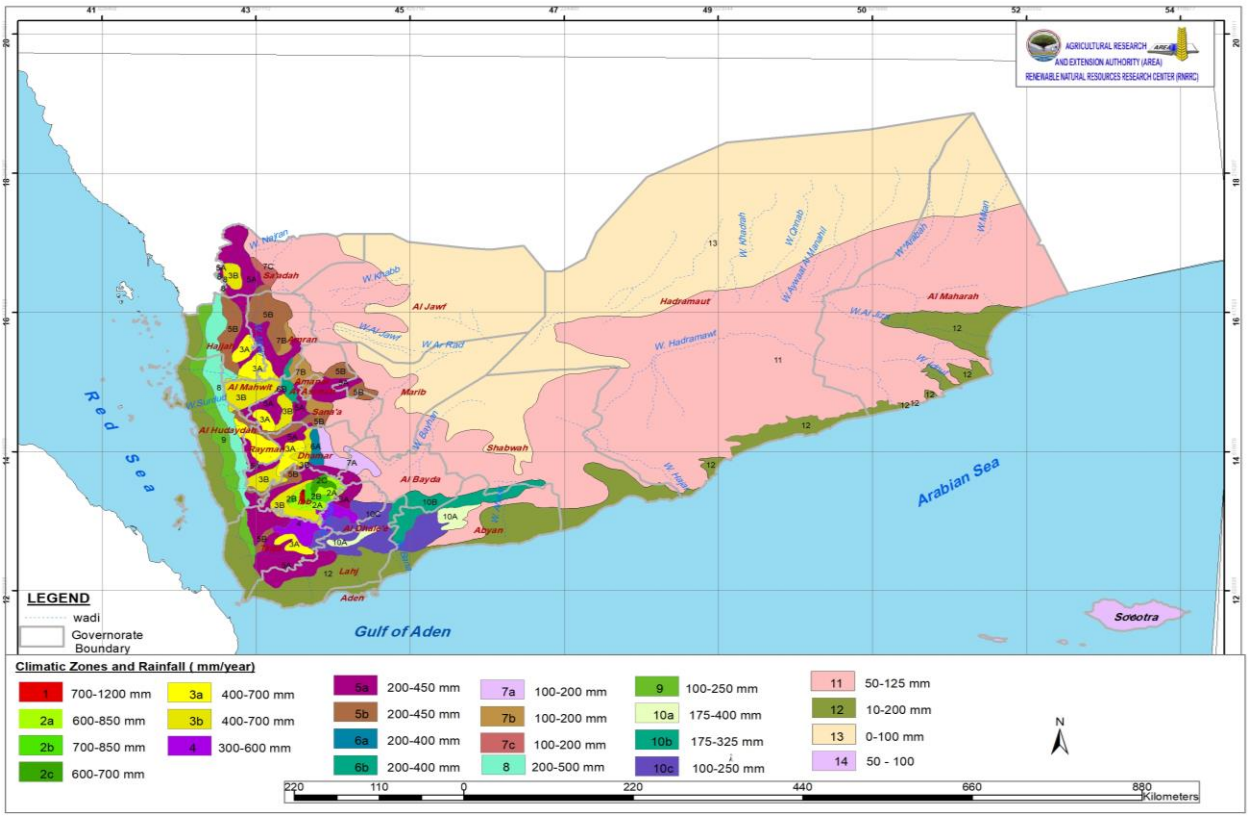
2.2. The Climate of Yemen

Yemen climate is described as tropical arid and semiarid climate along the cost and inland desert and a subtropical and temperate climate in its highlights (The World Bank Group, 2023). It lies between the two main weather patterns: the regular northerly winds (from the Mediterranean basin) and the southwest monsoon winds. The northerly winds in the winter result in rainfall deficiency while the southwestern monsoon in the summer brings rainfall with occasional flooding (EPA, 2017). Rainfall is influenced by The Red Sea Convergence Zone (RSCZ) and monsoonal Inter-Tropical Convergence Zone (ITCZ). Yemen's interannual seasonal fluctuations in precipitation are influenced by El Niño Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) events (The World Bank Group, 2023).

Rainfall pattern in the country is highly variable both temporally and spatially. Around the Tihāmah and along the southern coastal belt, the region receives annual average rainfall of 130 mm with no measurable rainfall in some years. The southern highlands receive 520-760 mm of rain per year. The south-western highlands, most notably Ibb city, receive more than 1,500 mm of rain each year. Accordingly, the northern part of the country has two rainy seasons between March-May and July- September while the southern part receives sporadic rainfall in the summer months.

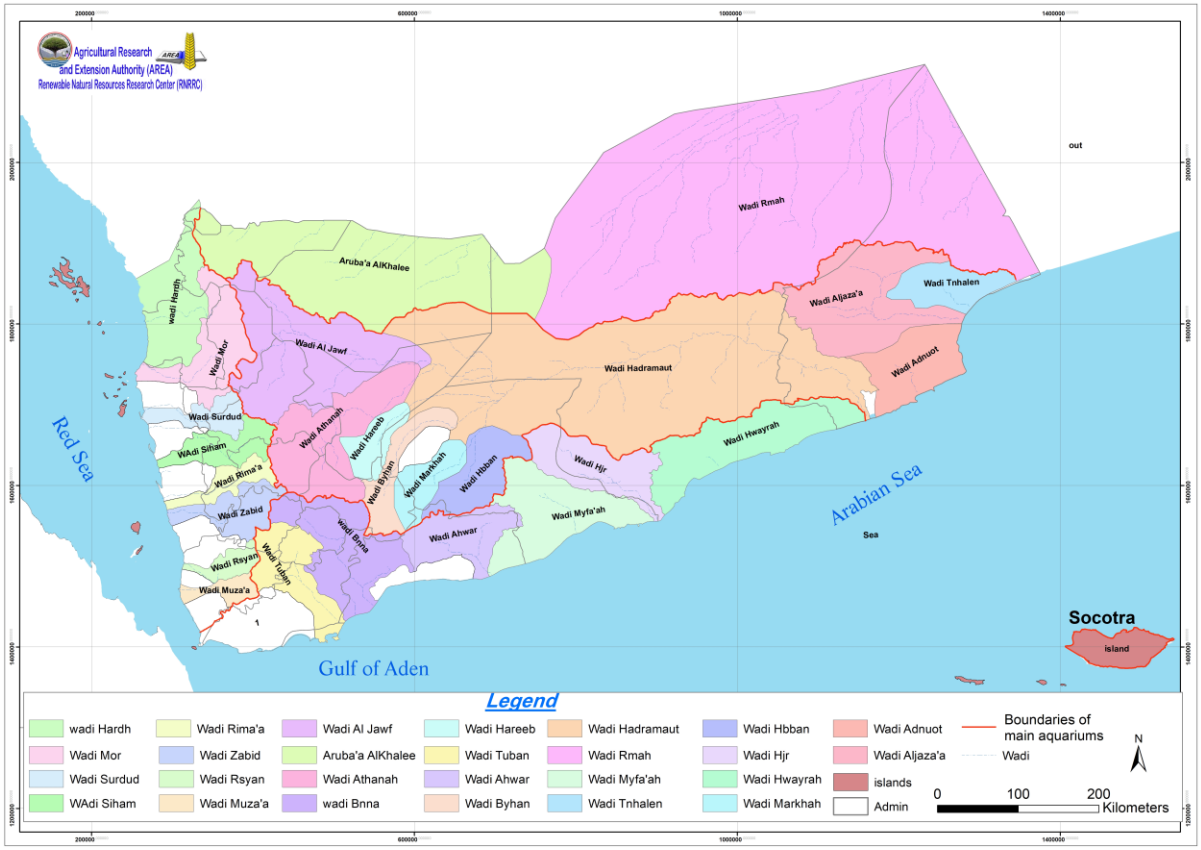
The maximum temperature in the summer may rise to 40 °C in the lowland and the desert region. In the winter, the temperature may fall below zero in the high mountain region. The mean annual temperature ranges from 11 °C in the highlands to 30 °C in the lowlands.

Based on the climatic characteristics, the country can be divided into 14 Agro-climatic zones (Bruggeman, 1995) (Map 2).



Map 2: Argo-climatic zones & Rainfall Map
Source: RNRRC, 2022.

Yemen has no permanent river systems but runoff from the rainfall events drains into the wadis. The catchment areas of the main wadis (26 named wadis) in Yemen have been re-digitized according to recent satellite images of Sentinel-2, 2021 with a high resolution of 10 m. In the northern part, westward toward the Red Sea through most major watercourses (wadis), in the southern part, southward into the Gulf of Aden and the Arabian Sea through other major watercourses, and in the eastern part, eastward into the desert some major watercourses. The largest being the Wadi Hadramaut (Hadhramaut Valley). Map 3 depicts the wadis in the country.



Map 3: Catchment areas of the main wadis in Yemen
Source: RNRRC, 2022.

2.3. Population, demographics and growth

Based on the latest population census of 2004, Yemen population is estimated at 33.7 million (The World Bank Group, 2023). The population is described as youthful with population of less than 24 years constituting 60.4 % (World Bank, 2023). Those over 64 years account for 6.8% of the population. The growth rate is estimated at 2.1 %, which is twice the world population growth rate of 1.1%. Life expectancy in the country is estimated at 64 years.

Urban population in the country constitutes about 39.2%. According to the World Bank Group (2023), there is a trend towards urbanization in the country in search of employment opportunities.

According to the UNDP, ongoing conflicts in Yemen has set back human development 20 years back (Seif, 2024), bbecause of the Houthi coup against the legitimate authority. It is estimated that half of the population lives on US$1 a day. The UNDP, Oxford Poverty and Human Development Initiative (OPHI)

estimated that 82.7% of Yemenis were living in multidimensional poverty by 2021 (Seif, 2024). Spatially, poverty is more pronounced in rural areas (89.4%) relative to the urban (68.9%) (Seif, 2024).

Due to the armed conflicts between the legitimate authority and the Houthi coup plotters, the country did not achieve any of the sustainable development goals (SDGs) and will not likely achieve any of the targets by 2030 (UNDP, 2023). Furthermore, the devastating impact of the civil war is that it has eroded the livelihood of over 54% of the population (UNDP, 2024). Subsequently, extreme poverty in the country because of the ongoing conflicts will have significant negative impacts on both the ecosystems and biodiversity in the country. Poverty is one of the major drivers of environmental degradation and species extinction in the country as communities have no alternative livelihoods (EPA, 2017, UNDP 2024). This creates unsustainable pressure on the ecosystems and their diversity.

2.4. Yemen's Ecosystems and Biodiversity

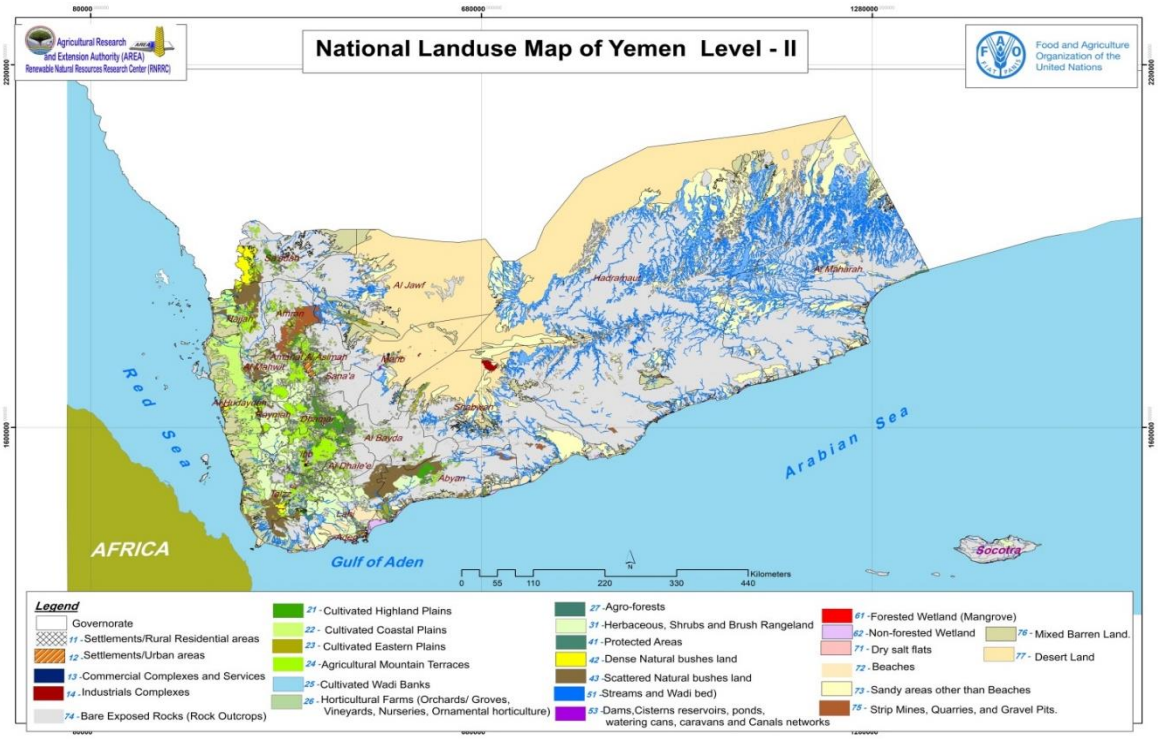
Yemen commands a significantly high biodiversity in the Arabian Peninsula (EPA, 2017; Ministry of Planning and International Cooperation, 2021). The country's impressive ecological and species diversity is due to its geographical positions at the juncture of three major biogeographic regions: the Pale-arctic, Afro-tropical and Oriental regions (EPA, 2017).

There are three main environmental regions in Yemen for biodiversity: the terrestrial Eco-region, the marine Eco-region, and the interior wetlands. These ecological areas include diverse key ecosystems that are unique and relatively intact, containing multiple habitats for many endemics, rare, and endangered flora and fauna at the national and global levels, and also support 57 global bird sites (according to the classification of the World Council for the Protection of Birds (Birdlife international).

Other factors that contribute to high species diversity include: the country's strategic position which is a passage and resting sites for migratory birds and marine resources (EPA, 2017), hence high avian diversity. Additionally, there are five main geographic regions across the different altitudinal zones and coastal areas. Furthermore, the country is a center of endemics for wild relatives of

domestic crops and has long been a center for breeding and selection of cultivated plants and livestock (EPA, 2017).

According to the recent national land use mapping study (Al-Mashreki, 2023), the land units for land uses were differentiated within seven categories based on satellite interpretation and field visits (Maps 4 and Table 1).



Map 4: National Land Use Map of Yemen
Source: Al-Mashreki, 2023

Table 1: Description of land use mapping units' categories

	Categories	Description	Area (ha)	% of total area
1.	Built-up Land	This category includes Urban & Rural Residential areas, Commercial and Industrials Complexes and Services.	361,188	0.65
2.	Agricultural Land	This category constitutes Cultivated Highland Plains, Coastal Plains, Eastern Plains, Mountain Terraces, Wadi Banks and Horticultural Farms, Agro-forests	2,948,855	5.31
3.	Rangeland	This category comprises of Herbaceous, Shrubs and Brush Rangeland.	1,703,333	3.07
4.	Forest Land	These are Protected Areas, Dense Natural bushes land and Scattered Natural bushes land.	1,034,288	1.86

	Categories	Description	Area (ha)	% of total area
5.	Water Body	Dams, cisterns reservoirs, ponds, watering cans, caravans and Canals networks,	2,716,017	4.89
6.	Wetland	These are Forested Wetland (Mangrove) and Non-forested Wetland.	141,343	0.25
7.	Barren Land	These are Dry salt flats, Beaches, Sandy areas other than Beaches, Bare Exposed Rocks (Rock Outcrops), Strip Mines, Quarries, and Gravel Pits, Mixed Barren Land and Desert Land	46,594,975	83.95
	Total area		**55,499,999**	**100**

Source: Al-Mashreki, 2023

2.4.1. Rangeland ecosystems

Rangelands are defined as extensive areas of land that are occupied by native vegetation species mainly herbaceous and shrubby vegetation which are grazed by domestic and or wild herbivores. They include grassland, desert grassland, shrub-lands, and savannas amongst others. Rangeland ecosystems are important ecosystems as they support livestock and wildlife. Additionally, the rangeland ecosystems provide vital ecosystem services and functions that support community livelihoods as sources of fuelwood, medicinal plants and provide regulatory and provision services which support millions of lives in the country. Importantly, they are habitats for mammals and provide vital food resources for their survival.

2.4.2. Forest ecosystems

Yemen is known as the greenest country in the Arabian Peninsula, with the green cover constituting approximately 4.6% of the country's land mass. Table 2 depicts the forest ecosystems classification in the country.

Table 2: Forest ecosystems and size

Categories	Size	% of Yemen Tree cover	% of Yemen land area
Forest	549	23	1.04
Other wood land	1406	58	2.7
Agro-forestry date palms and other land with tree cover	465	19	0.9
Total	**2420**	**100%**	**5%**

The country's forest can be categorized as mangrove forest, Hyphaene trees, Tihama Acacia forest, Acacia Commiphora forest, valleys forest (Ficus spp, Acacia spp, Other Forest Trees), and Juniperus spp forest (EPA, 2017). As depicted in Table 3, the vast majority of these forests constituting 68% are located in the Central Highlands and Wadis and the remaining 32% are located in the Coastal Plains and Al-Mahara (EPA, 2017). Other woodland areas in the country are found in escarpment and western mountains. Yemen woodlands species are classified as a combination of shrubs cover, bushes and tree, such as *Tihama Acacia* woodland, *Acacia-Commiphora* woodland, and *Acacia-Commiphora* woodland/shrubland (EPA, 2017).

Table 3: Woodland resources by ecological zones

Main Physiographic region	Forest land (1000 ha)	Woodland (1000 ha)	Agroforestry date palms (1000 ha)	Total land with Tree (1000 ha)	Share of total land with tree (%)
Coastal plan	156		5	161	6.7
Escarpment and w. mountains	-	1,405	381	1,786	73.8
Central highland and wadis	375		37	412	17.0
Mahra woodland and Juniper	19			19	0.8
Other trees in other area	-		42	42	1.7
Total	**550**	**,405**	**465**	**2,420**	**100**

Source: EPA (2017)

2.4.2.1. Forest ecosystems status

Yemen forest ecosystems are being deforested and degraded at a rapid rate. Deforestation and forest degradation is fuelled by the demand for fuelwood, which has reached critical levels in the country. An assessment of the use of fuelwood in the country reveals that 70% of the population are dependent on fuelwood (Imtiaz, 2023).

The fuel crisis has been exacerbated by the intransigence of the Houthis, including the mismanagement, monopolization, and excessive price hikes of

fuel supplies in areas under their control, as well as using the available quantities for military purposes. This has led to a severe shortage of diesel and gas, forcing residents to rely entirely on firewood as the sole source of energy.

It is estimated that about 5 million trees have been felled since 2018 (Reliefweb, 2024), which is about 0.9 million trees cut down annually to meet the demand for bakeries and restaurants in Sana'a alone (reliefweb, 2024), resulting in deforestation of 780 ha annually. In addition to the demand for fuelwood, rapid deforestation and degradation is attributed to conversion to cultivated lands, logging and other associated human activities. The annual depletion rate of forest areas during the period 1990-2000 was 1.04 per cent due, in part, to a number of factors, including agricultural activities, over-grazing and wooding (EPA, 2017).

During the last decades, it is estimated that a total of 8,764 ha, (69%) of the initial area of *Hyphaene thebaica* woodland in Tihama coastal plain has been destroyed and largely converted to rangeland after being initially cleared for agriculture (EPA, 2017). In addition, 29% of initial area of The *Salvadora-Tamarix* thicket was converted to wadi agriculture and about 17% of its total area of the Acacia woodland (2,637 ha) has been converted to cultivated lands, bare lands and open shrub lands (EPA, 2017).

Figures 1 and 2 depict the level of deforestation in some of the most important forests in the country Jabel Bura and Hawf Protected areas.

Deforestation and forest degradation has irreversible and rippling impacts on a wide range of species in the country. As forest ecosystem provide habitat for various fauna species, loss of forests results in species loss. Furthermore, it results in flora diversity loss. Forest loss impacts other species whose habitats are protected and supported by the forests such as wadi and marine ecosystems. These ecosystems are exposed to sedimentation which affects their function to provide to aquatic species.

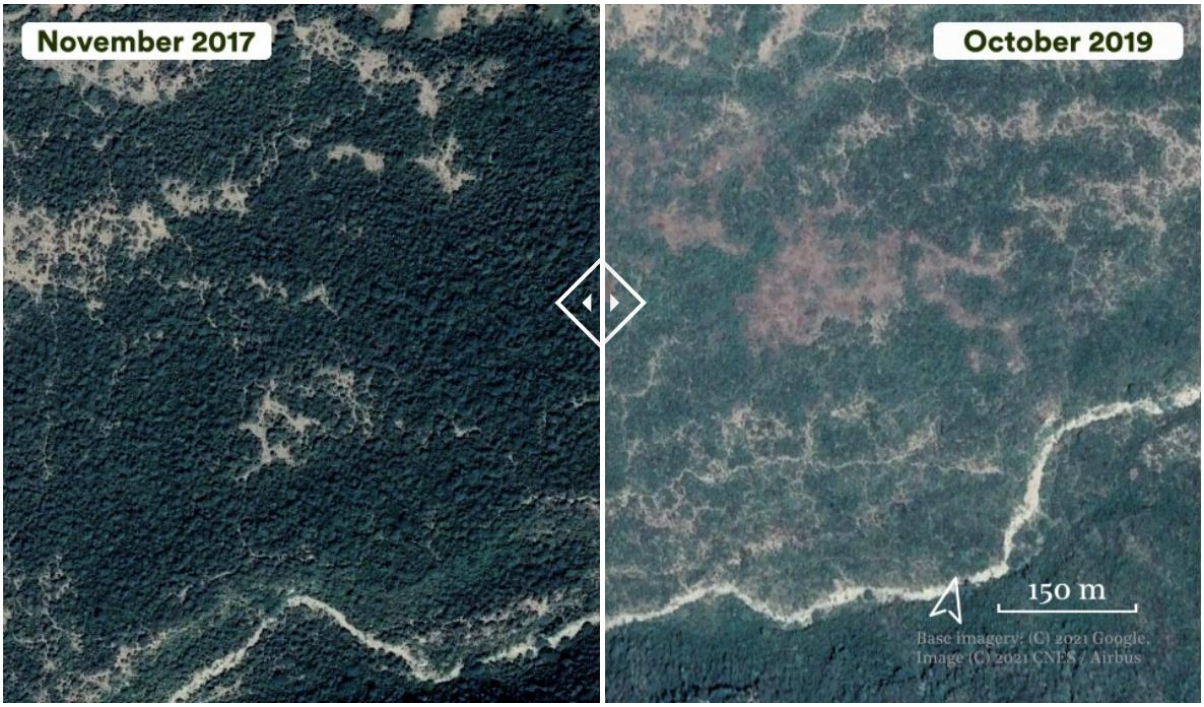


Figure 1: Deforestation outside the Jabel Bura protected area

Source: Conflict and Environment Observatory (2021)

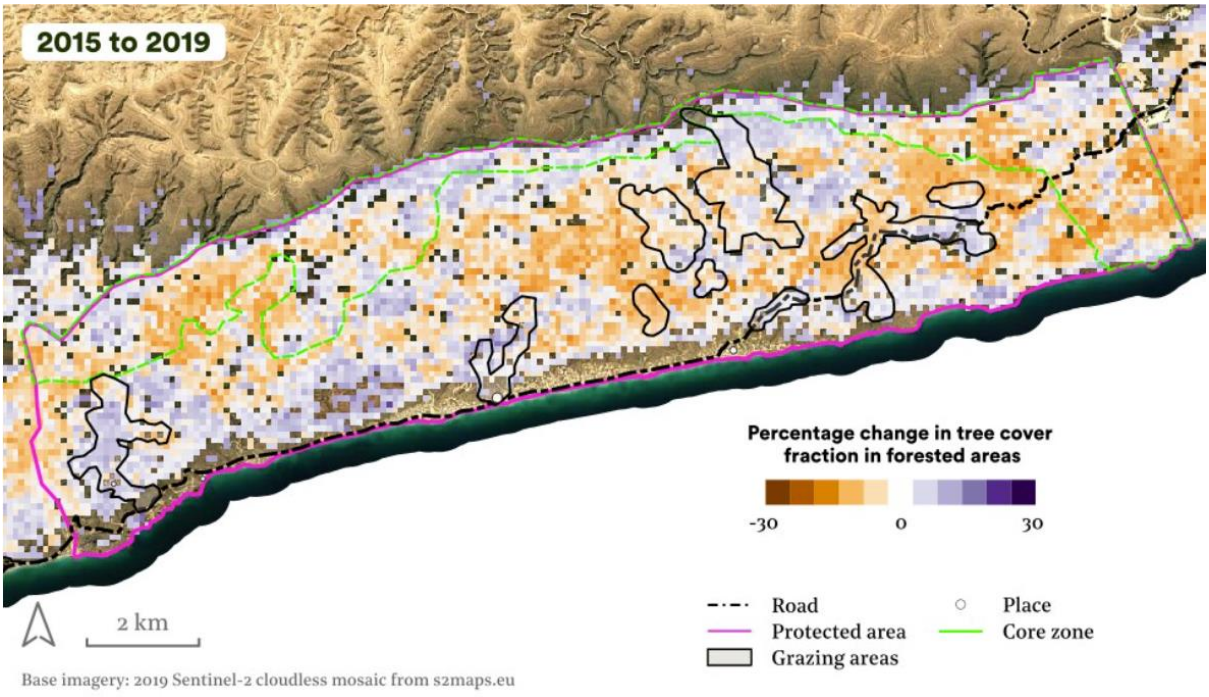


Figure 2: Forest Change in Hawf

Source: Conflict and Environment Observatory (2021)

2.4.3. Agroforestry ecosystems

Agroforestry ecosystems constitute areas under food production inclusive of livestock rearing. It is estimated that the country's agricultural system accounts for 45.4% of the total surface area. The plants that are planted in the agroforests include date palm tree, coffee, Cordia Africana and other shrub species which are of socio-economic importance. Agroforestry occurs across three physiographic regions, namely the Western Mountains, the Coastal Plains and Central Highlands, including the Wadies. Approximately 82% of Yemen agroforestry area is found in the escarpment and western mountains and the remainder in the Central Highlands and coastal plains. The agroforest ecosystems constitute a network of terraces, which is an important national heritage. Terrace is an advanced farming system which entails soil and water harvesting and at the same time utilisation of mountainous agricultural lands. It is estimated that terrace network system accounts for 20-25% of the agroecosystems (Al-Hebshi, 2018)

The major crops that are planted include cereals, vegetables, fodder, cash crops fruits and qat. Cereal ranks the first among domestic agricultural products, occupying about 60% of total area cultivated in 2012. Cereal that is produced constitutes barley, wheat, sorghum, amongst other.

Fruits, vegetables & cash crops occupied only 6% each, while Qat and animal fodder accounted for 11% each (Figure 3).

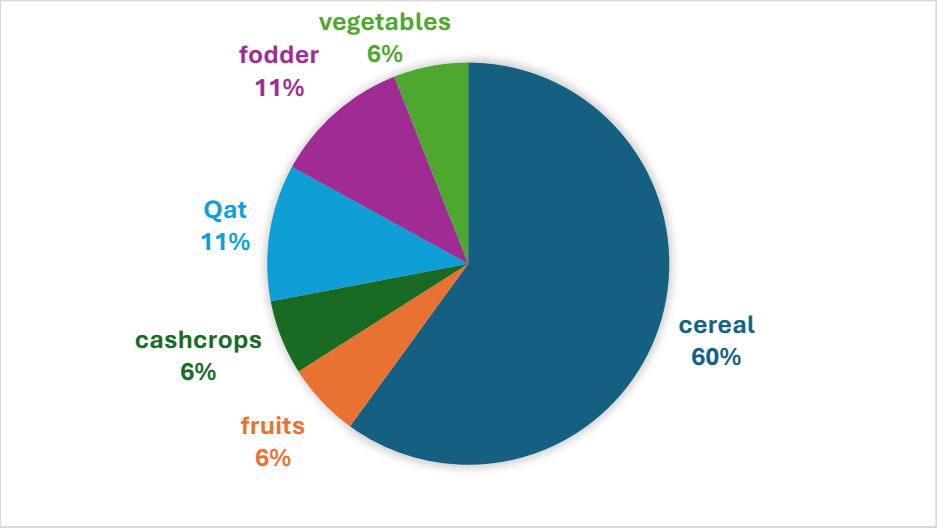


Figure 3: Share of crop in area cultivated at national level

2.4.3.1. Agroecosystems status

Conflict and environment Observatory (2021) reports that over 257,000 ha of agricultural land are exhibiting environmental degradation sign, which is about 16% of the total agricultural ecosystem. Further assessment of the rangeland reveals significant sign of environmental degradation. There is widespread soil erosion, land deterioration in the country's rangeland.

Terrace in the country play an important role in food production. However, the agricultural systems are being rapidly degraded due to soil erosion on the highland. It is reported that due to water erosion, the terraces networks are being degraded and abandoned by the farmers with amplifying negative feedback to the agroecosystems.

The environmental degradation of the agroecosystems (farmland and rangeland) has major implication in terms of their ability to continuously provide functions and services that are vital for biodiversity and mankind. The environmental degradation will have a significantly impact on species loss and mankind survival.

Furthermore, cereals, vegetables, fodder, cash crops and fruits are vastly degrading, causing high reliance on import to meet the food needs and fodder for their livestock with notable threat in food security (EPA, 2017).

2.4.4. Marine Ecosystems

The location of the Republic of Yemen in the southwestern corner of the Arabian Peninsula gives it a unique feature as it overlooks the Red Sea, the Gulf of Aden, and the Arabian Sea. Yemen has a long coastline of about 2,252 km in length, out of which, roughly 770 km is the Red Sea coast, while 1,482 km is the Gulf of Aden and Arabian Sea coasts (Nagi, 2021). The Yemeni coastal line extends from the border with the northern Saudi Arabia on the Red Sea waters, and heading south towards Bab-el-Mandab, and then turns towards eastern direction on the Gulf of Aden and Arabian Sea until the border with Sultanate of Oman.

The marine ecosystem is made up of lagoons, sandy and rocky beaches, dunes, mangrove swamps, wetlands, coral reefs and seagrass beds. Compared to other parts of the Red Sea, the shallow nutrient rich waters above the wide continental shelf of Yemen are rich fishing grounds. The Red Sea and Gulf of

Aden contain some of the world's most diverse and varied tropical marine habitats and communities. The combination of high levels of diversity, great biogeographical complexity, and high levels of endemism found in these bodies of water make them a region of global significance. The other highly diverse ecosystem in the marine is the sea grass. The sea grasses community comprises of flowering plants that can be categorised in four plants families being *Posidoniaceae, zosteraceae, hydrocharitaceae*, and cymodoceaceae.

2.4.4.1. Marine ecosystems status

An assessment of the status of the coral reefs, seagrass and mangroves reveal that these ecosystems are under great pressure from human economic activities resulting in their degradation. They are characterized by deforestation, degradation and destruction. Mangroves in the country are being deforested through conversion, overgrazing by the camels, fuelwood harvesting (EPA, 2017). Excessive cutting of mangrove trees by the local community for use in building huts, in addition to overgrazing by camels, are among the causes leading to the deterioration of mangrove ecosystems.

Similarly, there is extensive coastal erosion of the country's coastline due to extreme events associated with climate change, sea level rise, frequency of strong winds and high tidal waves (EPA, 2017).

The same trend has been observed on the coral reefs. An assessment of the coral reefs reveals that there is widespread destruction of coral reefs due to illegal harvesting of the coral stones (EPA, 2017). Fishing methods which involve the use of ground dragnets in fishing, or the use of explosives contribute to widespread coral ecosystem damage (EPA, 2017).

Marine pollution which causes ecosystems degradation is also reported to be rampant in the country (EPA, 2017).The marine environment in Yemen coastal area is subjected to contamination that arises in many different forms, such as: toxic chemicals (e.g., organic compounds, pharmaceuticals, pesticides, and metals), solid waste pollutants (e.g., plastic bags or bottles), increased nutrient (e.g., nitrates, silicates and phosphates), microbiological pollutants (e.g. pathogenic bacteria) and sediment inputs due to human activities such as sewage discharge, industrial waste, agricultural drain water, deforestation, ports development, aquaculture, radioactivity, run off during rainy periods, ship

and boat traffic, tourism, oil transportation, oil spillages and atmospheric fallout [Saleh, 2007]. Pollution in marine waters changes the physical and chemical characteristics of the waters and potentially affect marine organism, and biodiversity (Saleh and Al-Halmi, 2021; Al_Akhaly et al., 2020; Kasem and Al-Halmi, 2020; Saleh et al., 2018).

Furthermore, other economic activities such as dredging, land filling, mining and quarrying are resulting in significant loss of the Red Sea and Arabian Sea coastal habitats (EPA, 2017)

2.4.4.2. Ecologically sensitive marine habitats

Out of the 22 Yemeni governorates, ten are coastal; three overlooks the western Red Sea waters (i.e. Hajjah, Al-Hodeidah, and Taiz), and 7 overlooks the southern Gulf of Aden and Arabian Sea waters (i.e. Lahj, Aden, Abyan, Shabwah, Hadhramout, Al-Mahara, and Socotra Archipelago). The coastal and marine habitats of these governorates are rich and varied; including lagoons, sandy, muddy, and rocky beaches, dunes, mangrove swamps, wetlands, coral reefs, salt marshes, seagrass beds, in addition to rocky headlands with series of cuspate beaches in-between (Sheppard et al., 1992; DouAbul, and Haddad, 1999; EPA, 2009; Nagi et al., 2012; Hariri and Nagi, 2013; Al Saafani et al., 2015). Mostly, all marine coastal habitats, such as mudflats, mangroves, seagrass beds, rocky reefs, coral reefs, sandy beaches and the continental shelf, are vital for certain species, hence, they are considered to be sensitive and critical to some species (Abubakr, 2004). Threats like habitat degradation frequently play a significant role in determining the overall health of an ecosystem. As a result, these threats have a direct impact on the populations of species that rely on that specific ecosystem for survival and resources.

a) Mangroves

Mangrove ecosystems are distributed in seven coastal governorates, Hajjah, Al-Hodeidah, Taiz, Shabwa, Hadhramout, Al-Maharah and Socotra Island. The total area of Mangrove habitats was estimated to be 22.55 km^2 (2,255 hectares); approximately 91.1 % of the mangrove in the country are located in the Yemeni Red Sea coasts, while 8.9% are found in the coasts of Al-Maharah and Socotra (Nagi et al., 2012). The dominant mangrove species is the *Avicennia marina*, and the *Rhizophora macronata* species is found in two small batches in the Red Sea

(Kamaran Island), and Al-Gandal Island that is located in the north of Hodeidah City. *Bruguiera gymnorrhiza* is also reported in the country; however, its location has not been identified.

b) Coral Reefs

Coral reefs and coral communities are considered important marine and Coastal environments as they are habitats for marine species. Coral reefs flourish in the Red Sea mainly due to the warm temperatures throughout the year, low turbidity (clear water), and semi-enclosed sea, which is not directly subjected to the strong ocean currents and high waves. The presence of coral reefs is largely concentrated in the northern and middle of the Red Sea, and the presence of coral reefs reaches deep waters. In the southern Red Sea, coral reefs are less prevalent and are concentrated in shallow and semi-deep waters. The most important sites in the southern Red Sea are around Kamaran Island (Yemen). The Red Sea coral reefs are mainly coastal and island fringing reefs. Coral reefs cover about 25% of the Red Sea coastline (EPA, 2014). Approximately 300 species of coral reefs have been recorded in the coastal water of Yemen (EPA, 2009).

In the Gulf of Aden, coral reefs are less prolific due to fluctuations in temperatures (cold water currents reach 7-10 °C during upwelling period) in the summer, high turbidity in the Gulf of Aden waters due to its direct opening to the Indian Ocean, strong sea currents and high waves, particularly during the Monsoon period. Due to these conditions, they have been replaced by coral clusters concentrated in the west of Aden city (Ras Imran) and Bir Ali Islands (Shabwa). Coral clusters are also found scattered along the coastline of the Gulf of Aden at shallow depths (1-20 m). Coral clusters were also recorded on the northern side of Socotra Island.

c) Seagrass

Seagrass ecosystem is an important marine ecosystem and provide vital functions and services for marine diversity. These ecosystems are food for some species of sea turtles, fish, and marine mammals (dungeons and manatees). They are habitats and breeding sites for a variety of marine fauna such as molluscs, crustaceans, etc. They play a very important role in purifying sea water by removing various pollutants such as excess nutrients, producing anti-bacterial and anti-fungal materials, which contribute to reducing the exposure

of humans and animals to bacterial pathogens, in addition to altering the chemical composition of sea water and sediments. Seagrass meadows regulated the sea waves and, and hence protect the coastal communities from storm surges and erosion. Seagrass, same as mangroves, are considered a carbon sink which store a bulky amount of carbon dioxide, and thus help in combating the climate change .

According to Price et al. (1988), seagrass increases towards the south of the Red Sea coastline. Nine species have been recorded along the coastline of Yemen: i.e. *Halophila stipulacea, H. ovalis, H. ovata, H. decipiens, Halodula uninervis, Thalassodendron ciliatum, Thalassia hemprichii, Cymodocea serrulata, C. rotundata, Enhalus acoroides, and Syringodium isoetifolium* (Rouphael et al., 1999). As per Barratt et al. (1987), seagrass is found along 42% of the Red Sea coat of Yemen up to 500m offshore. It is restricted to sheltered areas, such as the shoreward side of the sand spits, islands and reefs.

Seven species of sea grasses were recorded along the coast of the Gulf of Aden: Cymodocea searrulata, Syringodium isoetifolium, Halodule uninervis, Halophila ovalis, Cymodossia rotundata, and Thalassia hemprichii at Khor Umaira to the west of Aden(Bawazir, 2003). Among these species, H. uninervis, H. ovalis, and C. Serrulat are the only three reported from the Socotra Archipelago.

d) Saltmarshes/Sabkhas

Saltmarshes are common features of muddy shores in temperate regions where the land meets the sea along low-lying coastlines. In subtropical regions, saltmarshes and salt flats form in areas with limited freshwater. These habitats are characterized by significant deposition of alluvial sediments (silt and clay) carried to the shore by the sea. Saltmarshes are often found near coastal lagoons where there is enough protection from strong wave action. In subtropical areas, they occur in arid or monsoon-influenced tropical regions and are commonly referred to as “Sabkhas”, especially along the Yemeni Red Sea coast, inland of mangroves.

Sabkhas are an important habitat type in the Red Sea, found in several locations such as Midi, Al-Luhayyah, Al-Urj, Al-Saleef, Habl, Mawshej, Al-Mukha, and Dhubab. In these regions, sabkhas often overlap with mangrove and seagrass areas, where regular tidal flushing helps reduce salinity stress.

e) Halophytes

Sabkhah usually supports high densities of halophytic vegetation (Salt bushes). Halophytic vegetation supports a variety of fauna such as insects and birds. They form grazing ground for goats and camels, in addition to providing nesting places for several sea birds. These vegetation habitats occur usually where fresh ground water supply is limited or absent, and where saline intrusion is rare. Halophytic vegetation such as Arthrocnemum glaucum and Halopeplis perfoliata are usually found close to the beach. They have the ability of limiting beach erosion and allow other less tolerant species to germinate. Succulents species like Zygophyllum album and Suaeda fruticose play an important role in stabilizing factor of sand transport along the edges of the Sabkhah. Five species of halophytes were recorded from the Red Sea coastal area of Yemen, and 16 species were recorded from Socotra Archipelago coastal area (Rushdi et al., 1994).

f) Sandy Shores

Sandy shores are dynamic and harsh environments, with species diversity, biomass, and community structure largely shaped by the action of waves and tides. Organisms living in these areas must adapt to winds, water, and sunlight. These shores are also popular tourist destinations, playing a significant role in family vacations and water activities. Sandy shores are predominant along Yemen's Red Sea coast, as well as in some locations along the southern coastline. They provide crucial habitats for a variety of species, including birds, fish, crustaceans, reptiles, and mammals, all of which have adapted to the coastal ecosystem. Plants also modify their growth to withstand the wind and salty air. Many of Yemen's sandy beaches, such as those in the Zuqar and Hunaish Archipelago in the Red Sea, as well as Socotra and Sharma-Jethmoon beaches on the southern coast, are important nesting sites for turtles.

g) Rocky Shores

Though rocky shores are challenging environments to inhabit, they support a diverse range of flora and fauna. These biologically rich intertidal zones encompass a variety of habitat types, including steep rocky cliffs, platforms, rock pools, and boulder fields. Organisms in these areas must adjust to harsh conditions, such as extreme heat during the day and the force of strong waves crashing against the rocks. Rocky shores are mainly found along Yemen's

southern coast, particularly around Aden, Little Aden, and east of Al-Mukalla. Limestone cliffs are present near Sharma Bay, Ras Sharwayn, and Ras Fartak.

2.4.4.3. Coastal and Marine Biodiversity

a) Phytoplankton

Phytoplankton are floating macroscopics organisms that live in aquatic ecosystems and use photosynthesis to produce oxygen and regulate climate. There are 283 species of phytoplankton recorded in Yemeni aquatic ecosystems. Diatoms and Dinoflagellates are the most dominant species in the country with a total number of 206 species. A total number of 130 species were recorded from the Gulf of Aden (Mutlag et al. 1992). Approximately 56 species were reported offshore waters opposite of Ras Isa Peninsula (EH&A, 1989), a total of 32 species were recorded to the southern section of the Red Sea and Gulf of Aden, and 21 species were recorded from Kamaran Island (Rushdi, et al., 1994).

b) Zooplankton

Zooplankton are heterotrophic plankton that range from microorganisms to large species such as Jelly fish. According to Abubakr (2004), about 139 species of Zooplankton were recorded in the Yemeni aquatic ecosystems. Those species belong to 9 groups, which are: Protozoan Tintinnids (55 species), Copepods (34 species), Chondrophora and Siphonophora (12 species), Chaetognatha (11 species), Scyphomedusa (10 species), Ostracoda and Cladocera (7 species), Tunicates (7 species), Echinodermata (2 species), and Decapoda (1 species).

c) Algae

Marine algae vary greatly in form and size, ranging from tiny microscopic flagellates to massive kelps. In the Red Sea, there are approximately 485 species of algae (Edward and Head, 1987). Along the Yemeni Red Sea coast, 39 species have been recorded in the intertidal zones between Dhubab–Yakhtul and Al-Saleef–Al-Urj (Rushdi et al., 1994). North of Al-Hodeidah, Sargassum sp. dominates the substrate, while Padina sp. and Turbinaria sp. are the most common intertidal algae. An exception is found in the northern Dhubab reef flat area, which is dominated by green algae, Caulerpa mexicana, and the brown macroalgae Dictyota liturata (IUCN, 1987). In the Gulf of Aden, where upwelling results in high primary productivity, 53 species have been recorded from Mukalla to Qusaiyer in Hadhramout (Ormond and Banaimoon, 1994). The area

between Ras Qawa'a and Bab-el-Mandab is largely dominated by Sargassum sp., with lower abundances of Codium sp. and Padina sp. In the intertidal zones between Shuqra and Ahwar, species like Dictyota sp., Halimeda sp., and Udotea sp. have been observed (DouAbul and Abubakr, 1996). Additionally, 24 species have been reported in the subtidal areas of the Socotra Archipelago (Abubakr, 2004).

d) Polychaeta

Polychaetes are predominantly marine worms. These worms have well-defined segments and bristles, and vary in size, shape, and diet. Only four species were recorded in Yemeni waters. These are: S*pirobranchus giganteus, Sabellastarte sanctijosephi, Pamatoeios kraussii,* and *Diopatra sp*. of the recorded species, only Diopatra sp. is restricted to the Gulf of Aden and Arabian Sea.

e) Crustacea

Crustacean marine benthic fauna includes Shrimps, lobsters and crabs. DouAbul and Abubakr (1996) , A total of 53 species of crustaceans belonging to 6 families were recorded in the Yemen Red Sea region, out of which 9 species were Penaeidae (DouAbul and Abubakr, 1996). Approximately 24 species were recorded from the southern area along the Gulf of Aden/Arabian Sea. The commercially important *Penaeus semisulcatus, Spiny lobster Panulirus homarus and swimming crab Portunus pelagiacus* were also recorded. A total of 45 species of crustaceans were recorded from Socotra Archipelago. There is a great biodiversity in the species of Brachyuran crabs, as the latest statistics for these species in Yemen. Al-Hindi (2019; 2020; 2023) recorded about 184 species belonging to 118 genera and 31 families, in coastal and fresh waters, and of these species, 65 species are considered the first recorded in Yemeni coastal waters (3 species recorded in the Red Sea, 53 species in the Gulf of Aden, 6 species in the Arabian Sea, and 8 species in the Socotra Islands in the Indian Ocean), in addition, 10 species are considered the first recorded in the marine waters of the Arabian Peninsula.

f) Mollusca

Mollusca are a phylum of soft-bodied, triploblastic, bilaterally symmetrical and coelomate species. The country has an impressive diverse mollusca species with about 950 to 1000 species recorded from Red Sea proper, of which 850 species were recorded from southern and central regions, (Sharabati 1984;

Mastaller 1987). The molluskan community in the Yemeni Red Sea area constitute 625 species representing four classes. The largest of which is the Gastropod with 86 families and Bivalvia with 47 families. Polyplacophora and Scaphopoda were represented by 4 families each and Cephalopoda with one family. Molluskan communities of the Yemen Red Sea water can be classified into four groups according to their distribution. The major features of the molluskan distribution can mainly be accounted for by differences in the distribution of habitats. The molluskan of the Yemeni southern coastal area was not sufficiently studied. However, according to Abubakr (2004), the oldest study was that of Shopland (1902) from Aden inner Harbor and little Aden. They have recorded a total of 729 species belonging to four classes. The largest class was the Gastropod (506) and Bivalvia (220), two species represent the Scaphopoda and only one species represented the class Cephalopoda.

More recent records along the coastal line of the Gulf of Aden/Arabian Sea and Socotra Archipelago shows the existence of 13 species of the class Polyplacophora (Socotra = 4 species) and 146 species represented the Gastropod (Socotra = 105 species) and 63 species of Bivalve (Socotra = 43 species).

g) Echinodermata

Echinoderm animals are marine invertebrates with pentaradial symmetry, spiny skin, and a calcareous endoskeleton. These animals include starfish, brittle stars, sea urchins, sand dollars and sea cucumbers. They are bottom dwellers and are found at all depths and latitudes. However, they usually thrive in shallow warm water. A total number of 72 species of Echinodermata were recorded in all Yemeni waters. Among the Yemeni echinoid community, *Diadema setosum* seems to be most commonly distributed in the area (DouAbul and Haddad, 1996).

h) Sea Turtles

Sea turtles, also known as marine turtles, are air-breathing reptiles that live primarily in the ocean, only coming ashore briefly to lay their eggs on sandy beaches. The suitable supra-littoral zone for nesting is ideally not be vulnerable to flooding during high tides. All species of sea turtles are endangered animals and are listed on the IUCN Red List. Five species of marine turtles have been recorded in Yemeni waters; being Green turtles (*Chelonia mydas*); Hawksbill

turtles (*Eretmochelys imbricata*); Loggerhead turtles (*Caretta caretta*); Leatherback turtles (*Dermochelys coriacea*) and the Olive Ridley (*Lepidochelys olivacea*) which was once sighted by a fisherman in Yemeni waters. According to EPA, many nesting sites have been reported in the coastal beaches of Yemen. The sandy beaches of southern Yemen on the Gulf of Aden represent one of the most important areas of global importance for nesting green turtles and hawksbill turtles. Sharmah – Jethmoon coast is reported to be a nesting site for Green, Hawksbill, and Loggerhead Turtles. This area is considered of globally importance as it is the largest nesting area for Green Turtles. EPA seeks to declare this area as a natural reserve for the endangered sea turtles.

i) Marine Mammals

The marine mammals include Whales (Cetacean), dolphins, porpoise, seals, sea lions and sea cows. These animals are adapted to live in marine environment. However, only two classes of marine mammals were found in the Red Sea of Yemen, i.e. Sirenia (Dugong dugon), and several species of dolphins and whales (Cetacea). The common dolphin, *Delphinus delphis* and the sperm whale *Physeter macrocephalus* were the only species recorded from the Socotra Archipelago. Abubakr (2004) listed 23 Cetaceans species that are most likely to be found in the Yemeni open waters.

j) Fishes

The fish fauna of the Yemen Red Sea, Gulf of Aden/Arabian Sea and Indian Ocean are mainly of Indo-Pacific origin. The Yemen Red Sea fish group is highly more diverse than that of the Gulf of Aden/Arabian Sea. This is mainly due to the varying habitats between the two seas. Sharks have a significant socio-economic role in the livelihood of the fishermen, particularly the artisanal in Yemen. Shark fins, livers and meat are exploited commercially (Hariri, 2002). In the same way, other bony fishes are a vital source of income for local and national hard currency source, and an important source of protein for the population. A total of 153 families and 969 fish species have been recorded in the Yemeni waters. Cartilaginous fishes include 11 families of rays and batoidei (44 Species), and 18 families of sharks constituting 68 species. The rest are bony fishes (Osteichthyes) which include 124 families and 857 species.

k) Sponges

Study of porifera (Sponges) in Yemen is limited and according to Abubakr (2004), only eight species have been documented. In Socotra Archipelago, five species were recorded; i.e. *Ircinia sp.*, *Cliona sp.*, *Hymedesmia sp.*, *Siphonochalina sp.*, and *Chondrilastra sp*. In the Red Sea, *Heteronema erecta, Bajulus laxux,* and *Biemna fortis* species of porifera were recorded.

l) Birds

The Arabian Peninsula is an important "land bridge" between Africa, Asia, and Europe for approximately three billion birds which annually migrate along north-south or east-west routes (Mckinnon, 1990). Due to Yemen's important geographical location and topography, it is rich in wild bird species. According to the latest statistics on wild birds in Yemen, there are 469 bird species, including 11 endemic species and 3 introduced or invasive species. The number of recorded species in Socotra Archipelago is about 229, including 12 endemic species, 40 regularly breeding species, 6 other species that breed occasionally, and other species of global importance (Egyptian Vulture).

2.4.5. Freshwater Ecosystems

Yemen is a developing country that lies in arid and semiarid areas. The country suffers from water scarcity and deterioration of quality. Groundwater is the main source of water supply for domestic needs (Al-Alimi et al., 2023; Taher et al., 2020). Yemen freshwater resources originate mainly from two principal water ecosystems, namely shallow aquifers and surface water. Surface water resources is generated from rainfall-runoff events to the 78 major Wadi catchments basins, which are grouped under 4 main drainage basins namely the basins of Red Sea, Arabian Sea, Gulf of Aden and Rub Al-Khali (EPA, 2017). Water available from both sources is limited due to low rainfall rate (i.e. 7500 mm annually in western highlands, 250 in lowlands and 50 mm in coastal plains), and nearly most of which is rapidly lost to evapotranspiration (ET).

Groundwater resources are mainly deep fossil groundwater basins and shallow alluvial aquifers which are recharged from precipitation during rainy seasons.

2.4.5.1. Aquatic ecosystems status

Yemen suffers from a suffocating water crisis (Yemen from poor water countries worldwide), and depends on rainwater that nourishes groundwater and surface (Al-Alimi et al., 2023; Taher et al., 2020), but under 3.5% accelerated population growth and the expansion of economic activity in which the water sector faces

weak institutional capacities for the state despite. However, public water networks are only 68% of urban residents in Yemen. Studies indicate that the average per capita in Yemen is the lowest in the Arab world 131 cubic meters in 1997 and gradually decreased until after the war reached 74 meters (Jagman, 2023; Mohammed, 2023).

Similar to the other ecosystems in the country, the aquatic ecosystems are being degraded through over-abstraction, pollution, erosion of the water bodies and high sedimentation. Total annual renewable water resources are estimated at 2.1 billion m^3 (1.1 billion m^3 of groundwater and 1 billion m^3 surface water) while water consumption stands at 3.565 billion m^3, resulting in groundwater being mined at a rate of 1.465 billion m^3 annually (EPA, 2017). Over extraction of water resources in Yemen over the years has resulted in the watershed degradation, continuing reduction of groundwater tables, drying of wadis and erosion of wadi bank (EPA, 2017). One of the major consumers of the water resources is the agricultural sector accounting for 90% of water abstraction. Qat which is high water intensive, takes up to 30% of all the agricultural water consumption (Gadain, 2023),

Water erosion is also observed to be rampant in the Coastal Plains and highlands with increase in wadi beds sedimentation which affects diversion schemes (weirs and canals) and result in widening of wadi beds and loss of arable land through wadi bank erosion (EPA, 2017) and the degradation of the terraces networks.

In addition to unsustainable water abstraction and sedimentation, water pollution is rampant in the country. There is prevalent chemical pollution (fertilizers pesticides and some metals) and biological pollution affecting for both the surface and groundwater aquifers (Al-Alimi et al., 2023; Saleh and Al-Sallami, 2022; Taher et al., 2020; Saleh et al., 2020). Furthermore, due to lack of waste management facilities for both solid and wastewater, there is uncontrolled discharge of untreated municipal and industrial wastewater into the waterways (Saleh et al., 2019; Saleh et al., 2018). Figure 4 and 5 depicts the wetland loss and degradation from informal waste management and waste generation at Al Heswa wetland Protected area in Aden.

Degradation of wetland ecosystems has directly resulted in species loss through habitat loss, decline in ecosystem functions and service to support species, and through poisoning from consuming polluted water with chemicals.

Figure 4: Deterioration of Al Heswa Wetland protected area Aden

Source: Conflict and Environment Observatory (2021)

Figure 5: Deterioration of Al Heswa Wetland protected area Aden

Source: Conflict and Environment Observatory

2.4.6. Desert and Dry Areas

Desert ecosystems dominate Yemen ecosystem occupying approximately 52% of the country surface area. This includes the northern parts of the country extending to Al-Rub-al-Khali (The Empty Quarter). Desert ecosystems are devoid of vegetation due to lack of rainfall. However, occasionally during the

rainy season, some river channels flow into the desert recharging the desert aquifers in the process. During these rare events, there is regeneration of vegetation around the oases which support wildlife and livestock. *Acacia tortili* and perennial grasses such as *Pennisetum sp*, and Orchard-like Ziziphus are among the most dominant vegetation species in the desert that spring to life and support wildlife and livestock population.

2.6. Biodiversity composition in Yemen ecosystems

2.6.1. Flora species

Yemen flora (plants species) is a mixture of the tropical African, Sudanian plant geographical region (Paleotropical origin) and the Saharo-Sindian or Saharo-Arabian region (Holarctic origin) with very few of Irano-Turanian and Mediterranean regions (White, 1983). Most of Yemen's flora belongs to Sudanian region (Eritreo-Arabian province of Sudanian region, or (Somalia-Masai region center of endemism, (white, 1983). The Sudanian element dominates the western mountains and parts of the high land plains which receive high precipitation (White, 1983). The Saharo-Arabian element dominates in the coastal plains, eastern mountain, the eastern and northern desert plains (White, 1983).

Yemen commands a highly diverse flora species. About 2,969 plant species belonging to 1,018 genera and 179 plant families have been documented in the country. These are categorized as 2679 naturalized, 126 cultivated and 109 introduced (EPA, 2017).

The natural forest system is spread in coastal, mountainous, and valley areas with an area of 5,490 km^2 and is represented on the coastline by mangrove forests with an area estimated at 22.55 Km^2 , *Acacia ehrenbergiana* forest in the western coastal plain, Bura'a forest in the highlands, Hawf forest in the eastern highlands, and other forests, the most important of which is *Juniperus* forests in the mountains (Iraf Lahj, Al-Riyami Taiz, Al-Lawz Sanaa, and Razih in Saada). There are also Valleys Forests, the most important species of which are *Acacia spp* and *Ficus spp*. This ecosystem is considered hotspots for plant and animal biodiversity, and constitutes habitat for most large mammals such as the Arabian wolf (*Canis lupus*), lynx (*Felis caracal*), and striped hyena (*Hyaena hyaen*), as well as for endemic birds such as the Houbara (*Ardeotis arabian*), partridges, and migratory birds such as pelicans and herons (in the mangrove

system), in addition to other wildlife. Forests have important protective environmental and other economic, social, scientific and educational functions, as well as providing various goods and benefits to the local population.

The gap analysis report for the key areas of biodiversity for the year 2011 (EPA, SRNMP, UNDP 2011) indicates the most important areas of concentration of endemic and semi-endemic plants after Socotra, which are the southern Hadhramaut plateau, the Gulf of the Moon (Fartak and Hawf Mountains), and the eastern desert plains (Hat) in Al-Mahra, the southwestern highlands in (Al-Hujareiah) of Taiz, the southeastern highlands (Jabal Al-Arayes) of Abyan, and the western highlands (Jabal Malhan, Bura', and Hadiya in Raymah).

According to Al-Khulaidi (2022), the endemic and near endemic plants were estimated at 659, of which 455 are classified as endemic. In the Island of Socotra, it is estimated that there are 825 plants species, 37% of which are endemic to the island (EPA, 2017).

The most dominant plant families in terms of the number of endemic species are as depicted in Table 4 below.

Table 4: Plant species endemic in the country

Family	Species no
Apocynaceae	44
Asteraceae	44
Euphorbiaceae	30
Fabaceae	27
Acanthaceae	24
Boraginaceae	23
Lamiaceae	22
Aloeaceae/ Asphodelaceae	16
Burseraceae	11

At the genera level, the genus *Euphorbia* ranks first with 23 species, followed by *Ceropegia* 18 species, *Aloe* 16 species, *Pulicaria* 13 species, *Heliotropium* 10 species, *Helichrysum* 9 species, *Leucas* 8 species, and the genus *Boswellia* 7 species (EPA, 2017).

Furthermore, there are over 21 invasive and native plant species in the country, which inevitably are negatively impacting ecosystems. It is necessary that

these invasive are documented and monitored for control and eradication purposes.

2.6.2. Fauna species

Similarly, the country commands a relatively diverse terrestrial mammal species. A total of 71 species belonging to 11 orders, 28 families, and 64 genera were recorded in the country representing 8 orders inclusive of bats (Mensoor, 2023). Of the recorded mammals, one third is large mammals such as:

- Arabian Mountain Gazelle (*Gazella gazella*),
- Ibex (*Capra ibex nubiana*),
- Baboon (*Papio hamadryas*),
- Arabian Red Fox (*Vulpes vulpes arabicus*),
- Sand Fox (*Vulpes ruppelli*),
- Blanford's Fox (*Vulpes cana*),
- Striped Hyena (*Hyaena hyaena*),
- Arabian Wolf (*Canis lupus arabs*),
- Jackal (*Canis aureus*),
- Arabian Leopard (*Panthera pardus nimr*).

Approximately 3,372 terrestrial arthropod species were also documented representing 38 orders, 313 families and 1,833 genera. Similarly, an impressive diversity was also documented in the reptile species, with a total of 103 species and 8 species of Amphibians. This included 71 species of lizards, 28 snakes and 3 amphibians, all belonging to the Order Squamata which comprises the largest reptilian group. Turtles (Order Testudinata) are represented in Yemen by 7 species, one terrestrial species (Geochelon sulcata), one freshwater species (Pelomadora subrufa) and four species of marine turtles. The amphibians include 8 species belonging to 3.

According to the latest statistics of avian species, there are about 469 species, including 11 endemic species and 3 species that are introduced and thus considered invasive species. Like the plant species, the Socotra Archipelago commands high avian diversity. Approximately 229 species, including 12 endemic species have been recorded in the Socotra Archipelago, of which 40 species breed regularly, and 6 other species reproduce occasionally.

The marine ecosystem commands impressive species diversity. A total of 416 species were recorded from the Yemeni Red Sea including 401 species of bony fish and 21 species of cartilaginous fishes (5 species of sharks and 16 species of sharks). The coral reefs in the country are highly diverse marine ecosystems and are a habitat for about 300 fish species with a high degree of endemism. Additionally, approximately 625 species of mollusks and four species of sea turtles have been documented. Table 6 summarizes species diversity in the country.

Table 5: Biodiversity documented in Yemen

Type	Species	Order	Family	Genera
Plants	2836		179	1065
Fauna				
Mammals	71	8		
Birds	363	18	61	177
Terrestrial arthropods	3373	38	313	1833
Reptiles	103			

2.6.3. Bird species

Due to Yemen's important geographical location and terrain, it is rich in wild bird species and wildlife in general. According to the latest statistics for wild birds present in Yemen, the number of registered bird species has reached 469 species, including 11 endemic species and 3 species that are introduced in some way or invasive.

This large number did not come by chance, but is due to the fact that Yemen enjoys a geographical location at the regional and international levels, and the European-Asian bird migration line through Bab al-Mandab, as well as the higher terrain in the Arabian Peninsula, the length of its beaches, and the multiplicity of its islands, which resulted in an increase in endemic species.

The number of species recorded in the Socotra Archipelago reached 229 species, including 12 endemic species, 40 species that reproduce regularly, 6 other species that reproduce occasionally, and other species of global importance (the Egyptian Rakhamah).

2.7. Trends in species population

Due to a decade-long armed conflict in the country, time series data on species population is not available. This lack of data is one of the gaps, for effective management of biodiversity in the country. Without the data it is not possible to categorise the species in terms of IUCN red list and concentrate the country's effort to prevent species extinction.

However, with the scanty available information, it can be insinuated that biodiversity in the country is threatened from ecosystems degradation, habitat loss and over-exploitation from hunting and fishing. There are telling signs that species in the country particularly large mammals are on the verge of extinction. Predators such as the Arabian leopard, hyena, Hamadryas baboon, honey badger, hedgehog, ibex, and fox are extremely rare and difficult to spot indicating their dwindling population numbers (Mensoor, 2023). All species of marine turtles are regarded as endangered worldwide by the IUCN. Four species of turtles were recorded from the Yemeni waters as endangered: *Chelonia mydas* (Green turtle), *Eretmochelys imbricata* (Hawksbill turtle), *Caretta caretta* (Loggerhead turtle) and *Dermochelys coriacea* (Leatherbacks turtle)

About eight species (seven of these from Socotra) are included in the IUCN Red Data Book as being endangered or rare, and an additional 19 species are considered to be endangered or rare at the national level in Yemen (EPA, 2017). Furthermore, seven mammal species are now considered endangered including three of the four species of gazelle, and another three species including the Cheetah, Arabian Oryx and the fourth gazelle, the Queen of Sheba's Gazelle, are now extinct in the wild. The most sizeable mammals have long since been hunted into extinction in the country (Mensoor, 2023).

Another conservation challenge that has been observed is genetic aspect of biodiversity. There are strong indications that there is widespread loss or erosion of the gene pools in the crops (EPA, 2017). Genetic diversity is important for species resilience from disease outbreaks particularly in the era of climate change. It is noted that despite the species richness of agrobiodiversity landraces, Yemen genetic resources are vastly degrading. One of the reasons for the erosion of the gene pools is the inadequacy of biosafety management to handle the transfer of Living Modified Organisms (LMOs) associated with increasing import of food and feeder. Furthermore, there is inadequate ex situ

conservation of cultivated plant species (EPA, 2017). Inadequate ex situ conservation attributable to inadequacy of seed banks, gene banks, herbarium, and zoological or botanical centers to safeguard and preserve genetic diversity of species against natural and man-made risks, causing adverse damage and loss of genetic resources (EPA, 2017).

2.8. Economic value of biodiversity in Yemen

Biodiversity provides vital life-supporting services to the extent that some of these services are invaluable. Yemenis from time in memorial have been utilizing their biodiversity sustainably to meet their needs. Yemenis have dependent on the ecosystems/biodiversity as source of medicine, freshwater, food production and other economic activities and livelihoods. In 2015, it was estimated that 15 million Yemenis were directly dependent on the ecosystem for their livelihoods (Conflict and Environment observation, 2021).

Consequently, the total economic value (TEV) of the ecosystem in the country is astronomical. TEV estimates the value of the ecosystems as constituting the use and non-uses values, where the use value are the direct and in-direct values. The non-use values include the option, existence and the bequest values.

In 2014, the economic value of the key ecosystems in the country was estimated at USD 287,829 million (Table 6) whilst the country's GDP is estimated at approximately USD 20,000 million per year. Therefore, the ecosystem value is ten times the value of GDP.

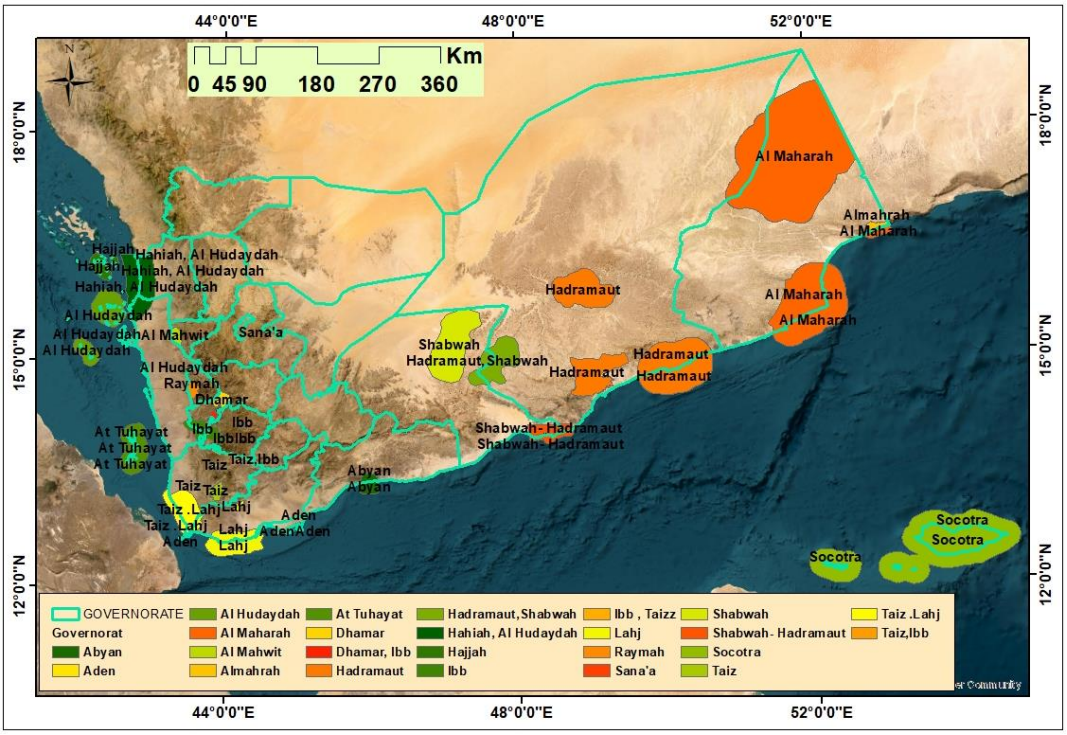
Table 6: Economic value of key ecosystems

Ecosystem	**Economic value (US$ million)**
Forest	260,787
Rangeland	12,146
Wetland	13,873
Marine	541
Mangrove	483
Total	287,830

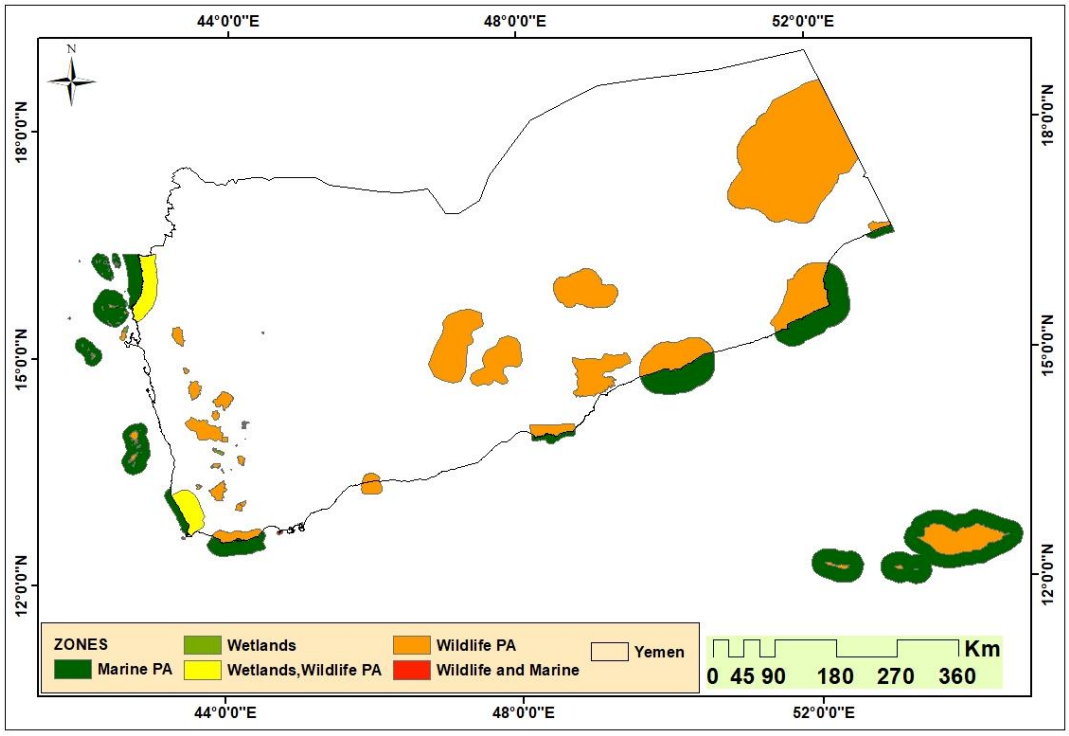
Source: EPA (2017)

2.9. Yemen biodiversity conservation efforts

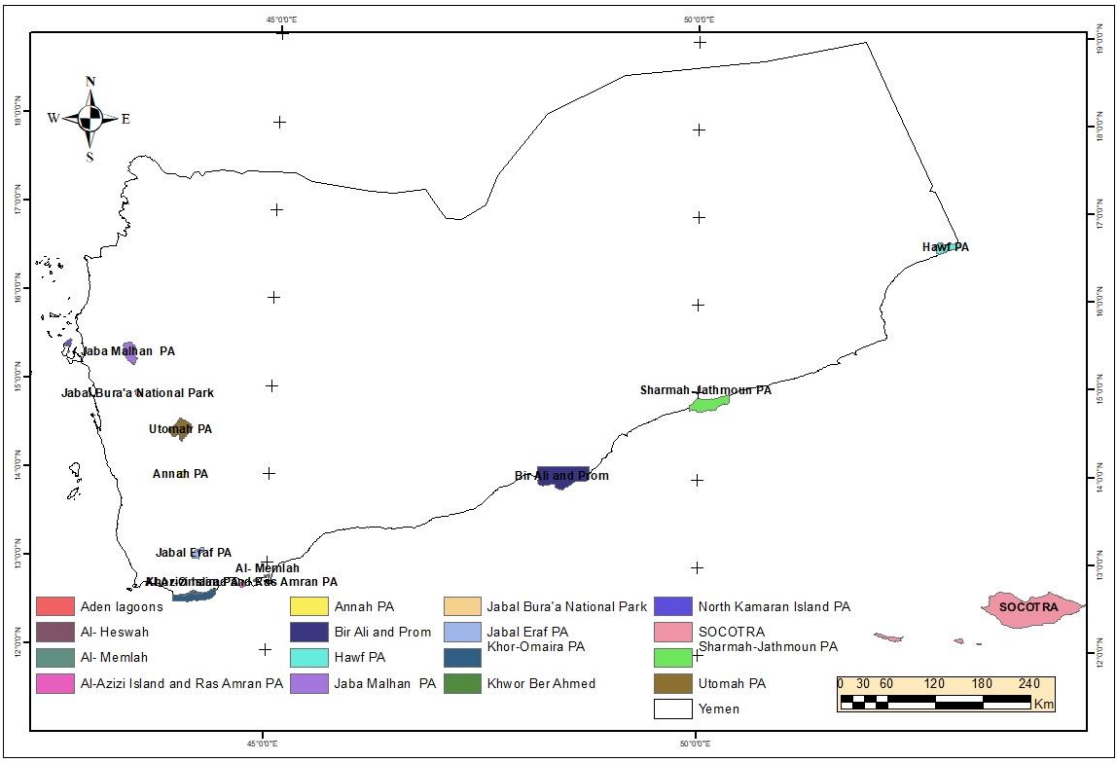
Over the years, Yemen has established institutional arrangements and legal frameworks to create an enabling environment for biodiversity conservation, protection, and sustainable utilisation. Furthermore, the country has established and operationalised protected areas (PAs) for the biodiversity conservation. There are over 25 PAs distributed across the country and covering major ecosystems; urban wetland, marine, terrestrial (Maps 5 and 6). It is estimated that the terrestrial PAs have a spatial coverage of 6,042.31 km^2 accounting for 1.1% of the total land area (Map 7) (Al-Muliki, 2024).



Map 5: PA location in Governorate



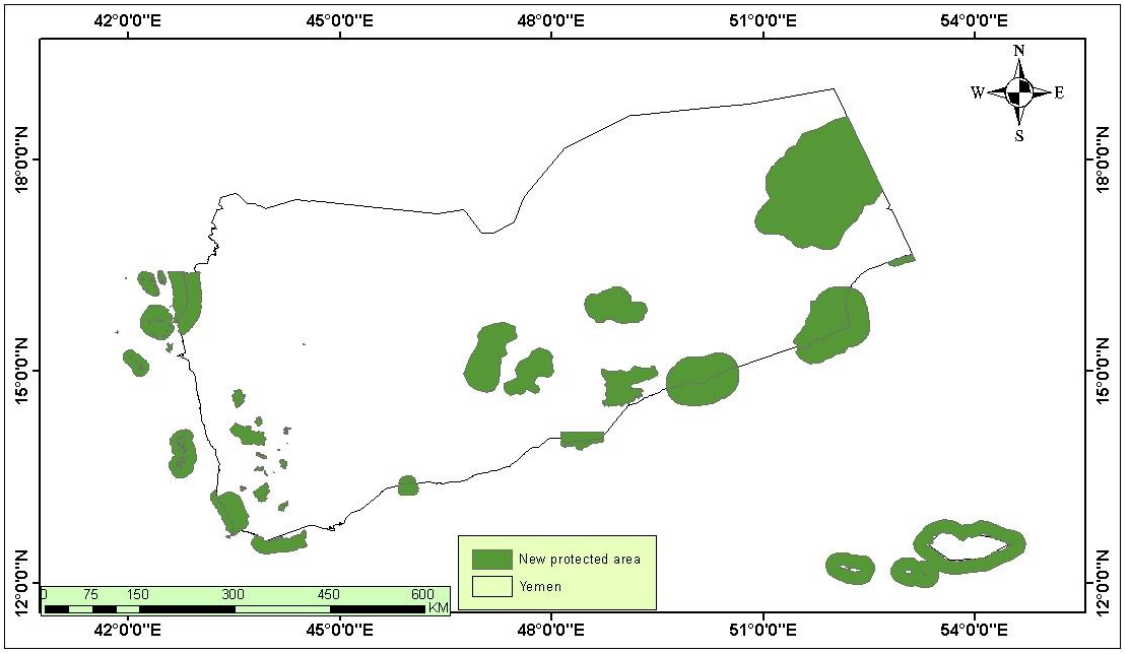
Map 6: PAs by ecosystems type



Map 7: Location of declared PAs

In line with global biodiversity conservation ambitions , GoY is committed to increase share of the PA to 16.3% of the country's land areas. These proposed areas encompass a wide range of ecosystems, including coastal zones, islands,

wetlands, and terrestrial regions, distributed across most of Yemen's governorates, as shown in map (8) (Al-Muliki, 2024).



Map 8: Location of proposed PAs

The PAs in the country are faced with main challenges resulting their ineffectiveness in conserving and protecting biodiversity. According to the Aichi Biodiversity Target 11 Country Dossier, the country's biodiversity intactness index (BII) and human footprint for the PA is 0.55 against the national BII of 0.87 (Convention on Biological Diversity & UNDP, undated). BII measures the extent to which the species (flora and fauna) has decline from their presumed pre-modern levels.

One of the main factors that have been identified as contributing to the ineffectiveness of the PA is the lack of institutional capacity to enhance PAs operational and management effectiveness. PAs such as Al Heswa, Hawf, Jabel Bura'a, and Socotra archipelago are under pressure from human activities such as hunting, livestock grazing, and forest felling for fuel wood and dumping sites. Consequently, species loss and ecosystem degradation is rampant in these PAs.

2.9.1. Legal framework for biodiversity conservation and protection

Prior to the joining UNCBD in 1996, Yemen has already put measures in place and concentrated its efforts in ensuring biodiversity conservation, protection and sustainable use. This is evident from the country's impressive and robust

legal framework that constitutes Laws and Presidential Decrees and policies. Furthermore, the country is a signatory to international conventions on biodiversity conservation. Thus, the legal framework predates the ratification of the CBD. Some of the relevant legal instruments include:

Law No. (2) of 2006 is concerned with the regulation of fishing and the exploitation of aquatic life and its protection. Article (3) aims to safeguard aquatic life and its marine environment from random fishing practices and harmful activities. It seeks to promote and improve the quality and sustainability of these resources, thereby increasing their stock. Additionally, the law emphasizes the activation and enhancement of marine inspection and monitoring roles to ensure the preservation of fishery resources, combat smuggling, and prevent unregulated and illegal fishing in coordination with relevant authorities.

Law 26 of 1995: this is one of the overarching environmental legal instruments for the country. The law explicitly states the roles and responsibilities of the Environmental Protection Authority (EPA) and its mandate to declare PAs, protect ecosystems (marine, terrestrial etc) and their biodiversity. It categorically emphasis on protection of endangered and threatened species. Furthermore, the law provides legal framework for pollution control from all sources. It further gives EPA the authority to prepare and enforce environmental standards and environmental impact assessments (EIAs) as a pre-requisite for development projects licensees.

Law No. 20 of 1995: deal with procedures for urban planning throughout the country. In accordance with Article (3) of the Law, the Law aims at optimising land uses and ensuring land use compatibility with environmental conservation and preservation of biodiversity. It emphasises on protection of agricultural land and sites for natural resources from various economic activities such as construction and building works. In harmony with the other legal instruments, it emphasises on environmental protection (valleys, water groundwater and coastal ecosystems) from adverse sources such as pollution, and other land uses.

Presidential Decree on Law No. 43 of 1997 is an amendment of the Republican Resolution on Law No. 42 of 1991 regulating fishing, exploitation and protection of aquatic animals. The law prohibition fishing in the territorial waters of the

Republic unless upon acquiring the required licence from the Ministry except for local vessels operating without engines

Yemeni Law No. 11 of 1993 concerning the Protection of Marine Environment from Pollution aims at protecting marine ecosystems from pollution, with focus on oil spillage from international passing ships. The law forms the basis for prosecuting, penalizing and requesting compensation from ships that pollutes the marine ecosystem. It gives the Public Corporation for Maritime Affairs the legislative power to deal with oil pollution at sea. The Law prohibits any form of discharge of pollutants into the sea without prior treatment. It further prohibits construction on the seacoast or near it, which may result in discharge that contravenes the provisions of the Law, unless sewage and wastes treatment units are provided.

Law No. 15 of 1994: It deals with the legal provisions of ships registration, documents, monitoring and supervision, marine accidents/incidents with emphasis on introduction of safeguards against pollution.

Law No. 25 of 1999 regulating and handling of pesticides: the objective of the Law is to ensure proper handling of herbicides, pesticides and procedures for registry, monitoring and inspecting herbicides in an effort to avoid the danger posed by them and their toxic effects on the health of humans, animals and the environment.

Law No. 37 of 1991: defines the territorial waters and the exclusive economic zones of 200 nautical miles, the boundaries of the islands. It emphasizes on the prohibition of dumping any wastes into the marine ecosystems. It explicitly states that "the passage of a ship or submarine or a submerged ship will be considered as a non-land passage if such a ship in any form while in territorial waters committed an act that caused intentional pollution that is harmful to human health, marine life and marine environment."

Law No. 32 of 1999 on Agricultural and Veterinary Quarantine regulations: It regulates the introduction of plants and agricultural products into Yemen and the issuing of health certificates for any importation.

Law No. 20 of 1999 on Agricultural Seeds and fertilizer uses: It regulates handling and use of fertilizers and seeds species, including monitoring and inspection and recording of their use.

Law No. 39 of 1999: is concerned with the general cleaning. I in accordance with Article No. (3), it aims at protecting the environment and public health, and

disposing of wastes by using proper methods, or treating them, or recycling them by using up-to-date techniques. The Law prohibits dropping, placing, or leaving behind wastes on seacoast, agricultural land, storm water courses and wadis valleys. The law also in accordance with Article No (10), prohibits the manufacture and import of plastic bags that do not breakdown and disintegrate with time.

A Forest Law: Its objectives are: forest protection and preservation; forest development; management and regulation of forest formations; erosion and desertification control; and contribution to the national economy. The law prohibits six specific actions that are considered harmful to forests.

Water and Irrigation Law of 1999: aims to promote the sustainable use of water, protect water resources from overexploitation, and balance the water needs of the various communities and sectors. The Law places more emphasis on conservation and sustainability rather than on water resources development. It aims at improving irrigation efficiency, to optimize its use, and to establish a strong central entity to oversee irrigation issues in the country. The law addresses a range of irrigation-related issues, such as institutional restructuring, mechanisms to prevent and resolve land and water tenure disputes, pollution prevention, and awareness campaigns.

2.10. Factors affecting biodiversity loss in Yemen

In order to update and align a relevant, responsive and effective NBSAP, it is necessary to identify the direct and underlying factors/parameters that influence biodiversity in the country. This approach will ensure that relevant national objectives, pathways, strategic national activities are designed to halt, decelerate and reverse biodiversity loss in the country. This section thus attempts to identify the cause of biodiversity loss in the country which will guide identifying pathways leading to achieving favourable ecosystem outcomes.

Despite the progress made in conservation and protection, Yemen is losing its biodiversity which is threatening its economic development and community livelihoods. Biodiversity is key to human survival in country as over 15 million Yemenis are directly dependent on it.

Biodiversity loss is clearly manifested through ecosystem degradation. Degradation of terrestrial ecosystems occurs in various forms. These include degradation of terraces from water erosion, degradation of farmlands, loss of fertile soil, rangelands, woodland and deforestation. Similarly, marine

ecosystem degradation is evident from destruction of coral reefs, coastal erosion and mangroves deforestation and degradation. There are various factors that contribute to unprecedent biodiversity loss in the country. These include both the direct and indirect causes.

2.10.1. Key direct pressure influencing biodiversity loss

2.10.1.1. War/conflicts in the country

The United Nations Environment Programme has documented the effects of war and armed conflicts. The study has provided compelling evidence that armed conflict directly contributes to the ecosystem degradation and biodiversity loss. The direct impact of armed conflict is wildlife loss which is harvested for income generation a source of unsustainable use. Similarly, they are also seen as a source of income for traders, which accelerates and stimulates the illegal trade in species.

Furthermore, due to the conflicts and the restricted movements of fuels, communities have resorted to fuelwood as the only source of energy. This has significantly impacted on species habitat further worsening biodiversity loss in the country.

Due to the armed conflict, PAs which have been established to protect and conserved wildlife species have become inefficient as evident from the reported BII of 0.55 against the national BII of 0.97. Ahmed (2023) highlights that because of the armed conflicts; Yemen is technically on the verge of an unimaginable environmental catastrophe.

Ultimately, the continued conflict in Yemen has stripped away the environmental governance and weakened the institutional capacity in the country to conserve and protect biodiversity (Conflict and Environment Observation, 2021).

2.10.1.2. Unsustainable Agricultural practises

It is estimated that approximately 1.6 million hectares is arable land, of which 1.488 million is cultivated (Conflict and Environment Observation, 2021). This represents a mere 2.8% of the country's total surface area. However, the agricultural sector is one of the most environmentally destructive and degrading economic activities in the country. Estimates are that the sector

accounts for over 90% of water abstraction which is against the global average of 70%. One of the most consumptive production processes within the agricultural sector is production of qat which account for over 30% of total water abstraction (Gadain, 2023). In addition to using disproportionate amount of water, qat production equally require a lot of pesticides and fertilisers which results in environmental pollution and insects' loss resulting in ecosystems functions loss such as pollination thus threatening food security. The major impact of unsustainable practises includes:

- Widespread water and soil erosion,
- sand dunes encroachment and desertification,
- terrace abandonment,
- loss of soil fertility due to soil salinity,

Increased sedimentation in water bodies causes significant changes to water quality and aquatic habitats. It affects the biochemical oxygen available to aquatic organisms, alters water temperature, and reduces light penetration. Moreover, it can increase the risk of flooding, degrade ecosystems, and impact water supply. Importantly, sedimentation reduces the water supply available for land animals, threatening their survival

Furthermore, the agricultural sector is directly responsible for deforestation in the country. For instance, it is reported that Jabel Bura's and the Hawf Protected areas deforestation is a result of agricultural activities mainly crop production and livestock grazing (Conflict and Environment Observation, 2021).

2.10.1.3. Land uses change

Land use change is another factor that has a direct impact on biodiversity loss. Yemen is a country that is faced with noticeable land uses change due to urbanisation amongst other factors. It is reported that urban encroachment is evolving at high rates contributing directly to ecosystem and biodiversity loss, particularly the loss of ecologically sensitive areas such as mangroves, forest and wetlands amongst others.

Yemen urbanization is attributed to multiple socio-economic and policy drivers such as high population growth, increased urban immigration, poor land use planning and outdated urban plans. The absence of comprehensive land use plans and human settlement plans has resulted in the growth of informal

settlements encroaching into wetland, forests, and agricultural ecosystems. Furthermore, illegal dumping sites have also degraded these ecosystems.

Furthermore, increased population in urban cities causes increased domestic water consumption and demands for food, fuel and other natural resources, leading to increased waste generation (solid and liquid). Ecosystem pollution (air, water and land) is one of the main drivers of species loss.

2.10.1.4. Destructive economic activities (Unfavourable Tourism)

Economic activities such as tourism were some of the rapidly growing industries prior to the conflict. It is projected that after the conflict, the sector will experience rapid growth. Meeting these tourism demands has previously led to unplanned construction of tourism resorts, uncontrolled movements of tourists resulting in trampling, disturbance and destruction of habitats, mainly the salt marshes, lagoons, wetlands and mangroves.

In addition, tourists' activities have previously exerted extensive direct pressures on biodiversity in the form of uncontrolled hunting, plant collection and waste disposal. Wastes generated by hotels are often dumped in ecologically sensitive areas and this had affected the species population.

The unplanned construction of tourism infrastructure combined with roads development sometimes on ecological sensitivity areas has had an irreversible impact on species population contributing to biodiversity loss. For instance, it is reported that the upgrading and widening of the road along the Jabel Bura'a forest has cause significant and irreversible damage to 13% of the forests (Conflict and Environment observation, 2021).

2.10.1.5. Unplanned infrastructure and production processes

The economic sectors that impact the country biodiversity that are associated with unsustainable production processes are the mining specifically oil and gas and the manufacturing industry (EPA, 2017). The current production processes adopted by these economic sectors is reported to be destructive and unsustainable, causing biodiversity loss and ecosystem depreciation (EPA, 2017). The main factors contributing to the existence of current production pattern across all production sectors are attributed to inappropriate practices,

abandonment of traditional good practices, and weak institutional capacities to monitor production activities.

Excessive use of environmental destructive technologies has negative impact on the ecosystems mainly the marine ecosystem. For instance, Kamaran Island is a marine protected area that is currently threatened by SAFER Floating Storage and Offloading terminal that is permanently moored 14 km from the island.

Road construction whose planning is not ecologically conscious is another developmental infrastructure that is having an irreversible impact on biodiversity. Over the period of 1960 to 2005, the network of paved and unpaved roads in Yemen has increased by about 71,300 km^2 (EPA, 2017). This has irreversibly resulted in the wildlife habitat and thereby species loss. A classical case is the Hawf protected area which has been significant impacted by road construction.

Similarly, a significant increase in number of airports, seaports, and transportation corridors has occurred over the same period, leading to increased encroachment on valuable agricultural land, destruction of landscapes and disruption of ecosystems (EPA, 2017). The negative impacts of infrastructural development have been severe, especially where such facilities are constructed around ecologically sensitive areas. In many instances, the construction of the infrastructures does not comply with the EIA and Environmental Management Plans (EMP) legislation.

2.10.1.6. Climate change and variability

Intergovernmental Panel on climate Change (IPCC) has provided irrefutable evidence that climate change is a reality and occurring at an advanced stage. IPCC (2022) highlights that observed increase frequency and intensity of climate and weather extremes (high temperatures, heavy precipitation events, drought and fire weather), have resulted in widespread, adverse impacts on ecosystems amongst others.

At the global level, it is report that biodiversity loss and degradation, damages to and transformation of ecosystems are already key risks for every region due to past global warming and will continue to escalate with every increment of global warming (IPCC, 2022). More disturbing is the fact that for the terrestrial

ecosystems, 3 to 14% of species assessed will likely face very high risk of extinction at global warming levels of 1.5°C, increasing up to 3 to 18% at 2°C, 3 to 29% at 3°C, 3 to 39% at 4°C, and 3 to 48% at 5°C (IPCC, 2022). In ocean and coastal ecosystems, risk of biodiversity loss ranges between moderate and very high by 1.5°C global warming level and is moderate to very high by 2°C but with more ecosystems at high and very high risk (high confidence). For endemic species it is projected that very high extinction risk will likely double from 2% between 1.5°C and 2°C global warming levels (IPCC, 2022).

Due to its aridity, Yemen is already experiencing significant signs of climate change as evident from frequent and intensifying recurrent droughts, extreme precipitation resulting in flood events. For instance, the floods of 2008, resulted on death of 180 people, displaced 10,000 and an economic loss of US$1,638 million. According to Ahmed (2023) global warming has intensified environmental issues such as biodiversity loss, desertification, and sea-level rise in Yemen.

As projected by the IPCC, sixth assessment, climate change will have worsened the already precarious biodiversity loss in the country. An assessment of the current state of ecosystems in Yemen indicates that they are degraded with varying degree of degradation. Therefore, through increased and sustained droughts, floods, high tidal waves and storms, ecosystems and biodiversity in Yemen will be irreversibly affected by the impacts of climate change.

Valuable ecosystems such as mangroves and coastal communities will be significantly impacts through increase and sustained high tidal waves from tropical storms and depressions and the sea level rise (SLR). Mangrove loss will have multiple impact on major marine ecosystems (coral reefs and seagrass ecosystems) which are protected by the mangroves. Incidentally coral reefs provide habitat to 25% of the marine species and their vulnerability due to destruction of mangroves will have significant effect on biodiversity loss.

Climate change is anticipated to alter the frequency and intensity of storms, leading to disturbance of the breeding pattern and population of various species such as fish, birds and turtles. In addition, most of Aden Governorate sandy coastal beaches, ecological systems (i.e. wetlands and underground aquifers) and most of the coastal zone are considered sensitive to the indicated accelerated SLR projections (EPA, 2017).

Last but not least, climate change will have widespread impact on food production, crop genetic further exposing the food production sector to the impacts of climate change.

2.10.1.7. Spread of invasive alien species

Over 21 invasive plants have been documented in Yemen. Invasive species cause widespread ecosystem degradation and species loss. Firstly, they outcompete the native species leading to mono-species (single species as they colonise an ecosystems) and thereby reducing the species diversity in a given locality.

Secondly, they cause damage to the native habitats or ecosystem through rapid colonisation and overuse of the given resources (water) in an area. Furthermore, they cause habitat damage through the spread of the diseases affecting the native species and, hence reducing biodiversity. According to IUNC (2021) invasive species are one of the biggest causes of biodiversity losses, as well as global threat to food security and livelihoods.

Inability to control introduction of invasive plants, seeds, microorganisms and animals has caused the degradation, decline and extinction of some native and/or endemic species (EPA, 2017). Crops such as wheat, lentil and millet are examples of local varieties whose yield and quality are deteriorating because of introducing homogenous high yielding varieties (EPA, 2017).

Similarly, the introduction of alien genera of honeybee has resulted in reduction of the Yemeni honeybee race Apies mellifera jemenitica as a result of spreading of the Varroa mite pest (EPA, 2017). Species such as *Opuntia dillenii* and Prosopis juliflora in Bura'a national park have caused ecosystems degradation.

Climate change and the associated impact mainly drought episodes, could accelerate the rate at which the invasive species are colonising the ecosystems in Yemen. Extreme climatic events associated with climate change, such as hurricanes, floods and droughts can transport invasive species to new areas and decrease the resistance of habitats to invasions (UNCN, 2021).

2.10.1.8. Ecosystem pollution

The volume of solid, liquid and gaseous waste generation including hazardous waste is increasing rapidly as a direct result of increased population and the need for economic growth and development. Without proper waste management facilities (wastewater, solid waste and hazardous wastes), arable land, marine and aquatic ecosystems are being increasingly contaminated, leading to the reduction in ecosystems productivity and hence the delivery of their services to support species population (EPA, 2017; Saleh et al., 2017; Saleh and Al-Sallami, 2022; Taher et al., 2023 Taher et al., 2023).

Water ecosystems, particularly shallow aquifers, water courses of wadies, natural springs and traditional dam reserves are contaminated primarily by industrial and residential waste, wastewater effluents, and inappropriate agricultural practices (EPA, 2017).

Overuse of agrochemicals, pesticides, insecticides, fertilizers and fruit ripening agent in the agricultural sector is having an irreversible impact on species population such as insects, fish, birds and mammals.

Coastal and marine habitats are contaminated from land-based sources such as agrochemicals wash and discharge of untreated domestic and industrial wastes (EPA, 2017 and Nasr et al., 2006). The discharge of excessive nutrients from urban and industrial wastewaters, contributes to the enrichment of inorganic and organic material in marine waters. Eutrophication can lead to the detrimental changes of the structure and function of both living organisms and non-living components in an ecosystem (Saleh and Al-Halmi, 2021).

Air pollution is another ecological disaster in the country that is threatening Yemen biodiversity. Air pollution results from energy production and use in mining, oil, gas production and transportation sector (EPA, 2017). Air pollution from pollutant emissions has become a threat to the biological system and human health. These air pollutants (gases and particulate) come from different sources such as industrial facilities, diversity of mobile or stationary sources such as vehicular emission, power generation plants, oil burning, waste incineration, as well as construction and demolition activities [Taher et al., 2021].

2.10.1.9. Illegal trade in species

Illegal trade in species such as bird mainly falcons, waterfowls, and other species is reported to be on the rise in the country. Furthermore, the country is a passage for illegal trade for exotic wildlife, which are often smuggled from the Horn of Africa through Yemen to rich buyers in the Gulf. Illegal trade in species obviously contributes to species loss in the country and will results in extinction of species which are heavily traded.

2.10.2. Indirect drivers accelerating biodiversity and ecosystem loss

The indirect drivers are underlying socio-economic factors that create a conducive environment for biodiversity losses and ecosystem degradation. They generally entail absence/lack and weak legal and policy, institutional frameworks, socio-economic characterises such as poverty levels amongst others. The indirect drivers generally create a leveraging environment for the direct causes of ecosystem degradation and species loss.

2.10.2.1. Economic failures and distortions

One of the underlying causes of ecosystem degradation and species loss is economic failure to mainstream the economic value of biodiversity in national planning and decision making. Even though biodiversity economic value is estimated to be ten times the country's GDP, this economic value is not known to the economic planners and policy makers. Consequently, this results in insufficient budgets and lack of emphasis on biodiversity conservation and protection initiatives. Most of the ecosystem values such as value of energy from fuel wood, the medicinal values of forests, pollinators, etc. are not accounted when estimating GDP. Under-valuation of goods and services delivered by the country's ecosystems resulted in a number of inappropriate harmful policies in various sectors. Consequently, as biodiversity values escape policy and economic decision making, some economic sectors such as agricultural are valued and prioritised more than ecosystems and biodiversity. This result in agricultural sector allocated more budget for expansion and allocated more water rights for irrigation at the expense of ecosystems water needs. Low water tariffs are a reflective of the current lack of mainstreaming the economic value of wetland ecosystems in decision making.

Another underlying factor that is linked to widespread pollution, drying up of wetland ecosystems and aquifers and ecosystem degradation, is the market failure to externalise the externalities. Most of the activities such as the use of pesticides and fertilisers have significant environmental costs which are borne by the ecosystems users but excluded in the decision making by the users. It is thus critical that policy interventions are put in place to internalise these externalities.

Void in the implementation of legal and policy frameworks

The country has developed comprehensive legal and policy framework to safeguard Yemen biodiversity. These include presidential decrees, Acts, policies and strategies. However, it is worth noting that the legal and policy framework is highly fragmented among several highly centralized agencies resulting in a void to implement the legal frameworks. Thus, coordination amongst the institutions is weak.

Another conspicuous characteristic of the legal framework is the weak involvement of the key stakeholders such as the private sector, women groups, local community, and NGOs. In addition to the obsolescence of these laws and legislations and their failure to accommodate emerging issues, which requires expediting their updating to meet Yemen's obligations under the relevant international agreements.

Consequently, the void in the legal and policy framework has results in lack of implementation, and enforcement of the policy. For instance, the enforcement of the EIA is weak resulting in widespread non-compliance. The same scenario is observed in the water sector, forest and rangeland, land resources which are characterised by the absence of comprehensive land use plans and human settlement plans, and the marine ecosystem.

There are also deficiencies in the legal and policy framework for the national biosafety regulations. There is lack of national Biosafety legislations to regulate the use and release of living modified organisms and the transfer of biotechnologies (EPA, 2017).

2.10.2.2. Weak institutional capacity for biodiversity conservation

Institutional capacity to implement and monitor biodiversity conservation effort is critical for the country's programme. Yemen leading institution in biodiversity

conservation and protection is the EPA. Consultation with the key informants reveals that the country institutional capacity to enforce, implement and monitor biodiversity is currently at its weakest point. One of the factors that aggravate the weak institutional capacity is a decade long conflict in the country. Over the years, the conflict has eroded the country institutional capacity to implement effective conservation management plans.

Furthermore, institutional capacity is a function on financial resources and the skilled/experienced manpower. An assessment of these two fundamental aspects reveals that there is limited funding from both international donors and domestic public spending. Thus, weak institutional capacity and under-funding means that there is a void between the existing legal and policy frameworks and their implementation.

Finally, the country has limited institutional capacity for the management and monitoring of biotechnology and biosafety issues, which is attributable to limited financial resources, equipment, expertise and facilities for both the biosafety unit in EPA and Quarantine centers (EPA, 2017).

2.10.2.3. Lack of involvement of stakeholders to effectively implement the plans

An effective national biodiversity conservation and protection require all-of-Government, all-of-society approach. As a cross-cutting issue, biodiversity is used and affect all members of the communities and all the departments. Therefore, it is critical that all members of the community and the governmental departments are involved in biodiversity conservation programmes and projects. However, currently there is significant lack of critical stakeholders' engagement in the biodiversity conservation national programmes. This deficiency results in lack of participation of communities who end up undertaking unsustainable economic activities which are against the national biodiversity conservation programmes.

2.11. The need for biodiversity action plan

Yemen's biodiversity is at peril state of widespread ecosystems degradation, jeopardizing the existence of various species that are dependent on these ecosystems and community livelihoods. There is widespread deforestation, ecosystems degradation from land uses changes and pollution, overharvesting of vital fish resources and over-extraction of critical water resources.

Whilst biodiversity in Yemen is under intense pressure from anthropogenic activities, its critical role in supporting community livelihood is undeniable important. Conversely, protecting biodiversity is tantamount to preserving human lives. It is thus critical that biodiversity is protected to ensure and enhance flow of ecosystems functions and services that support both national economy function and the fabric of humankind. These NBSAP is thus updated to ensure protection and preservation of vital ecosystems and biodiversity in the country.

Furthermore, as a member of Convention of Parties (COP), Yemen is obliged to develop and operationalise its biodiversity action plan in fulfilment of the United Nations 'Earth Summit' in Rio de Janeiro in 1992, specifically the three conventions being: The United Nations Framework Convention on Climate Change, the UN Convention to Combat Desertification and – most relevant to this Plan – the United Nations Convention on Biological Diversity (CBD). The CBD aims are:

- conservation of biological diversity,
- sustainable use of its components,
- fair and equitable sharing of benefits arising from the use of genetic resources.

The CBD will be implemented through the NBSAP III. This NBSAP is the country's third NBSAP and it is implemented in accordance with the Kunming-Montreal Global Framework targets.

2.12. Lesson learnt and experience from past NBSAP II implementation

The second phase of the National Biodiversity Strategy and Action Plan had 20 national targets that were operationalized during the period 2017-2023 in the form of strategic outputs, outcomes and activities. Some activities have been implemented and the country has faced some major challenges and implementation gaps due to the ongoing war and lack of funding.

.1. lessons learnt

Various lessons have been learnt during the implementation of NBSAP II. These lessons were critical in informing and strengthening the arrangements for the implementation of NBSAP III. One of the important lessons is that fact that there is a need to involve all the stakeholders in the implementation of the strategy.

This is important as stakeholders such as communities are the immediate users and technically the ecosystems managers and stewards. Therefore, bringing them on board in the implementation will result in successful implementation of NBSAP III. Implementation of the previous NBSAP, lack community and private stakeholder participation.

For the stakeholders to participate in the NBSAP implementation they have to know its existence and its objectives. Consultation with the stakeholders indicated a low level of knowledge of the NBSAP. Therefore, this hindered community participation and its implementation at the community level as they have no knowledge of its existence. Therefore, communication of the NBSAP through various forum and stakeholder engagement is crucial for the successful implementation of the NBSAP.

Monitoring and evaluation of the NBSAP is essential and form the basis for lessons learned which is critical for improving the country biodiversity management. Consultation reveals a gap in M&E process. The country lacks a robust M&E framework.

In addition, to M&E, the country lacks a dedicated database for information storage and management. Effectively, without a dedicated database, it is impossible to undertake M&E as there is no data on the indicators.

Another important lesson learnt is the importance of adequate funding for the NBSAP implementation. This lesson has resulted in the emphasis of developing NBSAP III financing strategy.

During the implementation of the NBSAP some of the success that has been realized are as follows:

- Increasing awareness of the importance of biodiversity and their role in the environment. There has been a lot of publicity about biodiversity through media platforms and issuing of pamphlets and booklets about avian species and their contribution to national economy,
- Inclusion of ecosystems and biodiversity in school curricula: one of the direct results of implementing the NBSAP II was the mainstreaming ecosystem and biodiversity into school curricula. This is a positive step towards mainstreaming biodiversity in national planning and decision making at the national and regional levels.

- Promoting tourism for birds and important bird sites in Yemen and facilitating eco-tourism around them: there has been some promotion of bird watching and identification of important bird's sites in the country which has resulted in increase eco-tourism activities.
- Protecting wetlands, providing effective management, and declaring them natural reserves: due to the implementation of NBSAP, robust wetland management initiatives have been undertaken to promote their sustainable use and waste management initiatives.
- Organizing visits to the Yemeni islands, which are known to be important for bird reproduction, and preventing illegal taking of the bird's eggs and young.
- Identification and announcement of new reserves: The country has identified additional biodiversity conservation areas as per the NBSAP II whose target was to expand the existing PAs.

.2. Challenges of implementing the NBSAP II

One of the stern challenges faced by the country in NBSAP implementation is the on-going armed conflict. Yemen has experience armed conflict since 2015 as a result of the Houthi coup against the legitimate authority. This close to a decade conflict coincides with the implementation period of the NBSAP II. Armed conflict created significant challenges as almost all the NBSAP activities were interrupted, and the focus was on resolving the armed conflict. This significantly undermined the implementation progress of the NBSAP.

Another challenge that is linked to the armed conflict was lack of funding for the implementation of the NBSAP II activities. NBSAP implementation requires significant funding both from the government and the international sources. With the ongoing conflict, all the limited financial resources were diverted to conflict resolution which affected the NBSAP II implementation.

One of the effects/impacts of the conflicts is that it weakened the country's institutional capacity and environmental governance, creating a void in the implementation of the critical environmental programmes. The current on-going conflict has undermined institutional capacity and environmental governance. This has had a major impact on the NBSAP implementation as there is limited capacity and governance for NBSAP II implementation.

Implementation of environmental and ecosystem programs requires reconnaissance field visit to implement activities such as rehabilitation, restoration, monitoring and wildlife surveys. However, since the beginning of the conflict in 2015, there has been limited field visits to carry out these activities.

2.13. NBSAP III development Processes approaches

This NBSAP is an update of the NBSAP II. Subsequently, its update involves a holistic and comprehensive approach that entailed a review of the NBSAP II, desk review on the ecosystem and biodiversity trends, review of Kunming-Montreal Global Biodiversity Framework and consultation with the stakeholders through national workshops and focal group discussions. These approaches are discussed in detail below.

The Kunming-Montreal Global Biodiversity Framework

K-M GBF was adopted by 196 member's states at UN Biodiversity Conference (COP 15) in December 2022. It aims to halt and reverse nature loss. It includes 4 goals by 2050 and 23 global targets for 2030. As per Decision 15/6, countries collectively agree to revise their existing NBSAP by ensuring that their national targets are addressing and contributing towards each of the goals and targets of the K-M GBF. Consequently, this involved ensuring that the national targets are aligned to the K-M GBF targets, taking into account the availability of resources and means of implementation. Therefore, the overarching approach for revising and updating NBSAP II was to review the K-M GBF goals and targets. It was on the basis of the aligned national goals and targets that the strategy was formulated.

Consultation with key stakeholders

Consultation with stakeholders was another approach that informed updating of NBSAP II. Key to the consultation process, was the key approach by the K-M GBF of *all-of-Government, all-of-society.* All the key stakeholders representing all the government line-ministries and all stakeholders representing different groups were invited to the consultation workshops. The consultation workshop was divided into groups to avoid and reduce dominance of one group over the other. Two main national consultations workshops were conducted. The first one being aligning the NBSAP II national targets to the K-M GBF targets, and the

second workshop involved identification of the national strategic activities to be implemented and updating sections on the current trends and status of biodiversity.

The updating of the national targets followed the CBD guidelines which involved assessing the degree of alignment between the national targets and the GBF targets. This was done for each of the national target against the Global targets. For the national targets that were deemed to be closely aligned to the global targets, efforts were made to further align them to the global. It was on the basis of aligning the National targets to the K-M GBF that the NBSAP II was updated by developing the biodiversity pathways, outcomes and the outputs. Ultimately, the updating process involved an all-of-government and all-of-society to ensure ownership and buy-in from all the stakeholders (government and community)

Desk review

Updating of the NBSAP II does not necessarily mean aligning the national targets, but also revising information to reflect current state of the ecosystems and biodiversity trends. Therefore, extensive desk review was undertaken on current status of ecosystems, trends in biodiversity in terms species population, categorisation of the species as per the IUNC list amongst others.

Key considerations in developing the NBSAP III

One of the key considerations that were made was to ensure that the NBSAP III builds on the existing NBSAP. This was deemed critical to ensure that the rhythm of implementing the NBSAP is not disrupted but maintained. Importantly, it was rationalised that a total overhaul of the NBSAP will create confusion and institutional memory loss in continued implementation of the NBSAP.

Another key consideration in the development of the NBSAP was the element of biodiversity conservation to be community-centric that is conservation should be undertaken with the primarily objective of benefiting the communities. Therefore, the key element of the NBSAP III is to enhance ecosystems services and function flow to support national economy and community livelihoods.

3.0. Yemen Biodiversity Strategy

3.1. The Vision

Yemen values its natural resources and endeavors to put in measures and system in place to protect, conserve and sustainably utilized its resources. Yemen recognizes that achieving economic development and poverty reduction is anchored around sustainable ecosystems management.

The vision of this NBS III is

Ecosystems and their diversity are fully restored, conserved, protected and properly valued to ensure optimal flow of functions and services to support the Yemeni national economy and Yemenis livelihoods

3.2. Guiding principles

The updating of the NBSAP III and subsequent implementation was and will be guided by a set of robust and encompassing guiding principles. The guiding principles were informed by the stakeholder's views and consistent with the CBD guiding principles. Furthermore, they are consistent with the country's legal framework and overall national priorities of biodiversity conservation and protection

Ecosystem based approach: this is an approach that emerged as the central principle in the implementation of the Convention of Biological Diversity (CBD). It is a strategy that aims at integrating management of land, water and living resources that promotes conservation and sustainable use in an equitable and balanced manner. The approach recognizes the intricate connectivity between land, water and living systems and thus strives to ensure that an all-inclusive approach is required to manage ecosystems. Thus, in implementing the NBSAP III efforts will be concentrated in ensuring holistic management of the ecosystems due to their connectivity. The guiding principle recognizes the fact that adaptive management is required to deal with complex and dynamic nature of ecosystems (Secretariat of the Convention on Biological Diversity, 2004).

All-government and all-society participatory approach: Ecosystem and their diversity is cross-cutting, influencing all the government department and society and at the same time affected by all government and society actions. Therefore, ecosystem and biodiversity management require the participation of all the stakeholders. Efforts will be concentrated in ensuring that the entire decision making is inclusive of all the stakeholders to ensure that each party interests are protected and respected. This guiding principle resonates with the CBD emphasis of all-of-government and all-of-society approach in updating and aligning the NBSAP to the K-M GBF targets.

Community-centric: Community in the country is highly reliant on the ecosystem's functions and services both directly and indirectly. Some of the services that the community derives include fuelwood, medicine, foods, water among others. Therefore, the primary and ultimate objective of biodiversity conservation is for the benefits of the community. Consequently, biodiversity conservation and protection will be community-centric for the community to continuously derive the benefits in a sustainable manner.

Mainstreaming ecosystems value in decision making at all levels: one of the reasons for biodiversity conservation program failure is lack of adequate funding and weak legal frameworks. These arise because ecosystems values are not mainstreamed into decision making at the national and local levels. This NBSAP will strive to ensure that economic values of ecosystems are mainstreamed at all levels of planning and decision making to enhance proper budgeting and financial planning at all levels.

Promote co-management approaches: PAs such as national parks and game reserves generally exclude communities adjacent to them. This creates conflict with the communities resulting in ineffective PA management. It is thus vital to include the communities in the management of the PAs through co-management. This has multiple benefits of improved security, reduced conflicts and increased effectiveness of the PAs as the community becomes part of the management bodies.

Blending traditional knowledge and science in ecosystem management: there is strong evidence that traditional knowledge and traditional management practices were effective in ecosystems management. Therefore,

the NBSAP III aims to blend proven traditional knowledge and science for sustainable ecosystem management.

Incorporation of Disaster Risk Mitigation (DRM): this strategy recognizes the need to incorporate DRM approaches and practices in biodiversity management to halt the loss of biodiversity, so as to ensure ecosystem resilience for providing ecosystem services sustainably. At the same time, it is necessary to recognize the role of ecosystems in DRM to prevent socio-economic losses.

Promoting international cooperation in biodiversity management: biodiversity such as marine, avian and transboundary and require cooperation between countries. This NBS will thus strive to promote and strengthen cooperation at the regional and global level.

3.3. The NBSAP III Framework

The current NBSAP builds on the preceding NBSAP II for 2010-2020. Its duration is 5 years (2025-2030). It was developed to accommodate and to be aligned with the existing global protocols and convention with emphasis on the UNCBD COP 20 with emphasis on the K-M GBF Targets, Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising from their Utilization; 2030 Sustainable Development Agenda, UNFCCC Paris Agreement amongst other global conventions.

Recognising the cross-cutting nature of biodiversity, The NBSAP Framework advocates for strengthening the institutional horizontal and vertical integration in its implementation. Furthermore, it promotes all-of-government and all-of-society approach. It is evident that biodiversity requires the full participation of the communities who are mostly custodians and managers of these resources, therefore, the cornerstone of this NBS is promoting co-management of the ecosystems inclusive of PAs. Emphasis is places on institutional arrangements, blending traditional knowledge with science based, co-management amongst others.

The M&E forms an important of the NBSAP and is highly prioritised. M&E will be undertaken in a timely and comprehensive manner following the recommended CBD approaches. The NBSAP has 6 pathways that are prioritised to be achieved with several outcomes and outputs.

4.0. Framework of action/pathways

The NBS contains a total of six pathways that define the country's biodiversity priority areas. The pathways were derived to be results oriented and aim to attain a balance between conservation, protection and sustainable utilization of biodiversity. In line with the K-M GBF, the pathways contain 19 national targets which are specific, measurable, achievable and time-bound.

The six strategic pathways are aligned with the national priority of socio-economic development and poverty reduction.

4.1. Biodiversity pathways and targets

To achieve a balance between sustainable utilization and biodiversity conservation and protection, six (6) pathways were identified covering the thematic area of K-M GBF goals and the targets. Subsequently, they were designed to address the country's underlying biodiversity problems/challenges and contribute to the global efforts of halting and reversing species loss. The six pathways are:

- Urgent conservation and restoration needs to halt extinction of species
- Promote communities access and equitable benefit sharing from biological resources and contribution to national economy
- Safeguard ecosystem integrity through sustainable uses and reduced anthropogenic pressure
- Guarantee adequate resources means to support implementation of the biodiversity conservation
- Use of appropriate economic instruments to create an enabling environment for sustainable use
- Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

The six pathways have 19 national targets which are aligned to the K-M GBF goals and targets. Table 7 depicts the national policy areas, targets and their alignment to the K-M GBF goals and targets.

Table 7: National objectives, their targets and alignment to K-M GBF

Pathways	Target	K-M GBF
Ensure urgent conservation and restoration needs to halt extinction of species	Target 1: By 2030: 20% of areas of environmental importance should be under spatial planning and effective management. By 2050, all land in Yemen should be under spatial planning to prevent land use changes in biodiversity-rich ecosystems. This includes sustainably increasing the area, quality, connectivity, access to, and utilization of green and blue spaces in urban and densely populated areas.	GBF 1
	Target 2: By 2030, restore 20% of degraded ecosystems on land and inland waters, coastal marine environments, wetlands, mangroves, and forests. By 2050, effectively restore all degraded ecosystems to enhance their capacity to provide ecosystem services that support the livelihoods of local communities and the national economy	GBF 2
	Target 3: By 2030, 20% of biodiversity-rich ecosystems should be conserved and managed under effective and interconnected terrestrial and marine protected areas with joint management systems, where local communities play an active role in conserving and managing existing protected areas.	GBF 3
	Target 4: Take urgent measures to prevent extinction caused by human activities, natural factors, and climate changes for threatened species, and restore and conserve species to significantly reduce the risk of extinction. Additionally, preserve and restore genetic diversity within native, wild, and domesticated species communities. By 2030, list all endangered species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and implement specific conservation measures to reduce the risk of extinction caused by human activities for priority threatened species or their trade	GBF 4
	Target 9: By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.	GBF 9
Promote communities access and equitable benefit sharing from biological resources and contribution to	Target 11: By 2030, restore 20% of priority degraded ecosystems to enhance the flow of ecosystem services to support community livelihoods and the national economy, including providing disaster risk reduction services. Restore and protect aquatic ecosystems to increase their capacity to sustainably provide water services to about 80% of Yemen's population by 2050	GBF 11
	Target 12: By 2030, integrate urban green spaces (recreational) into urban land use planning, ensuring their	GBF 12

Pathways	Target	K-M GBF
national economy	connectivity with nearby ecosystems to enhance the flow of ecosystem services, improve human health and well-being, increase connectivity with nature, and contribute to overall sustainable and inclusive integration while providing essential ecosystem functions and services	
	Target 13: By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning processes (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels	GBF 13 & 14
	Target 14: By 2030, ensure that all companies transparently disclose profits from the use of genetic resources and potential risks to ecosystems, and implement effective risk mitigation systems while ensuring fair benefit-sharing with communities.	GBF 15
Safeguard ecosystem integrity through sustainable uses and reduced anthropogenic pressure	Target 5: By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.	GBF 5
	Target 7: By 2030, significantly reduce pollution levels and the negative impacts of pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects and the ecosystems' capacity to absorb biodegradable pollutants. Achieve a 20% reduction in the use of agricultural chemicals and pesticides, and achieve 70% in recycling, reuse, and reduction of plastic waste by 2050.	GBF 7
	Target 8: By 2030, Integrating biodiversity within the Nationally Determined Contributions (NDC) for 2025-2030 by increasing the capacity of ecosystems to absorb greenhouse gas emissions through the restoration of at least 15% of degraded ecosystems (wetlands, mangroves, forests, and terraces). This contributes to mitigating and adapting to climate change and combating desertification, as well as focusing on ecosystem-based adaptation approaches to enhance resilience to climate change impacts and improve ecosystem resilience.	GBF 8
	Target 9: By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.	GBF 9
	Target 10: By 2030, implement ecosystem-based approaches in all agricultural systems (agriculture, aquaculture, fisheries,	GBF 10

Pathways	Target	K-M GBF
	and forestry) to ensure sustainable and safe food production in the future, conserve and restore biodiversity, maintain ecosystem services, including pastures and ensure that food production does not degrade due to ecosystem degradation.	
	Target 6: By 2030, prevent the introduction of any new invasive species into the country. Identify and take necessary measures to eradicate existing invasive alien species in environmentally priority sites and control them in lower priority sites.	GBF 6
Guarantee adequate means to support implementation of the biodiversity conservation	Target 17: By 2030, mobilize financial resources from all funding sources sustainably to bridge the biodiversity financing gap by 20%, and increase it to 80% by 2050.	GBF 19
	Target 18: By 2030, ensure an adequate scientific base, transfer traditional knowledge, enhance scientific research capabilities, monitoring capabilities, encourage innovations, and enable stakeholders to design, implement, and use advanced technology to conserve biodiversity. Ensure unrestricted access to necessary information, data, and technology for all stakeholders, including community members, involved in biodiversity management and conservation.	GBF 20 & 21
Use of appropriate economic instruments to create an enabling environment for sustainable use	Target 13: By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning process (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels.	GBF 13 & 14
	Target 16: By 2030, halve the monetary value of subsidies harmful to biodiversity and promote environmentally positive incentives targeting green technologies, ecosystem-based programs, and clean and renewable energy.	GBF 18
Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management	Target 19: By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making	GBF 22 & 23

Pathways	Target	K-M GBF
	Target 15: By 2030, train and enhance the competence of all relevant stakeholders in biosafety measures to protect the country's biodiversity and human health, benefit from eco-friendly and health-safe biotechnology, and strengthen monitoring and oversight of the transportation, handling, and use of genetically modified organisms and materials, providing necessary information to consumers in line with the Cartagena Protocol and national legislation	

Achieving the national targets will require government and stakeholders' commitment and participation in a coordinated manner. Furthermore, conflict resolutions at both the national level and community levels will contribute immensely to the attainment of national biodiversity vision.

At the national level and community, a set of strategic activities will be employed to actualize the NBS. These are discussed under each pathway. Furthermore, the outcomes and outputs are also highlighted.

4.2. Pathway 1: Ensure urgent conservation and restoration needs to halt species extinction

Yemen urgently needs to put in place effective conservation and restoration efforts to halt ecosystem degradation and species loss. Ultimately, uncontrolled ecosystems degradation could lead to mass species extinction. At the top of the list of the activities to implement is a combination of conservation strategies mainly in-situ and ex-situ conservation.

In-situ conservation is defined by CBD as "the conservation of ecosystems and natural habitats, the maintenance and recovery of viable population of species in their natural surrounding and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties". This is one of the areas of emphasis by the CBD. The PAs are thus the cornerstone for the in-site conservation. Currently Yemen PAs occupies only 0.77% of the country's land area. There is therefore a need to expand them, by identifying ecologically sensitive ecosystems and declare them as PAs. Additionally, it is critical that there is an improved PA management to conserve and protect species within the PAs. Currently, PAs are not operated and

managed effectively to protect and conserve biodiversity with a BII of 0.55 against the national BII of 0.87. The in-site conservation will thus entail the following:

- Habitat restoration, recovery and rehabilitation.
- Develop strategies for the sustainable use and management of biological resources.
- Recovery programmes for nationally or sub-nationally threatened or endangered wild species.
- On-farm agricultural biodiversity conservation targeted at traditional crop varieties and crop wild relatives.
- Genetic reserve conservation, i.e. monitoring of genetic diversity in natural wild populations within a delineated area (known as genetic sanctuaries or gene management zones)

Ex-situ conservation is the opposite of in-site conservation, and it is defined as the conservation of biological components of biological diversity outside their natural habitats. It entails storing seeds, conserving pollen, and for animal population storage of embryos, semen/DNA and captive breeding.

This policy area thus aims at ensuring that more conservation and restoration efforts are geared towards protecting and conserving biodiversity. This will be achieved through restoration of the degradation areas, increase effectiveness of the PAs by strengthening institutional capacity and enhance community participation in the management of the PA (co-management strategies). Ultimately, as per the community-centric guiding principle, this objective aims at enhancing flow of ecosystem functions and services for the community's beneficiation. Furthermore, it is vital that ecosystems that fall outside the PAs which are deemed areas of ecological significance are put under spatial planning. This will ensure that these ecologically significant areas are protected from land use change which is one of the direct factors that are responsible for ecosystem degradation and biodiversity loss.

This pathway constitutes 2 outcomes, the corresponding outputs and the national targets as discussed below.

4.2.1. Outcome 1.1: well restored functioning ecosystems supported by effective PA management

Yemen ecosystems are being degraded at an alarming rate from various economic activities. Furthermore, they are being fragmented affecting their connectivity. It is critical that efforts are concentrated on ensuring that these vital ecosystems are being restored, protected and conserved to guarantee optimal flow of ecosystems functions and services to support species and human activities. This outcome has several outputs and their strategic activities. These are highlighted below.

4.2.1.1. Output 1: Restored ecosystems that were degraded

Efforts will thus be geared towards restoring the identified degraded ecosystems. Restoration will be achieved through plantation of native species and controlling invasive species programs will be undertaken on the identified degraded ecosystems. Consequently, the degraded ecosystems will be restored to the near-original state to ensure ecosystem functions and services that support diversity, community livelihoods and national economy.

The targets:

- By 2030, restore 20% of degraded ecosystems on land and inland waters, coastal marine environments, wetlands, mangroves, and forests. By 2050, effectively restore all degraded ecosystems to enhance their capacity to provide ecosystem services that support the livelihoods of local communities and the national economy.
- By 2030, restore 20% of priority degraded ecosystems to enhance the flow of ecosystem services to support community livelihoods and the national economy, including providing disaster risk reduction services. Restore and protect aquatic ecosystems to increase their capacity to sustainably provide water services to about 80% of Yemen's population by 2050.

Achieving this output will involve implementing the following high level strategic actions:

ACT 1.1: Undertake a national mapping and assessment of the degraded ecosystems throughout the country and categorization of the extent of degradation, type of degradation e.g. soil erosion, deforestation, overgrazing, sedimentation and factors contributing to degradation

ACT 1.2: Development of ecosystem restoration and implementation plans and participation arrangements

ACT 1.3: Identification of the pro-poor economic community livelihoods and implementation plans to alleviate pressure from the ecosystems. Pro-poor economic community livelihood initiatives include alternative energy source, production of livestock feed from invasive species such as prosopis, apiculture, aquaculture

ACT 1.4: Establish communities' structure and collaboration structures with governmental departments that will spearhead and coordinate the restoration and rehabilitation program at the community

ACT 1.5: Develop a resource mobilization/financing strategy to finance restoration/rehabilitation plans

ACT 1.6: Train the communities' members on restoration programs based on the developed restoration and rehabilitation plans

ACT 1.7: Undertake ecosystem restoration program based on the developed restoration plans

ACT 1.8: Implementation of the identified pro-poor community livelihoods initiatives

ACT 1.9: Monitor and evaluate the restoration programs over time

4.2.2. Outcome 1.2: increase PA coverage with improved management and operational effectiveness

There are significant and rapid land uses dynamic with agriculture sector and the informal settlement encroaching into other land uses. Therefore, increasing PAs to safeguard and protect loss of species habitat will be a recommended step towards biodiversity conservation. At the moment, the terrestrial PA accounts for only 0.77% of the country's surface area. There are existing potential PAs that have been identified and waiting to be declared. Thus, this NBS presents a timely opportunity for the country to increase its PA coverage.

On the other hand, whilst it is critical that the PAs coverage is expanded in the country, equal emphasis must be placed on improving PA operational and management effectiveness.

4.2.2.1. Output 1.1: increased PA extent with improved management operational effectiveness

This output is aimed at expansion of the PA coverage in the country by identifying biodiversity-rich ecosystems throughout the country and declaring them as PA as per the Law 26 of 1995. Furthermore, management effectiveness will be enhanced through improved interconnectivity of the PA, increasing the participation of the local communities and adequate funding.

Currently, the PA management system is not effective as evident from the BII of 0.55. Improving effectiveness will be achieved through improved connectivity, co-management and decentralized PA management system and strengthening both the institutions and the community to increase PA operational effectiveness and efficiency. Effectively, this output calls for enhanced co-management of the PA to improve their operational management effectiveness.

The target:

- By 2030, 20% of biodiversity-rich ecosystems should be conserved and managed under effective and interconnected terrestrial and marine protected areas with joint management systems, where local communities play an active role in conserving and managing existing protected areas.

Achieving this output will involve implementation of high-level strategic activities as follows:

ACT 1.10: Undertake a national mapping and assessment to identify the ecosystem of high biodiversity throughout the country to identify those that can be declared PAs

ACT 1.11: Consultation with relevant stakeholders on the proposed PAs for buy-in and co-management proposals

ACT 1.12: Revise and strengthen the legal framework on decentralisation of the PA in the country for the community to play an active role in the PA management

ACT 1.13: Development of the community-based PA management plans

ACT 1.14: Train the communities on PA operations

ACT 1.15: Strengthening the institutional capacity for Effective PA management through training on PA operational effectiveness

ACT 1.16: Strengthening institutional capacity on the enforcement of the legal legislation

ACT 1.17: Identification of wildlife corridors between the ecological significant ecosystems to improve connectivity

ACT 1.18: Develop a national land use map identifying the wildlife corridors

ACT 1.19: Development of the management plans to maintain the wildlife management corridors intact

ACT 1.20: Identify suitable areas for PA and areas that have been previously suggested as PA and declare them as Pas

ACT 1.21: Declare the identified suitable ecosystems as Pas

ACT 1.22: Monitor and evaluation of the PAs operational and management effectiveness

4.2.2.2. Output 1.2: Prevent extinction for threatened species

A sizable number of mammals and marine species in the country are classified as either endangered, critical endangered or threatened. Though there is no recent data to categorize the species status due to on-going conflict, there are signs that some species are critically endangered. As per the K-M GBF global target, there is a need to take urgent measures to prevent and reverse the extinction of threatened species.

The target:

> Take urgent measures to prevent extinction caused by human activities, natural factors, and climate changes for threatened species, and restore and conserve species to significantly reduce the risk of extinction. Additionally, preserve and restore genetic diversity within native, wild, and domesticated species communities. By 2030, list all endangered species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and implement specific conservation measures to reduce the risk of extinction caused by human activities for priority threatened species or their trade.

> By 2030: 20% of areas of environmental importance should be under spatial planning and effective management. By 2050, all land in Yemen should be under spatial planning to prevent land use changes in biodiversity-rich ecosystems. This includes sustainably increasing the area, quality, connectivity, access to, and utilization of green and blue spaces in urban and densely populated areas

Achieving this output and the set national targets will involve implementation of the following at the national level:

ACT 1.23: Undertake a national species survey/count to categorize all wildlife in terms of IUCN vulnerability index

ACT 1.24: Conduct a comprehensive assessment of the causes of the categorized threatened species populations

ACT 1.25: Develop a strategic conservation plan for each of the threatened species to reverse its possible extinction

ACT 1.26: Develop threatened species financing strategy to implement the conservative plan and strengthen the institutions capacities and their arrangements in conservation efforts and in controlling illegal species hunting and trade through adequate allocation of resources and training

ACT 1.27: Development of national poverty alleviation and reduction programs including pro-poor economic initiatives that are biodiversity related such as apiculture, aquaculture and introduction of PES to generate income for the communities

ACT 1.28: Monitor the conservation effort to prevent extinction

4.2.3. Outcome 1.3: Improved spatial planning and land use around ecological sensitive ecosystems

As indicated under national context, Yemen land use is highly dynamic with other land uses taken over by aggressive activities such agriculture and informal settlement. It is high time that land use change is addressed through proper spatial planning to prevent habitat for species. This will be done through improved land use planning particularly around sensitive ecosystems.

4.2.3.1. Output 1.1.3: land use plans

This output is thus aimed at preventing land use change in biodiversity rich ecosystems in the country which results in ecosystem and habitat loss for species.

Land use change is one of the drivers of biodiversity loss in the country. Ecological sensitivity and important ecosystems are being replaced by economic activities such as informal settlements and agricultural activities (livestock grazing and crop production). Thus, improving land use spatial planning would prevent land use changes around the ecological sensitivity ecosystems.

The target:

- By 2030: 20% of areas of environmental importance should be under spatial planning and effective management. By 2050, all land in Yemen should be under spatial planning to prevent land use changes in biodiversity-rich ecosystems. This includes sustainably increasing the area, quality, connectivity, access to, and utilization of green and blue spaces in urban and densely populated areas.

Achieving this target as aligned to the K-M GBF target will involve a set of strategic and interrelated actions such as:

ACT 1.29: Develop a national land use plan policy which will ensure that all land in the country is under spatial planning

ACT 1.30: Establish a national spatial planning unit to oversee the implementation of the national land use plan policy

ACT 1.31: Develop national land use plans and zoning which identifies ecological sensitive zones and recommended compatible land uses in the proximity based on community participatory approach for buy-ins

ACT 1.32: Strengthen institution capacities to enforce the national land use plans and zoning through increasing manpower, adequate resource allocation and training to avoid land use changes around ecological sensitive areas

ACT 1.33: Strengthen the communities land uses structures and establish structure for implementation of the land use plans to avoid land use changes around ecological sensitive areas

4.3. Pathway 2: Safeguard ecosystems integrity through sustainable uses

Sustainable use of ecosystems entails maintaining a balance between social and ecological needs. Whilst allocating resources quotas for economic

activities, humanity must realize that the same resources are also needed for ecological functioning. For instance, water resources are needed by both humans and biodiversity. Ultimately, a balance should be maintained to ensure that resources are available to meet the needs for both humanity and biodiversity. Sustainable uses further involve using the ecosystems as a waste sink in a sustainable manner. This can only be achieved by producing waste at a level that is at par with the waste assimilative of the environment. The assimilative capacity of the environment measures its ability to absorb the pollutant without causing irreversible damage to it or those who use it. Consequently, this objective calls for managing the harvest rates and regulating the pollution levels to sustainable levels. For renewable resources, maximum sustainable yield will be defined, while for waste generation, the assimilative capacity of the environment will be established, and efforts will be geared at ensuring that the set rates are achieved. Consequently, the goal is to ensure that there is no mining of resources which will cause irreversible damage and extinction of the resources.

As per the national context, Yemen ecosystems are currently being degraded due to unsustainable and destructive consumption and production patterns. These include widespread overuse of agricultural chemicals such as pesticides and fertilizers, over-abstraction of water resources both surface and groundwater for agricultural purposes and increased waste generation coupled with lack of proper waste management facilities. One of the major factors that contribute to unsustainable and destructive production processes is economic subsidies which distort the markets and send the wrong signal to the producers. Similarly, market failure which results in externalities results in overharvesting of biological resources.

This pathway is aimed at ensuring that the ecosystems and the biodiversity are protected from environmentally destructive consumptive and production behavior. This will be achieved by removing environmentally perverse incentives and replacing them with incentives that correct the market distortions. The national objective has one outcome, and two outputs as discussed below.

4.3.1. Outcome 2: Sustainable use of ecosystems and their diversity

This outcome will contribute to safeguarding ecosystem integrity in the country through regulating harvesting rates, pollution levels and trade of species both flora and fauna. Ultimately, it aims at reducing overharvesting and consumption of terrestrial, aquatic and marine resources in the country. The outcome constitutes three (3) outputs with their targets and strategic activities are discussed below:

4.3.1.1. Output 2.1: sustainably managed agroecosystems

Agroecosystems provide vital services of food production which sustain all the Yemenis. Therefore, to safeguard the food production and security, it is vital that agroecosystems are sustainably managed. This entails safeguarding the agricultural lands from losing their fertility, preventing soil and water erosion and ensuring that productivity of the soils is maintained. Furthermore, sustainable managed ecosystems take into account climate change challenges. Therefore, measures will be put in place to promote climate smart agriculture, ecosystems-based approaches to agricultural production systems.

Furthermore, the agriculture sector in the country is one of the major ecosystems polluters from extensive use of agrochemicals (pesticides and fertilizers). Therefore, efforts will be geared to promote environmentally sustainable approaches, mainly promoting integrated Pest Management to reduce use of pesticides.

The sector is one of the major water consumers resulting in water depletion and reduced water availability for ecosystems' water needs. Therefore, through climate smart agriculture and strategic switch to less water intensive crops, there will be significant reduction in water consumption from this vital economic sector. More importantly, will be a shift to green technology in efficient irrigation and the shift to rain-fed agriculture.

The target:

By 2030, implement ecosystem-based approaches in all agricultural systems (agriculture, aquaculture, fisheries, and forestry) to ensure sustainable and safe food production in the future, conserve and restore biodiversity, maintain ecosystem services, including pastures and ensure that food production does not degrade the ecosystem degradation

Achieving this target will involve implementation of the following activities

ACT 2.1: Develop a country-wide national sustainable agriculture strategy/ plan detailing ecosystem-based approaches, nature-based solution and smart climate agriculture practices covering soil and water management, integrated pest control etc.

ACT 2.2: Develop a resource mobilization strategy for the implementation of national sustainable agriculture strategy

ACT 2.3: Build the capacity of the farmers and food producers to implement the national sustainable agricultural strategy through training and establish farming association

ACT 2.4: Strengthen institutional and technical capacity within the Ministry of Agriculture and Irrigation to implement the sustainable agriculture strategy

ACT 2.5: Removal of perverse agricultural subsidies and replace with environmentally sustainable instruments

ACT 2.6: Promote eco-labelling to enhance the use of eco-friendly farming methods

4.3.1.2. Output 2.2: sustainable managed marine ecosystems

The Fishery sector contributes 3% to the country's GDP and the third largest economic sector. Currently, the marine ecosystem is facing various challenges from unsustainable harvest rates, illegal fishing, destruction of coral reefs, pollution, climate change impacts and weather events such as cyclones. These challenges will have a somber impact on the Yemen fishery sector with rippling effects on the community's livelihoods and national economy.

Another challenge that is hindering the country's fishery sector is the lack of scientific research and knowledge production regarding the size and health of Yemen's fish stocks (Mohammed, 2020).

The target:

> By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.

Achieving this target and this output will entail a mixture of the following strategic activities:

ACT 2.7: Build the capacity of the relevant institution to conduct marine scientific research to document fish population and trend

ACT 2.8: Establish partnership with lead marine research institute at regional and global level

ACT 2.9: Conduct scientific assessments of national fish stocks and studies of the marine habitat

ACT 2.10: Develop fishery management plan with detailed annual sustainable fisheries harvest quotas for all the fish species

ACT 2.11: Strengthen the Ministry of Fish Wealth (MAIF) and relevant stakeholders to conduct monitoring and surveillance to reduce illegal fishery from international vessels

ACT 2.12: Restore and rehabilitate important fishery spawning habitats such as mangroves ecosystems and coraives.

ACT 2.13: Establishing monitoring framework for harvesting and fish population

4.3.1.3. Output 2.3: sustainable managed forest and rangeland ecosystems

Forest and rangelands ecosystems directly support over 15 million Yemenis through provision services. These include foods, fuelwood, medicines and livestock grazing. At the same time, the forest and rangeland ecosystems are habitat for terrestrial species. Therefore, sustainable managed forests and

rangelands is important for both Yemenis and species survival. Currently, the forests and rangeland ecosystems in the country have been degraded through deforestation activities (demand for fuelwood), overgrazing, encroachment of the agricultural sector and widespread ecosystems pollution. Thus, there is a need to address all these direct causes of these ecosystems' degradation.

Thus, sustainable managed forest and rangeland, will be achieved through regulating harvest rates to sustainable levels, managing livestock stocking rates, reduced reliance on rangeland in providing livestock feed. Identifying alternative renewable energy sources. Sequentially, efforts will be geared towards controlling and where possible eradication of plant invasive species to build the resilient of forest ecosystem to bounce to original state. Improved waste management will also be emphasized to reduce ecosystem pollution.
The targets:

- By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.

- By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.

Achieving this strategic output will involve implementation of an array of activities that require research, strengthening both institutional capacity and legal frameworks. These will include:

ACT 2.14: National assessment of forestry resources, their sustainable harvest yield for fuelwood and medicinal plants

ACT 2.15: Establish PES schemes (payments for ecosystem services) for fuelwood and medicinal plants based on quota system to regulate harvesting

ACT 2.16: Establish safeguards to protect communities and indigenous groups from PES schemes and access to resources

ACT 2.17: Establish and strengthen partnership between government departments to monitor and regulate the harvest rates based on PES and quotas

ACT 2.18: Identify alternative energy sources (methane production from livestock manure and use of invasive species for generation of renewable energy) to reduce dependence on fuelwood

ACT 2.19: Develop NTFPs value chain strategy to improve community income generation alternatives and reduce pressure on forests

ACT 2.20: Developing a strategy and law for equitable benefit sharing and Digital sequence information on genetic resources

4.3.1.4. Output 2.4: Sustainable managed freshwater ecosystems

This output aims at ensuring that the freshwater ecosystems are sustainably managed to guarantee continued and sustained flow of ecosystems services mainly provision of freshwater to people, and the economic sectors (agriculture both crops and livestock) and to meet the need the ecosystem water needs. As noted, Yemen aquatic ecosystems are degraded through overuse and pollutions. Therefore, several institutional and policy interventions will be implemented to ensure that this critical ecosystem is protected and conserved. The root causes of current unsustainable freshwater utilization include over abstraction from the agriculture sector due to subsidies, environmental pollution from solid, liquid and chemicals, encroachment of different land uses.

The targets:

- By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.
- By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.

A set of strategic activities will be implemented to achieve sustainably managed fresh aquatic ecosystems as follows:

ACT 2.21: Undertake a nationwide assessment on economic instruments (subsidies, tax, incentives) to assess their impact on freshwater ecosystems

ACT 2.22: Undertake a policy reform to eliminate harmful subsidies and replace them with ecologically friendly instruments

ACT 2.23: Mapping and assessment of aquatic ecosystems in terms of level of degradation

ACT 2.24: Develop a conservation and rehabilitation management plan and undertake restoration

ACT 2.25: Establish co-management structure to implement a conservation and rehabilitation management plan for the aquatic ecosystems

ACT 2.26: Development and implementation of transferable water harvesting quotas in collaboration with the communities

ACT 2.27: Develop a national rainwater harvesting master plan inclusive of fog harvesting technologies, dam construction, traditional water harvesting and conservation

ACT 2.28: Promotion of Integrated Water Resource management (IWRM) program (water efficiency use, reuse and recycling, efficiency)

ACT 2.29: Build and strengthen community capacity on implementation of national rainwater harvesting master plans and IWRM

ACT 2.30: Monitor abstraction rates and pollution levels

4.3.1.5. Output 2.5: improved waste management and reduced pollution levels

Pollution of water bodies (freshwater and marine ecosystems), wetlands and forest ecosystems is widespread in the country. Factors that contribute to

pollution of the ecosystems include weak financial and technical capabilities to collect, treat and properly dispose of the waste. Furthermore, the waste recycling initiatives in the country are weak due to lack institutional capacity and promotion programs. These results in garbage and wastewater directly discharged in the environment without treatment. Moreover, in the absence of effective regulations, the manufacturing sector is dumping untreated wastewater and solid waste in the environment.

This output is aimed at reducing ecosystems pollution levels to accepted level through improved waste management practices, strengthening the waste management sector to increase reduce, reuse and recycling initiatives.

The target:

By 2030, significantly reduce pollution levels and the negative impacts of pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects and the ecosystems' capacity to absorb biodegradable pollutants. Achieve a 20% reduction in the use of agricultural chemicals and pesticides, and achieve 70% in recycling, reuse, and reduction of plastic waste by 2050.

This will call for the design and implementation of technical and policy related activities such as:

ACT 2.31: Introducing a ban on single plastic and promoting grocery bags
ACT 2.32: Strengthen the institutional capacity to promote reuse, recycling/composting and disposal systems
ACT 2.33: Develop a waste management master plan for the country identifying strategic landfills and greywater treatment sites
ACT 2.34: Develop and operationalize financing strategy for the waste management sector constituting polluter pays principles and users fees to support construction and operations of waste management facilities
ACT 2.35: Promote technological transfers of high-end technologies on wastewater treatment
ACT 2.36: Strengthen the institutions to enforce legal frameworks on pollution and Hazardous waste
ACT 2.37: increase monitoring waste management and pollution control efforts

4.3.1.6. Output 2.6: controlled invasive species

Invasive species are putting significant strain on the ecosystem rendering them less effective in their functions of provision, supporting and regulation services. There is an urgent need to prepare a national policy to manage, control, eliminate the existing and prevent further introduction of new invasive species. Thus, this output calls for development and implementation of national strategy on invasive species. Currently, invasive species such as *Prosopis juliflora* are affecting the wadies and agroecosystems.

The targets:

- By 2030, prevent the introduction of any new invasive species into the country. Identify and take necessary measures to eradicate existing invasive alien species in environmentally priority sites and control them in lower priority sites
- By 2030, train and enhance the competence of all relevant stakeholders in biosafety measures to protect the country's biodiversity and human health, benefit from eco-friendly and health-safe biotechnology, and strengthen monitoring and oversight of the transportation, handling, and use of genetically modified organisms and materials, providing necessary information to consumers in line with the Cartagena Protocol and national legislation.

Achieving this target of preventing and reversing the colonization of invasive species will involve the following actions:

ACT 2.38: Undertake a comprehensive assessment cataloguing and profiling the invasive species in the country and their pathways

ACT 2.39: Develop national invasive species eradication and control management plan

ACT 2.40: Develop a financing and mobilization plan for the implementation of the national invasive species eradiation and control management plan

ACT 2.41: Strengthen the capacity of the relevant institutions to control and prevent the entering of the invasive species at the borders and entry points through training and adequate resource allocations

ACT 2.42: Establish a pro-poor development strategy to use the invasive plant species for poverty alleviation programs such as production of charcoal, livestock feed, methane as cooking gas

ACT 2.43: Train the stakeholders in handling and use of GMOs to prevent introduction and colonization of invasives species

ACT 2.44: Development of the stakeholder engagement and participation strategy on control and management of the invasive species

4.3.1.7. Output 2.7: climate resilient ecosystems

Climate change is already accelerating ecosystem degradation and species loss in the country due to several reasons. The first one being that it creates a conducive environment for invasive species spread. Secondly, increased drought episodes in terms of intensity and frequency contribute to ecosystem degradation and species loss. Urgent measures need to be put in place to build climate resilient systems. This will be achieved through participation in international initiatives of reducing GHG emission, emphasis on ecosystem-based approach, and overall reducing anthropogenic pressure on the environment.

The target:

- By 2030, Integrating biodiversity within the Nationally Determined Contributions (NDC) for 2025-2030 by increasing the capacity of ecosystems to absorb greenhouse gas emissions through the restoration of at least 15% of degraded ecosystems (wetlands, mangroves, forests, and terraces). This contributes to mitigating and adapting to climate change and combating desertification, as well as focusing on ecosystem-based adaptation approaches to enhance resilience to climate change impacts and improve ecosystem resilience.

Achieving the target will require an array of supporting and complementary activities constituting strategic activities outlined in other national objectives

such as restoration initiatives, reducing pollution levels and harvesting rates. Furthermore, the following activities will be essential:

ACT 2.45: Develop the NAP with specific components on ecosystem and biodiversity sectors

ACT 2.46: Develop the ecosystems and biodiversity sectoral adaptation plan

ACT 2.47: Revise the NDCs to mainstream biodiversity and ecosystems with emphasis on restoration and rehabilitation of the ecosystem to absorb GHG emissions

4.4. Pathway 3: safeguard communities' access and equitable benefit sharing from biological/genetic resources and contribution to national economy

Safeguarding the communities' access is of paramount importance to the Yemenis. Close to half of the Yemenis are dependent on forest and rangeland resources. This national strategy is aligned to the Nagoya Protocol. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) was adopted in 2010 in Nagoya and came into force in 2014. Its objective is the fair and equitable sharing of benefits arising from the utilization of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity (UNEP, undated).

Thus, as per the Nagoya Protocol, Yemen through its NBS aims at ensuring that communities have access to biodiversity. Not only should the Yemenis have full access and equitable benefit sharing, but the benefits should be optimized/ maximized through promotion of value chain analysis schemes for the NTFPs. This strategy will contribute to poverty alleviation which is one of the underlying causes of ecosystem degradation and species loss.
In addition to poverty eradication, improving access and equitable benefit sharing will improve positive attitudes towards biodiversity conservation and restoration efforts as communities realize the benefits of their conservation programs. This over time will improve community participation in biodiversity conservation. Additionally, unrestricted and monitored access to biodiversity would reduce illegal access to resources as resource ownership becomes more apparent.

This national objective has one outcome and two outputs as discussed below.

4.4.1. Outcome 3: improved access and equitable benefit sharing of biological resources to the communities

This outcome is aimed at achieving the Nagoya Protocol. Improved access to the resources strengthens sustainable use of the ecosystems as there is a sense of ownership to the resource. Moreover, this outcome aims at improving the benefits realized by the communities from the commercialization of genetic resources.

4.4.1.1. Output 3.1: increased number of communities with access to ecosystems functions and services

Over time it is expected that the number of communities or households with improved access to ecosystems services such as clean water resources, protection of the communities against extreme events such as coastal communities and high tidal waves and farmers against soil and water erosion will increase. Furthermore, it is envisaged that more farmers will have access to better pastures and improved grazing. This will undoubtedly contribute to household income and improved livelihoods thereby reducing the national poverty levels. Similarly, it is important that the urban dwellers have access to ecosystem services. Therefore, urban cities must incorporate green spaces in land uses to ensure that urban communities have unrestricted access to ecosystem services for their recreation.

The targets:

- By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.
- By 2030, integrate urban green spaces (recreational) into urban land use planning, ensuring their connectivity with nearby ecosystems to enhance the flow of ecosystem services, improve human health and well-being, increase connectivity with nature, and contribute to overall sustainable and inclusive integration while providing essential ecosystem functions and services.

The strategic activities to be implemented to achieve this target are as follows: **ACT 3.1**: Undertake restoration and rehabilitation of the degradation ecosystems to enhance their ability for optimal flow of ecosystems functions and services to support community livelihoods and national economy

ACT 3.2: Strengthen the community capacity to be effective co-managers of the ecosystems including protected areas

ACT 3.3: Strengthen legal frameworks to recognize the communities to be equal partners in the management of ecosystems

ACT 3.4: Develop community-based management and strategic plans for sustainable management of ecosystems and biodiversity

ACT 3.5: Design community national value chain strategy for biological resources for community participation to maximise benefits to the community and national economy

ACT 3.6: Promote ecosystem-based approach to enhance contribution of ecosystem in production processes such as food production

ACT 3.7: Strengthening partnerships between communities and the private sector in the genetic resources manufacturing sector and developing mechanisms and legislation for dealing with digital sequence information on genetic resources.

ACT 3.8: Design and operationalize PES scheme with communities being beneficiaries

4.4.1.2. Output 3.2: increased income generation from the genetic resources

Over time it is expected that there will be an increase in income generation from the use of genetic resources through equitable benefit sharing from the use of the genetic resources. Therefore, all the national and multinational companies are expected to improve their rewards structure for paying the communities members involved in the propagation, domestication and management of the genetic resources. Effectively, equitable sharing of the benefits will motivate the

local communities to be better managers of their genetic resources and their ecosystems.

The target:

- By 2030, ensure that all companies transparently disclose profits from the use of genetic resources and potential risks to ecosystems, and implement effective risk mitigation systems while ensuring fair benefit-sharing with communities.
- By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning processes (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels.

Achieving this output will involve the following strategic activities:
ACT 3.9: Establish legislation for companies to disclose risk and mitigation plans and social corporate responsibility for equitable benefit sharing and benefit from digital sequence information on genetic resources.

ACT 3.10: Develop a national value chain strategy for the NTFPs aimed at improving benefit sharing for the lower value chain activities that involve the local communities

ACT 3.11: Develop a national partnership strategy to promote partnerships between local communities and (multi) National Corporation

ACT 3.12: Build capacity of the local communities to establish and operate genetic based companies for the exploitation of genetic resources through training and establishing cooperative structures

4.5. Pathway 4: Adequate means to support implementation of biodiversity conservation

Globally and nationally, the contribution of biodiversity is significantly high. Research from the World Economic Forum estimates that approximately US$ 44 trillion of global GDP is highly or moderately dependent on nature. Nationally, over half of the population is directly dependent on biodiversity. Whilst the contribution of biodiversity to both global and national economy is extremely high, there is a conspicuous mismatch between resources that are allocated to the conservation, protection and promotion of sustainable utilization of biological resources. Currently, it is estimated that the global biodiversity financing gap is approximately US$711 billion (Paulson Institute, 2020). While no financing gap assessment has been undertaken for the Yemen Biodiversity, it can be estimated to be significant due to budgets constraint and the need to meet the social needs which are given priority over conservation.

Consequently, this objective is aimed at closing the biodiversity financing gap by creating an enabling environment for biodiversity financing. Availability of financing will enable the government to meet the ecosystems restoration and rehabilitation targets. The strategic objective is not limited to financial resources but to capacity building, technical and scientific cooperation, and access to and transfer of technology for biodiversity conservation and protection. Importantly, there is a need to undertake periodic research and monitoring to assess both the effectiveness and conservation efforts all of which require financial resources.

4.5.1. Outcome 4: Adequate resources for NBSAP III implementation

The outcome envisages an ideal scenario where there will be adequate financial resources to support capacity building for the effective PAs operational and management effectiveness, strengthened institutional and community to be involved in biodiversity management, unrestricted resources to conduct research, monitor biodiversity, and for restoration efforts. Moreover, there will be transfer and domestication of relevant technologies for the restoration and conservation and monitoring biodiversity.

This outcome has 4 outputs which are listed below and the corresponding targets

4.5.1.1. Output 4.1: reduced financing gap for NBSAP III

Reducing financing gap for NBSAP will be achieved through mobilization of finance from both internal (domestic public spending) to be achieved through PES, domestic private sector, and international sources (bilateral, multilateral, international private sector) as Yemen is one of the countries affected by conflict, with high poverty levels and fragile ecosystems. Reducing financing gaps is critical for the success of NBSAP III.

The target:

- By 2030, mobilize financial resources from all funding sources sustainably to bridge the biodiversity financing gap by 20%, and increase it to 80% by 2050

This target will be achieved through the following high-level activities:

ACT 4.1: Develop biodiversity financing strategy detailing the financing gaps, financing sources (public domestic, private domestic, Multilateral, bilateral, innovative funding etc) and strategic activities for mobilizing financing from various sources

ACT 4.2: Build the institutional capacity of the relevant institutions to mobilize the funding from international source by training them on proposal development through training and strengthen institutional arrangements

ACT 4.3: Develop a stakeholder's engagement and participation strategy to enhance community contribution through in-kind (labour resources) in the management and conservation of biodiversity

ACT 4.4: Design and operationalize PES schemes

ACT 4.5: Establish an Environmental Protection Fund to finance biodiversity expenditure and manage revenues generated from the ecosystem services scheme and international financing.

4.5.1.2. Output 4.2: information and data and knowledge is available and accessible to decision makers

Scientific research plays a critical role in generating data and information to inform biodiversity conservation and sustainable utilization. Due to the on-going conflict, the country has significant data and information gaps on biodiversity status in terms of species numbers, classification of species based on IUCN list, scale and levels of forest degradation amongst others. There is a thus a need to conduct scientific research on biodiversity in the country to close the existing data gaps. Similarly, the country is rich in traditional knowledge on ecosystem restoration and conservation practices which need to be transferred and implemented across the country.

This output will thus ensure that information, data and knowledge in available to inform decision making and planning around biodiversity conservation and restoration efforts in the country. Furthermore, traditional conservation and restoration will be researched, documented and shared amongst the various stakeholders to ensure their application.

The target:

- By 2030, ensure an adequate scientific base, transfer traditional knowledge, enhance scientific research capabilities, monitoring capabilities, encourage innovations, and enable stakeholders to design, implement, and use advanced technology to conserve biodiversity. Ensure unrestricted access to necessary information, data, and technology for all stakeholders, including community members, involved in biodiversity management and conservation.

The following strategic activities will be implemented to promote data and information exchange and accessibility

ACT 4.6: Establish robust partnership with local and international research institutions for joint biodiversity research initiatives

ACT 4.7: Develop and operationalize communication strategies for knowledge and information transfers across stakeholders

ACT 4.8: Build capacity of the communities, women, People with special needs and children on available technologies and synthesizing information and knowledge

ACT 4.9: Research and document traditional practices on biodiversity conservation, restoration and sustainable management practices

ACT 4.10: Train communities on scientific research with emphasis on women and youth

4.6. Pathway 5: use of appropriate economic instruments to create an enabling environment for sustainability

One of the major factors that contribute to ecosystem degradation and species loss in the country is market distortion. Market distortions are a result of subsidies, incentives and taxes that are formulated and implemented to promote certain economic sectors such as agricultural to ensure food security. Whilst these initiatives are critical to stimulate economic growth and achieve national food security, they have unintended ecosystem impacts which over time will negatively affect the economic sectors at the national level through negative feedbacks. Therefore, removal of perverse incentives and implementing environmental sensitive incentives would create an enabling environment for sustainable management of the ecosystems.

4.6.1. Outcome 5.0: A conducive environment for sustainable ecosystem management

This outcome aims at promoting sustainable consumption and production behavior from all economic sectors by removing market distortions. Market distortions from poorly designed subsidies and taxes result in unsustainable consumption and production behavior such as over-abstraction of water resources, overuse of fertilizer due to their affordability. Thus, a need to remove perverse economic instruments and introduction of sustainable environmentally friendly instruments would remove market distortions. This outcome has 4 outputs, strategic activities and targets

4.6.1.1. Output 5.1: Mainstreamed economic value of ecosystems in national planning processes

Yemen's ecosystems provide vital services and functions that support all economic activities. These ecosystems command a high TEV which is not mainstreamed or included in the decision making and planning processes. This deficiency of not capturing the ecosystems value results in automatic undervaluation which in term results in low budget for biodiversity conservation and protection. Furthermore, this process results in discounting the value of these resources and not considered of significant importance in planning and decision making. This is one of the underlaying factors that results in ecosystems degradation and species loss in the country.

Furthermore, mainstreaming the value of ecosystems in decision-making is also required at the individual level. By charging the individual a certain fee, they will automatically mainstream the economic cost of their activities. For instance, PESs such as polluters-pays charges are good initiatives for individuals to mainstream ecosystems values (costs and benefits) in decision-making.

Another way to mainstream the value of biodiversity at the national level is to construct national accounts by estimating the country's sustainable income based on the World Bank framework of Wealth Accounting and the valuation of ecosystem services (WAVES).
The target

- By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning process (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels.

Achieving this output of mainstreamed economic value of ecosystems in decision-making and planning processes will involve an array of interrelated activities. This will include periodic ecosystems valuation amongst the others. These activities are highlighted below:

ACT 5.1: Build and strengthen Institutional capacity on ecosystems valuation and mainstreaming approaches through training and hiring relevant experts
ACT 5.2: Undertake Periodic ecosystems valuation exercises throughout the country
ACT 5.3: Develop the sustainable income account framework for the country which incorporates value of natural resources

ACT 5.3: Develop WAVES for the country

ACT 5.4: Incorporate and mainstream economic value in all strategic plans such as national accounting system, poverty reduction plans at all levels

ACT 5.5: Design and operational PES scheme.

4.6.1.2. Output 5.2: Market corrected from distortions

Market distortions are known for causing widespread pollution through unsustainable use of fertilizer and over abstraction of water resources as a result of cheap fuels (diesels) and fertilizers. Removing perverse economic instruments and replacing them with environmentally friendly instruments targeting green technologies, clean and renewable energy would correct the market distortion.

Similarly, externalities create market distortion which results in widespread environmental degradation. Externalities are a result of market failure which causes market distortion. Thus, correcting the existing marketing distortion in the country will partially solve the underlaying cause of widespread ecosystem degradation and species loss.

The target:

> By 2030, halve the monetary value of subsidies harmful to biodiversity and promote environmentally positive incentives targeting green technologies, ecosystem-based programs, and clean and renewable energy.

The target will be achieved through the implementation of strategic activities such as:

ACT 5.6: Design and operationalize a PES scheme for the country for all the ecosystems such as water resources (water abstraction), use of fertilizer (internalize the cost of pollution to the environment), fisheries, fuelwood harvesting (sell permits)

ACT 5.7: A national assessment on monetary instruments (subsidies, taxes, incentives) and their impact on the environment and identification on friendly incentives based on international best practice

ACT 5.8: Develop strategies to reallocate the revenue from harmful subsidies to ecosystem friendly incentives

ACT 5.9: Strengthen the relevant institutions on system approach to assessing the influence proposed economic incentive prior to implementation

4.7. Pathway 6: Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

Governance is one of the critical and fundamental aspects in ecosystem and biodiversity management. Governance is defined as the norms, institutions and processes that determine how power and responsibilities over natural resources are exercised, how decisions are taken, and how citizens - including women, men, youth, Indigenous peoples and local communities - participate in and benefit from the management of natural resources (Springer et al., 2021). Effectively it entails issues of access, ownership and equitable benefit sharing which are the determining factors for sustainable management of ecosystems.

This pathway thus aims at ensuring communities are considered equal partners in natural resources management and have full access to biological resources. Furthermore, it calls for better coordination between the institutions and the communities in the management of the ecosystems and their diversity. To achieve this objective, there is a need to capacity the institution on biodiversity governance frameworks, training communities on biodiversity

management practices, and strengthen coordination between the communities and the line ministries on biodiversity conservation and sustainable use.

4.7.1. Outcome 6: good governance in ecosystem and biodiversity management

The link between good governance and effectiveness of conservation efforts and contribution of ecosystems to community livelihoods are apparent. This outcome thus aims at good governance of biodiversity. This outcome addresses the current gap in biodiversity in the country where there is lack of representation of key stakeholders in the biodiversity management decision making at the national level. Effectively this affects the use of traditional knowledge which has over the years been proven to be effective in natural resource management. Aspects that are emphasized under this outcome include promotion of ecosystem co-management; establish adequately capacitated institutions and mechanisms for coordinating.
This outcome has 3 outputs and their strategic activities as detailed below.

4.7.1.1. Output 6.1.1: revised legal framework

This output calls for strengthening and amendment of the legal framework to recognize the communities as equal custodians of biological resources and equal partners in the management of the natural resources. Thus, the legal framework should put more emphasis on ecosystems co-management such as PAs, ecological sensitive area and the wadis. The output aims at decentralization of the legal framework which is currently highly centralized.
The target:

By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making.

Achieving this output will involve the following activities:

ACT 6.1: Revision of the existing Decrees, Policies and Acts to ensure that the legal framework recognizes the communities as equal partners in the management of natural resources

ACT 6.2: Legal framework is revised to promote decentralization of ecosystems management e.g. PAs

ACT 6.3: Develop a community based sustainable management plans for the PA and other ecological sensitive ecosystems

4.7.1.2. Output 6.1.2: restructured institutions

For good governance to be achieved in the country, it is necessary that institutions are restructured to facilitate good governance. This restructuring process should entail ensuring that the relevant institutions such as EPA and the line ministries have a fairly representation of groups that are reflective of the communities. Thus, the starting point is to make deliberate efforts of ensuring that human resources in the relevant institution constitute a fair representative number of women, youth, vulnerability groups and indigenous groups in the work forces. Furthermore, it is necessary that each institution should establish a focal point (community liaison group) that is mandated to deal with community for good collaboration and consultation on matter incidental to natural resources management.
The target:

- By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making.

Achieving this target will involve the implementation of the following strategic activities:

ACT 6.4: Each relevant department to establish a target on number of women, youth, vulnerable groups (people living with disability), indigenous groups to ensure fair representation in decision making
ACT 6.5: Establish a community focal point (liaison officer) for community engagement
ACT 6.6: Strengthen collaboration with institutions and departments that deal with communities, indigenous, gender groups and vulnerable groups

4.7.1.3. Output 6.1.3: well-equipped and trained community

For the community members to be equal partners and ecosystem co-managers and in some instances be sole managers of PA, it is necessary that they are trained, equipped and capacitated on proven effective and efficient scientific and traditional practices and methods. The starting point is mainstreaming ecosystems and natural resources management courses at school curriculum starting at primary to tertiary. Secondly, it is necessary that selective crash courses are offered to the communities' members on both traditional and scientific range resources management courses. Furthermore, the community-based ecosystems management plans should be developed in a community participatory approach to ensure buy-in and ownerships which should be followed by extensive training.

The target:

> By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making

This target will be achieved through the following:

ACT 6.7: Design training programs for the community on co-management of PA, community-based PA management, financial management etc

ACT 6.8: Establish community structures on PA management, ecosystem management etc

ACT 6.9: Design community-based ecosystem management plans and train communities established structures on such.

5.0. NBS budget and resource mobilization

Successful implementation of the updated NBS to meet the set targets in line with the K-M GBF will require significant financial resources, both in-kind and money. The in-kind contribution would be through the participation of the communities groups (CGs) and the NGOs through restoration programmes, co-management and monitoring illegal activities such as hunting, dumping waste and abstraction rate of water resources and training. Currently, there is no information on biodiversity national expenditure in the country but the estimates from NBSAP II was less than 1% of the national expenditure. Based on the estimated national expenditure of 9.1% of GDP, it is estimated that biodiversity expenditure is approximately US$13 million annually. The last NBSAP II estimated the biodiversity financing needs at US$ 102 million.

An indicative budget for the updated NBSAP to achieve the set targets is approximately US$ 500 million.

Table 8 depicts the indicative budget for the activities that could be estimated.

Table 8: Indicative budget for the NBSAP III

Pathway/outcome	Budget (US$ million)	Source
pathway 1: ensure urgent conservation and restoration needs to halt species extinction	165.43	DPS, BMF, ODA, NGOs, CGs
Outcome: Improved spatial planning of ecologically important ecosystems	17.1	DPS, BMF, ODA, NGOs, CGs
prevent extinction of threatened species	19.5	DPS, BMF, ODA, NGOs, CGs
Pathways 2: safeguard ecosystems integrity through sustainable uses		
Sustainably managed agricultural systems	25.8	DPS, BMF, ODA, NGOs, CGs

Pathway/outcome	Budget (US$ million)	Source
Sustainably managed marine ecosystems	25.8	DPS, BMF, ODA, NGOs, CGs
Sustainably managed forest and range ecosystems	2.23	DPS, BMF, ODA, NGOs, CGs
Sustainable management of freshwater ecosystems	120.17	DPS, BMF, ODA, NGOs, CGs
Improve waste management and reduce pollution levels	19.4	DPS, BMF, ODA, NGOs, CGs
Invasive species under control	5.84	DPS, BMF, ODA, NGOs, CGs
Climate-resilient ecosystems	72.51	DPS, BMF, ODA, NGOs, CGs
Pathway 3: Protect communities' access to biological/genetic resources, share benefits equitably and contribute to the national economy		
Increased number of communities with access to ecosystems, their functions and services	19.4	DPS, BMF, ODA, NGOs, CGs
Increased income generation from genetic resources	5.02	DPS, BMF, ODA, NGOs, CGs
Pathway 4: Adequate means to support the implementation of biodiversity conservation		
Reducing the financing gap for the third National Biodiversity Action Plan	1.18	DPS, BMF, ODA, NGOs, CGs
Pathway 5: Adequate means to support the implementation of biodiversity conservation		
Information, data and knowledge are available to decision makers	0.3	DPS, BMF, ODA, NGOs, CGs
Pathway6: Use appropriate economic instruments to create an enabling environment for sustainability		
Market corrected for distortions	1.22	DPS, BMF, ODA, NGOs, CGs
Strengthen ecosystem governance , institutional capacities and arrangements for improved ecosystem management		
Review of the legal and policy framework	0.2	DPS, BMF, ODA, NGOs, CGs
Strengthen ecosystem governance , institutional capacities and arrangements for improved ecosystem management		
Restructuring of institutions	0.24	DPS, BMF, ODA, NGOs, CGs
Strengthen ecosystem governance, institutional capacities and arrangements for improved ecosystem management		
A well-equipped and trained community	0.25	DPS, BMF, ODA, NGOs, CGs
Total budget (approximately)	500	Five hundred thousand dollars

A detailed financing strategy is required for the implementation of NBSAP III. The text below provides a snapshot of the possible funding sources and how the funds are mobilized. However, it must be emphasized that a financing strategy must be developed.

The implementation of the National Biodiversity Strategy and Action Plan (NBSAP III) will be financed through a diverse range of funding sources, with primary reliance on international mechanisms and grants provided by donor countries and international organizations. Additionally, available domestic

resources will be utilized, though they are inherently limited due to the financial challenges the country faces as a result of difficult economic conditions and the ongoing impacts of conflict.

The domestic funding will constitute domestic public spending (DPS) and the private funding. To support DPS, revenue will be generated from design and operationalizing PESs. From the PESs, revenue will be generated through user's charges such as polluter pays principles (PPP), park fees, tourism levy, carbon tax, and sell of harvest permits for commercial harvesters. For the PES scheme to work efficiently, there is a need for improved institutional capacity to monitor and collect revenue from the scheme. It is important to emphasis that ecosystems have the huge potential to self-funding their conservation and restoration programs; therefore, PES schemes must be emphasized. Furthermore, another avenue to increase public domestic spending is to phase out environmentally perverse subsidies and reallocates them to biodiversity conservation and restoration projects. Through such strategies a significant amount of revenue can be mobilized to funding the major components of the NBSAP III.

Another domestic avenue through which revenue will be mobilized is the private sector. This will involve development of Public private partnerships (PPP) to jointly operate the national parks (PAs) tourism ventures and fishery industry, through such partnerships, the private sector will be expected to invest in some of the conservation measures such as restoration and rehabilitation programs and monitoring.

Another way through which the NBSAP can be financially supported is through in-kind contributions from the community participation and NGOs. Restoration, rehabilitation and monitoring sustainable consumption of biodiversity is highly laboured intensive and costly. The community groups (CGs) have the potential to mobilize their labour and contribute significantly to the implementation of the NBS activities. Therefore, forming partnerships through robust co-management schemes would unlock the much-needed human resources for the NBS implementation.

International funding constitutes an important funding source for the country biodiversity. During the NBSAP II development, it was estimated that international funding accounts for approximately 80% of biodiversity financing

in the country (EPA, 2017). The bilateral and multilateral sources include GEF, UNDP, UNEP, World Bank Group (WBG), OECD member countries, including Netherlands, Italy amongst others. There are numerous multilateral funds that support various components of biodiversity such as restoration, rehabilitation, sustainable utilization. These include Global Biodiversity Framework Fund (GBFF), Adaptation Fund (AF); Least Developed Countries Fund (LDCF); Green Climate Fund (GCF), Climate Investment Funds (CIF), Clean Technology Funds (CTF) and the Strategic Climate Fund (SCF); the forest Investment Program (FIP), the Pilot Program for Climate Resilience (PPCR), and the Scaling-up Renewable Energy Program (SREP) attached to CIF; and the Performance-Based Payments for Reduced Emissions from Deforestation and forest degradation (REDD), Certified Emission Reductions (CERS) established under the Clean Development Mechanism (CDM) , Nationally Determined Contributions (NDC),Islamic Bank and some initiatives such as the Green Middle East Initiative, Islamic Bank and some initiatives such as the Green Middle East Initiative.

The OECD will constitute funds such as USAID, JICA, GIZ, Norfund and many others. Each of these funds has procedures and processes in place to access them.

6.0. Implementation plans and requirements

NBSAP III will be implemented between 2025 and 2030 and hence 5-year project. The implementation will involve execution of the strategic activities as listed under each pathway. These strategic activities are list as ACT. It is crucial that overlaps and grey areas are eliminated on the onset to avoid confusion on the implementation of the NBSAP.

The success of NBSAP III will depend on the level of mainstreaming across the different sectors. Furthermore, key to the success will be collaboration and coordination amongst the stakeholders involved. It is also fundamental that communication on the implementation of the NBSAP III is sustained throughout the implementation phase. The implementation will commence once the NBS is adopted at the national level and announcements have been made at all levels. The NBS implementation plan framework is provided in Table (12).Table 9: Generic implementation plan for NBSAP

Strategic target	Activities and intervention	Duration	Start	End	Responsible agent	Estimated costs

6.1. Supporting elements for implementation

The key to success in NBS implementation is mainstreaming across all the key economic sectors national plans and decision-making processes. This will ensure that once the economic sector plans and decisions are implemented, the NBS activities will automatically be implemented.

The NBS pathways and targets have provided a framework for deriving the actions as listed under each pathway. Thus, the NBS Implementation will involve execution of the identified biodiversity management actions/activities. To fully execute the identified strategic activities, it is vital that there is capacity development across the key players who are involved in the biodiversity management. Furthermore, information regarding NBS through stakeholder engagement is necessary. Thus, there should be adequate knowledge and information access across all stakeholders. Lastly, technological and its application is important for implementation particularly monitoring and survey. These aspects are discussed below.

6.1.1. Capacity building for NBS implementation

Successful NBS implementation requires that key stakeholders are all equipped and capacitated to fully participate in its implementation activities. From the previous experience on the implementation of the NBS II, capacity building is critical and should be done at the individual and staff level. This is important as it provides the individual with the knowledge to ensure that each member can implement the NBS activities at an individual level. For instance, through capacity building on waste management, individuals will practices reduce, reuse and recycling and thereby reduce waste at household level. Similarly, through capacity building on ecosystems-based approaches, farmers will adopt integrated pest management and reduce pesticides uses which will one of the strategic activities for NBS III.

Similarly, capacity building is critical at the organizational level (public private and community-based organization). Capacity building at this level will

enhance organization/institutional performance and capacities in implementing the NBS activities. With capacity building, key aspects such as resource mobilization for implementation will be mobilized. Similarly, capacity building on appropriate technologies such as plant propagation, genetic conservation, water and marine require technologies, Geographic Information Systems (GIS), remote sensing etc is fundamental as most of the NBS activities require survey, assessment and monitoring which require appropriate technologies.

6.1.2. Appropriate technologies

As highlighted above, application of appropriate technologies will determine the success of NBS in achieving its targets. A wide of technological needs will be required to implement some of interventions such as technologies to promote sustainable consumption and production in agriculture, fisheries and sustainable forestry, soil and water conservation, pest control, weather forecasting, species survey, habitat restoration and genetic preservations.

Similarly, a lot of information will be required and at the same time generated for biodiversity. Therefore, Information technologies and systems engineering technologies will be required to provide knowledge and information on Traditional knowledge, science, for data collation, reformulation and analysis and decision-making.

6.1.3. Stakeholder engagement and communication

Stakeholder engagement from the onset is crucial for the community participation and engagement in the NBS. One of the lessons learnt from the previous NBSAP is that stakeholders particularly the communities and the private sectors were not engaged from the onset. This effectively implied that the critical stakeholders such as communities and the private sector were left behind. Furthermore, due to lack of engagement, some stakeholders were not aware of the existence of NBSAP There is therefore a need to develop a stakeholder engagement and communication plan. The stakeholder engagement plan will detail the stakeholders, their expected participation and engagement in the NBS, and how they will be engaged by the relevant party to ensure that they are fully involved in the implementation of the NBSAP III.

Furthermore, communication on the implementation process of the NBSAP is critical to ensure that the stakeholders are aware of the ongoing activities.

Furthermore, to raise awareness, facilitate resource conflict resolution and stakeholder management, and package biodiversity information suited to each of the various publics. Thus, the communication strategy will highlight and profiles ecosystem services and biodiversity conservation in terms of their contribution to development and community livelihoods. To ensure that there is regular and sustained communication on the NBSAP itself, the community strategy will address the key messages on

- Value of ecosystems and contribution to community livelihood and national economy
- Mainstreaming efforts on the value of ecosystems
- Progress on the implementation of NBSAP
- Success and failures
- Communities' involvement and engagement

6.1.4. Strengthening Institutional Arrangements and collaborations

One of the current weaknesses in the NBSAP II implementation was weak institutional arrangements and collaborations. Institutional arrangements defined the policies, systems, and processes that organizations use to legislate, plan and manage their activities efficiently and to effectively coordinate with others in order to fulfill their mandate. The starting point to effective implementation is to organize the institutions to ensure that each institution knows what it is doing, identify the synergies and ensure that the synergies are integrated and mainstreamed in the NBSAP. Through this process, overlaps and grey areas will be identified and dealt with. Strengthening institutional arrangements and collaboration is one of the strategic activities under the NBS and should be done by the EPA.

This strategic activity will further entail reinforcing governance systems to facilitate and guide biodiversity management. It will also involve consolidating inter-sectoral and inter-agency coordination; establish and operationalize public private partnerships on biodiversity utilization and conservation in the country. This will be achieved through establishing and creating biodiversity focal point within institutions and at the same time establish community and private sector focal points within EPA

6.1.5. Synergies with existing frameworks

In addition to mainstreaming NBSAP across the country planning and decision-making process as emphasised, it is crucial that critical synergies and leveraging areas are identified for the NBSAP III implementation. Enforcing the Environmental Protection Law and EIA regulations offer a critical leverage area for the implementation of some of the components of NBSAP. Through enforcement of the EIA Act some of the critical aspects of the NBSAP will be achieved. EIA is a management tool that forces the stakeholders to integrate and mainstream biodiversity protection, management into the decision-making process from the initial stage of decision making up to the production stage and closure of the project.

Legal provisions for EIA exist in Yemen since 1995, when the Environmental Protection Law was issued. EIA remained voluntary until 2005 though, when the Environmental Protection Authority (EPA) got a legal mandate for some EIA-related procedures. Since 2006, the EPA has been preparing a new Environmental Protection Law. Enforcement of the EIA by EPA is crucial for attaining the country's ambitious biodiversity goals. Thus, there is a need for the EPA to be strengthened and cooperation with the other stakeholders enhanced to ensure that EIA is enforced in the country.

6.2. Monitoring and evaluation

Monitoring and evaluation is a critical component of NBSAP III as stressed in the K-M GBF. Accordingly, Yemen endeavors to allocate adequate resources to monitor and evaluate the NBSAP III implementation is accordance with the monitoring framework provided by the CBD. Two types of M&E will be employed being, process monitoring and results monitoring. The results-based monitoring is based on the results-based management approach and measures the achievements of the project outcomes.

The results-based monitoring approach provides an overall assessment on the performance of the project on the set targets and the output. Critically, it provides means for verification and auditing purposes. Key aspect of the M&E framework is that it will be participatory, consultative and emphasis will be on identifying the key areas for improvements. Through the M&E framework, gaps and areas of weakness will be identified for strengthening.

A lot of data will be generated for indicators which are over 30. It is necessary that EPA develop a central storage facility for data storage and management. The data storage facility should be accessible to all the stakeholders for purposes of depositing the data.

Based on the long-time nature of the project, M&E will be undertaken on quarterly and annually basis throughout the project duration. The outputs from the M&E will consist of initial report, quarterly, annually, mid-term and final revaluation reports.

The initial report will constitute the inception report for the commencement of the M&E process and it will be a product of the workshop meeting which will be conducted at the commencement of the NBSAP III implementation. The initial M&E will detail the methodology to be employed, the targets for all the policy area and the corresponding indicators both local and CBD headlines indicators, methods of data collection and analysis, responsible agents, frequency of data collection and reports. At the inception meeting, it is crucial that all stakeholders are involved to ensure collective agreement on the M&E process, reports and formats.

Following the M&E inception report, each stakeholder/responsible agent will be required to collect and store assigned NBS implementation activities on weekly and monthly basis. The data will be collected on the specific indicator as relevant in the NBAP. For instance, the communities tasked with restoration through planting will record number of trees planted each day, similarly, each department will record daily activity undertaken contributing to the strategic activities (ACT). The data recorded on daily activities will be deposited in a central storage facility for easy of access by the stakeholder tasked with M&R reporting.

Based on the daily or weekly data captured on the NBSAP activities, periodic (monthly report and yearly) reporting will be done. The M&E periodic reporting (monthly, quarterly and yearly) report will be synthesis of the data collected on activities.

The annually reporting will be done by the EPA which is focal point for CBD and comply all the various sections of the NBSAP. The report will be submitted to the CHM.

At the end of the NBSAP lifespan, a terminal evaluation will be undertaken by EPA. It will be developed based on the last annual evaluation period (2029) and will be the responsibility of EPA. The terminal evaluation will assess whether the overall National targets have been achieved. Consequently, it will form the basis for lessons learnt and which activity are carried forwards for the NBSAP IV.

Audits are critical elements of M&E and for verification and transparency purposes. An independent body should be identified for conducting independent audits to verify the M&E report. Therefore, all the reports produced should be submitted to an independent body that will be established under the Ministry of Finance (MoF). This is crucial for transparency, which is one of the essential components for attracting international funding. Therefore, an audit body under the MoF will be established to conduct timely audits on all M&R and be cleared to the CMH. Annex 1 depicts the M&E framework for NBSAP.

7.0. National Biodiversity Action Plan (NBAP)

Acronyms

AREA	Agricultural Research and Extension Authority
CA	Customs Authority
CAMA	Civil Aviation and Meteorology Authority
CAPS	Central Agency for Public Mobilization and Statistics
CIF	Cleanliness and Improvement Funds
COP	Convention of Parties
CSO	Civil Society Organizations
EIA	Environmental Impact assessment
EPA	Environment Protection Authority
FZA	Free Zones Authority
FZA	Free Zones Authority
GALSUP	General Authority of Lands, Survey and Urban Planning
GASQ	General Authority for Standards and Quality
GDFCD	General Department of Forestry and Combating Desertification
GEF	Global Environmental Facility
GHG	Greenhouse gases
GISRSC	Geographic Information Systems and Remote Sensing Center"
GoY	Government of Yemen
ID	International Donars including world Bank
K-M GBF	Kunming- Montreal Global Biodiversity Fund
LWSC	Local Water and Sanitation Corporations
MAI	Ministry of Agriculture and Irrigation and Fish
MEGI	Middle East Green Initiative
MFAE	Ministry of Foreign Affairs and Expatriates"
MIT	Ministry of Industry and Trade
MLA	Ministry of Local Administration
MOE	Ministry of Education
MOE	Ministry of Electricity
MoF	Ministry of Finance
MOI	Ministry of Interio
MoJ	Ministry of Justices
MoLA	Ministry of Legal Affairs
MORC	Ministry of Road & Construction
MOT	Ministry of Touris
MPIC	Ministry of Planning and International Cooperation
MSAL	Ministry of Social Affairs and Labor
MSRA	Marine Science and Research Authority

MWE	Ministry of Water and Environment
NBAP	National Biodiversity Action Plan
NWRA	National Water Receourses Authority
NWRA	National Water Receourses Authority
PES	Payment for ecosystem Services
PWP	Public Works Project
SDF	Social Development FundSDF Social Development Fund
SLPA	State Land and Property Authority
TBD	To be determined
UNAs	UNITED Nation Agensies
UP	Urban Planning
URC	Universities and Reasearch Centers
URC	Universities and research Centers
VGA	vulnerable groups associations/women/children

1.1. Introduction

Yemen updated its existing NBSAP II as per COP 15 decision 15/6, which calls for party members to revise their existing NBSAP by ensuring that their national targets are addressing and contributing towards each of the goals and targets of the K-M GBF. Subsequently, through updating and aligning its NBS, the GoY shows its commitment to the global efforts of working in partnership to reverse and halt species extinctions. Beside the global effort and commitment, the GoY has prior to joining the UNCBD, prioritized biodiversity and ecosystems in its national agenda as evident from existing Laws and Decrees. Biodiversity has for a long time being prioritized due to the government's recognition of its strategic importance in contributing to economic development and poverty alleviations.

Following the alignment of the NBS to the K-M GBF goals and targets, the National Biodiversity Action Plan (NBAP) was developed. The NBAP is a critical component of the NBSAP. It is through the NBAP that the NBS is implemented. It typically depicts the strategic pathways, strategic high-level activities and the responsible agent for overseeing the implementation of the recommended strategic activities.

In order to achieve the country's biodiversity vision, the NBS identified 6 policy areas as pathways. The 6 pathways are:

- Urgent conservation and restoration needs to halt extinction of species
- Promote communities access and equitable benefit sharing from biological resources and contribution to national economy
- Safeguard ecosystem integrity through sustainable uses and reduced anthropogenic pressure
- Guarantee adequate resources means to support implementation of the biodiversity conservation
- Use of appropriate economic instruments to create an enabling environment for sustainable use
- Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

These six pathways were informed and aligned with the K-M GBF goals and targets. Nineteen (19) national targets were developed which are consistent

with the K-M GBF targets. Annex 2 depicts the K-M targets and the NBSAP III targets.

Similar to the NBS, the NBAP was developed following due diligence as per the CBD guidelines. Its development was based on the all-of-government and all-of-community approach to ensure that both parties contribute to a desirable NBSAP aligned with the national priorities. Critically, the national stakeholders were consulted to ensure that the document is accepted and owned by the audience at all levels. Critical stakeholders such as interdepartmental Biodiversity Working Group and the independent Biodiversity Forum were involved throughout the development process.

The NBAP is thus a continuation of the NBS, as it details the national pathways, the national targets as aligned with the K-M GBF and the high level national strategic activities to be implemented to achieve the targets. Furthermore, it highlights the responsible party, partners, the indicative costs of implementation and the indicators. Indicators are critical for the development of a robust and comprehensive monitoring and reporting of the NBSAP.

This NBAP sets out the national biodiversity agenda for the period 2025-2030 and aims to deliver transformative changes to achieve a balance between conservation, protection and sustainable utilization of biological resources.

The design of the national strategic activities were based on the following guiding principles

- Ensure continuity with NBSA II
- Address the current underlying factors that contribute to biodiversity loss

Effectively the strategic activities were designed to be both proactive and pragmatic and provide a strategic direction towards balance protecting, conserving and utilization of biodiversity.

The action plan constitutes the framework of action in a tubular form for each identified pathway. Under each pathway and outcome a table is developed. Above each table, there is a heading consisting of pathway, outcome and output. Furthermore, each table consists of several components:

- National target which is aligned to the K-M GBF
- Proposed strategic activity which are interventions

- Duration of implementation
- Lead agent and partnerships
- Indicative budget for implementation
- Indicators for monitoring the implementation progress

Annex (3) depicts the Action Plan.

8.0. Reference

Abubakr, M (2004). Marine Biotic Ecosystem (Resources, Habitats and Species), Ministry of Water and Environment (MWE), Environment Protection Authority (EPA), 128pp. The Republic of Yemen.

Al-Alimi, A. A., Saleh, Sh.M.K., Al-Mizgagi, M. A. (2021). Seawater Pollution by Heavy Metals in Coastal Area of Al Hudaydah Gov., Yemen, J Scientific&Eng.Res, 8(7):193-201.

Al-Alimi A., Rimawi, O., Al-Alaiy S., and Saleh Sh.(2023). Assessment of Household Drinking Water Quality in Zabied City, Yemen, International Journal of Water Resources and Arid Environments 12(1): 31-45.

Al-Akhaly I, Al-Shwafi N and Al-Kabsh Sh (2020). Distribution of nutrient salts and chlorophyll-a in surface water along the Gulf of Aden and Arabian sea coast, Yemen. SQU Journal for Science 25 17-24.

Amer A.Th., Saleh Sh.M.K., and Al-Halmi, F.Th. (2021). Seasonal variations in the physico-chemical characteristics of coastal waters in Aden City-Southern Yemen. International Journal of Research and Analytical Reviews, 8(2): 48-60.Al-Hindi, A. N.; Forster, S.; Apel, M. and Melzer, R. (2023). New Records of Brachyuran Crabs Species (Crustacea-Decapoda) In Gulf of Aden, Yemen; Electronic Journal of University of Aden for Basic and Applied Sciences, 1(4): 106-129.

Al-Hindi, A. N.; Wranik, W.; Apel, M.; Forster, S. and Melzer, R. (2020). First Record of Eight Brachyuran Crabs' Species (Crustacea-Decapoda) in Socotra Archipelago in the Indian Ocean-Yemen; Electronic Journal of University of Aden for Basic and Applied Sciences; 1(4): 193-207.

Al-Hindi, A. N. (2019). Brachyuran Crabs of the Yemeni Coastal Waters (Red Sea, Gulf of Aden, Arabian Sea and Socotra Islands). A Ph.D. Dissertation Submitted

to the Marine Biology Department, Faculty of Mathematics and Natural Sciences, Rostock University, Germany, 291 pp.

Al-Khulaidi, A. W (2022). A checklist of Flora of Yemen.

Al-Mashreki, M. H (2023). Land Use Mapping of Yemen Using Remote Sensing Techniques and Geographic Information System. Food and Agriculture Organization of the United Nations and Agricultural Research and Extension Authority. Dhamar, the Republic of Yemen.

Al-Muliki M. M (2024). Biodiversity Assessment of Natural Reserves in Yemen using Remote Sensing (RS) and Geographic Information System (GIS). Environment Protection Authority, Ministry of Water and Environment. Aden, Republic of Yemen.

Al Saafani, M.; Nagi, H.; Alhababy, A. and Hajer, A. 2015. Impact of Sea Level Rise and Climate Change on the Coastal Zone of Aden Governorate, Republic of Yemen; Faculty of Science Bulletin; 27: 15-23.

Barratt, L.; Dawson-Shepherd, A.; Ormond, R. and McDowell, R. (1987). Yemen Arab Republic Marine Conservation Survey, Volume 1, Distribution of Habitats, Species along the YAR Coastline; Unpublished Report; International Union for Conservation of Nature and Natural Resources.

Bawazir, G. M. (2003). Halophila stipulacea (Forsskal) Ascherson: New record for the south of Arabia/Northern coast of the Gulf of Aden. *Journal of Natural and Applied Sciences*, 7(3), December.

Bruggeman, H.Y., (1997). Agro-Climatic Resources of Yemen, part 1 Agro-Climatic Inventory. Agricultural Research and Extension Authority (AREA), Dhamar, The Republic of Yemen.

Conflict and Environment Observation (2021). Protected Areas conservation in Yemen's Conflict. https://ceobs.org/protected-area-conservation-in-yemens-conflict/

Convention on Biological Diversity & UNDP (undated) Aichi Biodiversity Target 11 Country Dossier: YEMEN. https://www.cbd.int/pa/doc/dossiers/yemen-abt11-country-dossier2021.pdf

Daily, G. C., ed. (1997). Nature's services: societal dependence on natural ecosystems. Island Press, Washington, DC.

DouAbul, A. and Abubakr, M. (1996). Marine Conservation Survey along the Southern Coast of Yemen in the Gulf of Aden / Arabian Sea; Sponsored By the Royal Netherlands Government.

DouAbul, A. and Haddad, A. (1999). The Red Sea and Yemen's Red Sea Environments; [In: Protection of Marine Ecosystem of the Red Sea Coast of Yemen (Eds.): DouAbul et al.]; UN Publications; 139 Pages.

EPA (2017). National Biodiversity Strategy and Action Plan II `` achieving a resilient, productive and sustainable socio- ecosystem by 2050. Ministry of Water and Environment, Sana'a, Yemen.

EPA (2014). The 5th National Report to the Convention on Biological Biodiversity (2010-2014); Environmental Protection Authority, Yemen.

EPA (2009). Assessing Progress towards the 2010 Target – The 4th National CBD Report; Environmental Protection Authority, Yemen.

Gadain, H (2023). FAO Yemen: supporting efficient water use for agrifood system transformation in Yemen https://yemen.un.org/en/249626-fao-yemen-supporting-efficient-water-use-agrifood-systems-transformation-yemen

Hariri, K. and Nagi, H. M (2013). Coastal Ecosystems of Al-Mahrah Governorate, Yemen; University of Aden Journal of Natural and Applied Sciences; 17(3): 637-645.

Imtiaz Ahmed, I (2023). Impacts of war on the environment: an overview of Yemen. International Journal of Humanities & Social Science Studies (IJHSSS). DOI: 10.29032/ijhsss.v9.i3.2023. 216-229. https://www.ijhsss.com/files/23.-Imtiaz-Ahmed.pdf#:~:text=Some%20of%20the%20immediate%20effects%20are%20the%20deaths,desertification%2C%20and%20oil%20spills%2C%20which%20cause%20biodiversity%20loss.

IUCN (2021). Invasive alien species and climate change. issues brief. https://iucn.org/sites/default/files/2022-04/ias_and_climate_change_issues_brief_2021.pdf

IUCN (1987). Yemen Arab Republic, Marine Conservation Survey; Gland Switzerland.

Jagman, A. (2023). Impact of conflict on the environment in Yemen.

Kasem, Sh. M. & Al-Alimi A. (2012). Environmental Assessment of metal pollution in sediments of Al-Dhabah Terminal, Gulf of Aden. *J. Nat. & Appl.Scie.,*16(2): 321-334.

Kasem, Sh. M. & Al-Alimi A. (2013). Distribution and characteristics of Persistent Organic Pollutant Residues in Brown Mussels *Perna Perna* of Hadhramout Coastal Area, Gulf of Aden, Yemen. *University of Aden J. of Nat.& Appl.Sci.,* Vol.17, No. 3.

Kasem Sh. M. & Al-Halmi, F.Th. (2020). Phys-Chemical prop.; *Total coliform* and *Fecal coli*.; Nutrient salts; Pollution of Seawater in Aden coasts. *Human&Nat.Sci.J*. 1(4):79-93.

Majeed, H. N., Pawar R. S. and Panaskar D. B. (2012). Studied Assessment of heavy metals in sediments from coastal Al-Hodiedah governorate. Univ. J. of Envi. Res. & Techno, 2(3): 168-173.

Mensoor, M (2023). The Mammals of Yemen. https://www.researchgate.net/publication/365573909_The_Mammals_of_Yemen

Ministry of Planning and International Cooperation (2021). Sana'a, The Republic of Yemen.

Mohammed, A. A (2020). "The Impact of the War in Yemen on Artisanal Fishing of the Red Sea," LSE Middle East Centre, 2018, http://eprints.lse.ac.uk/91022/. Accessed February 13, 2020.

Mohammed S. (2023). Environmental crisis in Yemen: for forgiving repercussions of a permanent conflict, Arab Reform Initiative, pp. 1-7.

Nagi, H. M. (2021). Delineating and Calculating the Length of Yemen's Mainland Shoreline. Journal of Alternative Fuels and Energy, 5(1): 1-9.

Nagi, H. M Hisham M. Nagi, Bassim S. Al Khirbash, Maryam A. Taher, Nabil A. AL (2021). Management of Populated Islands of Yemen (Case Study of Kamaran Island). Tihama Scientific Academic Journal

Nagi, H. M.; Khanbari, K. M. and Al-Sameh, A. (2012). Estimating Total Area of Mangrove Habitats in the Republic of Yemen Using Remote Sensing and GIS; Faculty of Science Bulletin, 24: 75-84.

National Clearing House Mechanism (undated) Yemen Biodiversity: Flora. https://ye.chm-cbd.net/flora

National Clearing House Mechanism (undated) Yemen Biodiversity: Fauna. https://ye.chm-cbd.net/fauna

Nasr S.; Okbah M.; Kasem Sh.M. (2006). Environmental Assessment of Heavy Metal Pollution in Sediments of Aden Port, Yemen, Int J of Oceans &Oceanography1(1):99-109.

Okbah M; Samir M.; Kasem Sh.M. (2011). Fractionation of trace metals (Mn, Zn, Cu, Pb) in Red Sea sediments, Gulf of Aden, Yemen, Chemistry and Ecology, 27(1): 81-90.

Ormond, R. and Banaimoon, S. (1994). Ecology of Intertidal Macroalgal Assemblages on the Hadhramout Coast of Southern Yemen, an Area of Seasonal Upwelling; Marine Ecology Progress Series; 105: 105-120. Paulson Institute (2022) Financing Nature: Closing the Global Biodiversity Financing Gap. https://www.paulsoninstitute.org/conservation/financing-nature-report/

Price, A. R.; Crossland, C. J.; Dawson-Shepherd, A. R.; McDowall, R. J.; Medley, P. A.; Stafford Smith, M. G.; Ormond, R. F. and Wrathall, T. J. (1988). Aspects of Seagrass Ecology along the Eastern Coast of the Red Sea; Botanica Marina, 31: 83-92.

Rushdi, A.; Abubakr, M. and Hebba, H. (1994). Marine Habitats of the Red Sea at AlUrj-Al-Saleef and Dhubab-Yakhtul Areas: Their Ecology, Environment and Management Recommendations; Sana'a University and UNDP.

Reliefweb (2024). Yemen's climate crisis is threatening lives, livelihoods and culture. https://reliefweb.int/report/yemen/yemen-s-climate-crisis-threatening-lives-livelihoods-and-culture#:~:text=More%20than%205%20million%20trees%20have%20been%20cut,likely%20to%20be%20devastating%20to%20Yemen%E2%80%99s%20long-term%20development.

RNRRC (2022). Updating national maps production. Renewable Natural Resources Research Center, Agricultural Research and Extension Authority. Dhamar, the Republic of Yemen.

Rouphael, T.; Turak, E. and Brodie, J. (1999). Seagrasses and Mangroves of Yemen's Red Sea; [In: Protection of Marine Ecosystems of the Red Sea Coast of yemen; DouAbul, A.; Rouphael, T.; Marchant, S. and Marchant, M. (Editors)]; Hassall and Associates and Australian Marine Science and Technology Ltd; and UNOPS; pp 41-49.

Saleh, Sh.M.K. (2007). Environmental assessment of heavy metals pollution in bottom sediments from the Gulf of Aden, Yemen, Ph.D. Thesis, Institute of Graduate Studies and Research, Alexandria University, Egypt.

Saleh Sh.M.K., Al-Alaiy S. Gh., Abdulrazak B. I. (2017). Application of water quality index to assessment of groundwater quality. *J.of Nat and Appl Sci.* 21 (1):127-136.

Saleh Sh.M.K., Al-Alaiy S. Gh., Abdulrazak B. I., Ghunaim N. (2017). Evaluation of Groundwater Quality and its Suitability for Drinking and Agri. Use of Rural Areas for Zabid Hodiedah, Yemen, *J of Scientific&Eng. Res.* 4(7):10-24.

Saleh Sh. M.K. Al-Alimi, A. A., Al-Mizgagi, M. A. (2021). Physico-chemical characteristics in the Red Sea coastal water in Al-Hudaydah city, Yemen. *J Res in Chem and Pharmaceutical Sci. 9(2): 111-120. doi.org/10.36673/AJRCPS.2021.v09.i02.A16.*

Saleh Sh.M.K., and Al-Halmi, F. T. (2021). Distribution of Nutrients in Seawater from the Aden coasts/Gulf of Aden, Yemen, *IOP Publ.*, doi:10.1088/1742-6596/1900/1/012022.

Saleh Sh.M.K., Amer, A.T., Al-Alawi, A. (2018). Potential Ecological Risk of Heavy Metals in sediments from the Aden Coast, Yemen, *J.Env.Sci.Toxi Food Tech.,*12,(10):42-55.

Saleh Sh. M.K., Amer T. A., Shdeewah F., Yahya A., Al-Shwafi N. (2018). Spatial Distribution, Seasonal, and Pollution Assessment of Heavy Metals in Sediments from Aden Coasts, Gulf of Aden, Yemen. *J Scientific & Eng. Res.* 5(11):314-332.

Saleh Sh., and Al-Sallami A. (2022). Assessment of the level of physicochemical and microbiological contamination of Groundwater in parts of Bir Nasser and

Bir Ahmed water fields in Tuban Delta in Aden and Lahej Governorates, Yemen. *EJUA-BA*,3(2):101-116. https://doi.org/10.47372/ejua-ba.2022.2.000

Saleh Sh., Naser, N., Okbah, M. (2019). Geochemical Forms and Risk Assessment of some heavy metals in Aden coasts sediments, Yemen, *J.Nat. &Appl.Sci*, 23(2):383-397.

Saleh Sh. M.K., Taher, M.M., Saif, B.O. (2020). Estimation of Heavy Metals in the Groundwater of Al-Dhalia Gov., Yemen, *EJUA-BA*, 1 (3): 151-158.

Secretariat of the Convention on Biological Diversity (2004). The Ecosystem Approach, (CBD Guidelines) Montreal: Secretariat of the Convention on Biological Diversity 50 p.

Seif, A (2024). A Roadmap to Recovery: Addressing Poverty in Yemen's Ongoing Conflict. https://www.undp.org/yemen/news/roadmap-recovery-addressing-poverty-yemens-ongoing-conflict

Sheppard, C. R. C.; Price, A. R. G. and Roberts, C. (1992). Marine Ecology of the Arabian Region: Pattern and Processes in Extreme Tropical Environment; Academic Press, London.

Springer, J., Campese, J. and Nakangu, B. (2021). The Natural Resource Governance Framework – Improving governance for equitable and effective conservation. Gland, Switzerland: IUCN

Taher, M., Saleh Sh. & Alburkani, A. (2021). "Assessment of metal contamination in deposited dust of the industrial area and some streets in Aden City, Yemen" J.Nat.& Appl.Sci, Uni. 25, 111-129. doi.org/10.47372/uajnas.2021.n1.a10.

Taher, M.; Saleh Sh., Al-Mansari, M. (2023) Physicochemical Properties of Hot Springs in Shara'a and Kirsh, Lahj Governorate-Yemen, J. Nat. and Appl. Sci., 27(1):97-113.

Taher, M.M.., Saleh Sh.M.K., Saif, B. O. (2020). Estimation of physical and chemical properties of Groundwater of selected Al-Dhalia Gov., Yemen, EJUA-BA, 1(4):208-217. https://doi.org/10.47372/ejua-b.

The World Bank Group (2023) CLIMATE RISK COUNTRY PROFILE-Yemen. 1818 H Street NW, Washington, DC 20433 Telephone: 202-473-1000; www.worldbank.org

The World Bank (2000). The Republic of Yemen comprehensive development review environment. World Bank Document https://documents1.worldbank.org/curated/en/123861468335500463/pdf/multi0page.pdf

UNEP (undated) The Nagoya Protocol on Access and Benefit-sharing. https://www.cbd.int/abs/about

Wenner, Manfred W. and Burrowes, Robert (2024). "Yemen". *Encyclopedia Britannica*, 13 Aug. 2024, https://www.britannica.com/place/Yemen. Accessed 13 August 2024

White F. UNESCO; Paris (1983). The Vegetation of Africa. A Descriptive Memoir to Accompany the Unesco/Aetfat/UNSO Vegetation Map of AfriGoogle Scholar

Annex 1: M&E Template

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
Target 1: By 2030: 20% of areas of environmental importance should be under spatial planning and effective management. By 2050, all land in Yemen should be under spatial planning to prevent land use changes in biodiversity-rich ecosystems. This includes sustainably increasing the area, quality, connectivity, access to, and utilization of green and blue spaces in urban and densely populated areas.	• Red List of Ecosystems • Extent of natural ecosystems • Percentage of land and seas covered by biodiversity-inclusive spatial plans	TBD	20% of area of ecological importance under planning		Quarterly	EPA, MWE, MAIF /GALSUP /MOLA /MPIC
Target 2: By 2030, restore 20% of degraded ecosystems on land and inland waters, coastal marine environments, wetlands, mangroves, and forests. By 2050, effectively restore all degraded ecosystems to enhance their capacity to provide ecosystem services that support the livelihoods of local communities and the national economy.	Area under restoration	TBD	20% of degraded ecosystems restored		Quarterly	EPA, MWE, MAIF /AREA / MSRA
Target 3: By 2030, 20% of biodiversity-rich ecosystems should be conserved and managed under effective and interconnected terrestrial and marine protected areas with joint management systems, where local communities play an active role in conserving and managing existing protected areas	Coverage of PAs and other effective area-based conservation measures	TBD	20% of biodiversity rich ecosystems PAs		Quarterly	EPA, MWE, MAIF /AREA
Target 4: Take urgent measures to prevent extinction caused by human activities, natural factors, and climate changes for threatened species, and restore and conserve species to significantly reduce the risk of	• Red List Index • The proportion of populations within species with an	TBD	All endangered species identified and conservation		Yearly	MAIF, MWE /AREA / MSRA

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
extinction. Additionally, preserve and restore genetic diversity within native, wild, and domesticated species communities. By 2030, list all endangered species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and implement specific conservation measures to reduce the risk of extinction caused by human activities for priority threatened species or their trade	effective population size > 500		measures in place			
Target 5: By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.	Proportion of fish stocks within biologically sustainable levels Harvest rate for renewable resources (timber and forest products)	TBD	Harvest rates at maximum sustainable yield for all species		quarterly	MAIF, MAIF, MWE/EPA /MOJ / MOLA / MSRA
Target 6: By 2030, prevent the introduction of any new invasive species into the country. Identify and take necessary measures to eradicate existing invasive alien species in environmentally priority sites and control them in lower priority sites.	Rate of invasive alien species establishment	TBD	No introduction of any new invasive species		Yearly	MWE / EPA / MAIF /CA/ MSRA
Target 7: By 2030, significantly reduce pollution levels and the negative impacts of pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects and the ecosystems' capacity to absorb biodegradable pollutants. Achieve a 20% reduction in the use of	• Index of coastal eutrophication potential • Aggregated Total Applied Toxicity • Water quality	TBD	Reduce pollution level to assimilative capacity of environment		Monthly	MWE, MAIF /EPA

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
agricultural chemicals and pesticides, and achieve 70% in recycling, reuse, and reduction of plastic waste by 2050						
Target 8 : By 2030, Integrating biodiversity within the Nationally Determined Contributions (NDC) for 2025-2030 by increasing the capacity of ecosystems to absorb greenhouse gas emissions through the restoration of at least 15% of degraded ecosystems (wetlands, mangroves, forests, and terraces). This contributes to mitigating and adapting to climate change and combating desertification, as well as focusing on ecosystem-based adaptation approaches to enhance resilience to climate change impacts and improve ecosystem resilience	• GHG emission in Kt CO2eq • Carbon sequestrated in Kt CO2	TBD	• An NDC with ecosystem based approach • Carbon sequestrated		Yearly	EPA /MWE
Target 9: By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.	• Revenue generated from the sustainable use of wild/genetic resources • Percentage of the population in biodiversity related activities	TBD	• All ecosystems sustainably managed		Yearly	MWE, MAIF /EPA /MOLA/
Target 10: By 2030, implement ecosystem-based approaches in all agricultural systems (agriculture, aquaculture, fisheries, and forestry) to ensure sustainable and safe food production in the future, conserve and restore biodiversity, maintain ecosystem services, including pastures and ensure that food production does not degrade due to ecosystem degradation	• Proportion of agricultural area under productive and sustainable agriculture	TBD	All agricultural systems under Ecosystems-based approaches		Yearly	, MAIF/MIT /MWE / MSRA

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
	• Progress towards sustainable forest management					
Target 11: By 2030, restore 20% of priority degraded ecosystems to enhance the flow of ecosystem services to support community livelihoods and the national economy, including providing disaster risk reduction services. Restore and protect aquatic ecosystems to increase their capacity to sustainably provide water services to about 80% of Yemen's population by 2050	Services provided by ecosystems Ha of degraded ecosystems restored	TBD	20% of prioritised ecosystems restored and provide optimal services		Yearly	EPA /MWE /MOLA
Target 12: By 2030, integrate urban green spaces (recreational) into urban land use planning, ensuring their connectivity with nearby ecosystems to enhance the flow of ecosystem services, improve human health and well-being, increase connectivity with nature, and contribute to overall sustainable and inclusive integration while providing essential ecosystem functions and services	Average share of the built-up area of cities that is green/blue space for public use for all	TBD	Integrated urban green spaces (recreational) into urban land use planning		Yearly	GALSUP /MOLA/ EPA /MWE
Target 13: By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning processes (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels	• Indicator on monetary benefits received Indicator on non-monetary benefits	TBD	All communities in the supply chain of NTFPS are formally recognised in the value chain		Yearly	MSAL/MAIF /MWE/ EPA /AREA/ MPIC

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
Target 14: By 2030, ensure that all companies transparently disclose profits from the use of genetic resources and potential risks to ecosystems, and implement effective risk mitigation systems while ensuring fair benefit-sharing with communities	• Number of companies disclosing profits • Revenue to community and company profit ratio	TBD	All companies disclose the their biodiversity related profit and fair benefits sharing		Yearly	MoF/MWE/EPA
Target 15: By 2030, train and enhance the competence of all relevant stakeholders in biosafety measures to protect the country's biodiversity and human health, benefit from eco-friendly and health-safe biotechnology, and strengthen monitoring and oversight of the transportation, handling, and use of genetically modified organisms and materials, providing necessary information to consumers in line with the Cartagena Protocol and national legislation	• Number of staff trained on biosafety • Number of stakeholders with access to information	TBD	All relevant stakeholders trained in biosafety measures		Quarterly	EPA /MWE/ CA/MIT /
Target 16: By 2030, halve the monetary value of subsidies harmful to biodiversity and promote environmentally positive incentives targeting green technologies, ecosystem-based programs, and clean and renewable energy	• Value of Positive incentives in place to promote biodiversity conservation and sustainable use • Value of subsidies and other incentives harmful to biodiversity	TBD	20% of monetary value of subsidies reallocated to environmentally friendly		Yearly	MoF, MAIF/MWE /EPA /AREA /MOE /MIT

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
Target 17: By 2030, mobilize financial resources from all funding sources sustainably to bridge the biodiversity financing gap by 20%, and increase it to 80% by 2050	• Value of International public funding on biodiversity • Domestic public funding on biodiversity • Private funding (domestic and international) on conservation and sustainable use of biodiversity and ecosystems	TBD	Financing gap on biodiversity reduced by 20% and 80% in 2030 and 2050		Yearly	MoF, EPA /MWE
Target 18: By 2030, ensure an adequate scientific base, transfer traditional knowledge, enhance scientific research capabilities, monitoring capabilities, encourage innovations, and enable stakeholders to design, implement, and use advanced technology to conserve biodiversity. Ensure unrestricted access to necessary information, data, and technology for all stakeholders, including community members, involved in biodiversity management and conservation	• Number of stakeholder access to information • Number of technologies transferred • Number of TK employed	TBD	Fully available information on both TK and scientific methods		Yearly	EPA /MWE / MPIC /MIT /CAPS
Target 19: By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a	• Number of women, youth and vulnerable group in committees	TBD	Fair and reasonable representation of women,		Yearly	MSAL /MOLA /MSAL /MWE /EPA

National target	KPI	Baseline	Target	Data source	Frequency	Responsible agent
gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making	• Number of gender-responsive approach employed		youth and vulnerable group in committees and biodiversity related work force.			

Annex 2: Aligned NBSAP target with the K-M GBF

NBSAP III national target	K-M GBF target
Target 1: By 2030: 20% of areas of environmental importance should be under spatial planning and effective management. By 2050, all land in Yemen should be under spatial planning to prevent land use changes in biodiversity-rich ecosystems. This includes sustainably increasing the area, quality, connectivity, access to, and utilization of green and blue spaces in urban and densely populated areas.	**Target 1**: Ensure that all areas are under participatory integrated biodiversity inclusive spatial planning and/or effective management processes addressing land and sea use change, to bring the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity, close to zero by 2030, while respecting the rights of indigenous peoples and local communities,
Target 2: By 2030, restore 20% of degraded ecosystems on land and inland waters, coastal marine environments, wetlands, mangroves, and forests. By 2050, effectively restore all degraded ecosystems to enhance their capacity to provide ecosystem services that support the livelihoods of local communities and the national economy	**Target 2**: Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity

NBSAP III national target	K-M GBF target
Target 3: By 2030, 20% of biodiversity-rich ecosystems should be conserved and managed under effective and interconnected terrestrial and marine protected areas with joint management systems, where local communities play an active role in conserving and managing existing protected areas.	**Target 3**: Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures, recognizing indigenous and traditional territories, where applicable, and integrated into wider landscapes, seascapes and the ocean, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories
Target 4: Take urgent measures to prevent extinction caused by human activities, natural factors, and climate changes for threatened species, and restore and conserve species to significantly reduce the risk of extinction. Additionally, preserve and restore genetic diversity within native, wild, and domesticated species communities. By 2030, list all endangered species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and implement specific conservation measures to reduce the risk of extinction caused by human activities for priority threatened species or their trade	**Target 4**: Ensure urgent management actions to halt human induced extinction of known threatened species and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species to maintain their adaptive potential, including through in situ and ex situ conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence.
Target 5: By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.	**Target 5:** 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, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities

NBSAP III national target	K-M GBF target
Target 6: By 2030, prevent the introduction of any new invasive species into the country. Identify and take necessary measures to eradicate existing invasive alien species in environmentally priority sites and control them in lower priority sites	**Target 6**: Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands
Target 7: By 2030, significantly reduce pollution levels and the negative impacts of pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects and the ecosystems' capacity to absorb biodegradable pollutants. Achieve a 20% reduction in the use of agricultural chemicals and pesticides, and achieve 70% in recycling, reuse, and reduction of plastic waste by 2050	**Target 7**: Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution
Target 8: By 2030, Integrating biodiversity within the Nationally Determined Contributions (NDC) for 2025-2030 by increasing the capacity of ecosystems to absorb greenhouse gas emissions through the restoration of at least 15% of degraded ecosystems (wetlands, mangroves, forests, and terraces). This contributes to mitigating and adapting to climate change and combating desertification, as well as focusing on ecosystem-based adaptation approaches to enhance resilience to climate change impacts and improve ecosystem resilience	**Target 8:** Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity
Target 9: By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance	**Target 9:** Ensure that the management and use of wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on

NBSAP III national target	K-M GBF target
ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050	biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.
Target 10: By 2030, implement ecosystem-based approaches in all agricultural systems (agriculture, aquaculture, fisheries, and forestry) to ensure sustainable and safe food production in the future, conserve and restore biodiversity, maintain ecosystem services, including pastures and ensure that food production does not degrade due to ecosystem degradation	**Target 10** Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches contributing to the resilience and long-term efficiency and productivity of these production systems and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services
Target 11: By 2030, restore 20% of priority degraded ecosystems to enhance the flow of ecosystem services to support community livelihoods and the national economy, including providing disaster risk reduction services. Restore and protect aquatic ecosystems to increase their capacity to sustainably provide water services to about 80% of Yemen's population by 2050	**Target 11:** Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature
Target 12: By 2030, integrate urban green spaces (recreational) into urban land use planning, ensuring their connectivity with nearby ecosystems to enhance the flow of ecosystem services, improve human health and well-being, increase connectivity with nature, and contribute to overall sustainable and inclusive integration while providing essential ecosystem functions and services.	**Target 12**: Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services.
Target 13: By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and	**Target 13** Take effective legal, policy, administrative and capacity-building measures at all levels, as appropriate, to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources and from digital sequence information on genetic resources, as well as traditional knowledge

NBSAP III national target	K-M GBF target
ecosystems into national planning processes (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels	associated with genetic resources, and facilitating appropriate access to genetic resources, and by 2030 facilitating a significant increase of the benefits shared, in accordance with applicable international access and benefit sharing instruments **Target 14** Ensure the full integration of biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors, in particular those with significant impacts on biodiversity, progressively aligning all relevant public and private activities, fiscal and financial flows with the goals and targets of this framework
Target 14: By 2030, ensure that all companies transparently disclose profits from the use of genetic resources and potential risks to ecosystems, and implement effective risk mitigation systems while ensuring fair benefit-sharing with communities	**Target 15** Take legal, administrative or policy measures to encourage and enable business, and in particular to ensure that large and transnational companies and financial institutions: (a) Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains and portfolios; (b) Provide information needed to consumers to promote sustainable consumption patterns; (c) Report on compliance with access and benefit-sharing regulations and measures, as applicable; in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production
Target 15: By 2030, train and enhance the competence of all relevant stakeholders in biosafety measures to protect the country's biodiversity and human health, benefit from eco-friendly and health-safe biotechnology, and strengthen monitoring and oversight of the transportation, handling, and use	**Target 17**: Establish, strengthen capacity for, and implement in all countries in biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention.

NBSAP III national target	K-M GBF target
of genetically modified organisms and materials, providing necessary information to consumers in line with the Cartagena Protocol and national legislation	
Target 16: By 2030, halve the monetary value of subsidies harmful to biodiversity and promote environmentally positive incentives targeting green technologies, ecosystem-based programs, and clean and renewable energy	**Target 18** Identify by 2025, and eliminate, phase out or reform incentives, including subsidies, harmful for biodiversity, in a proportionate, just, fair, effective and equitable way, while substantially and progressively reducing them by at least 500 billion United States dollars per year by 2030, starting with the most harmful incentives, and scale up positive incentives for the conservation and sustainable use of biodiversity.
Target 17: By 2030, mobilize financial resources from all funding sources sustainably to bridge the biodiversity financing gap by 20%, and increase it to 80% by 2050	**Target 19** Substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources, in accordance with Article 20 of the Convention, to implement national biodiversity strategies and action plans, by 2030 mobilizing at least 200 billion United States dollars per year, including by
Target 18: By 2030, ensure an adequate scientific base, transfer traditional knowledge, enhance scientific research capabilities, monitoring capabilities, encourage innovations, and enable stakeholders to design, implement, and use advanced technology to conserve biodiversity. Ensure unrestricted access to necessary information, data, and technology for all stakeholders, including community members, involved in biodiversity management and conservation	**Target 20** Strengthen capacity-building and development, access to and transfer of technology, and promote development of and access to innovation and technical and scientific cooperation, including through South-South, North-South and triangular cooperation, to meet the needs for effective implementation, particularly in developing countries, fostering joint technology development and joint scientific research programmes for the conservation and sustainable use of biodiversity and strengthening scientific research and monitoring capacities, commensurate with the ambition of the goals and targets of the framework. **TARGET 21** Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring,

NBSAP III national target	K-M GBF target
	research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities should only be accessed with their free, prior and informed consent, in accordance with national legislation
Target 19: By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making	**Target 22**: Ensure the full, equitable, inclusive, effective and gender-responsive representation and participation in decision-making, and access to justice and information related to biodiversity by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as by women and girls, children and youth, and persons with disabilities and ensure the full protection of environmental human rights defenders **Target 23**: Ensure gender equality in the implementation of the framework through a gender-responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity.”

Annex 3: The Action Plan

Goal 1: Ensure urgent conservation and restoration needs to halt extinction of species

Outcome 1.0. Well restored functioning ecosystems supported by effective PA management

Output 1.1. Restored ecosystems that were degraded

Targets	**Target number**	**Activities**	**Duration**	**Lead agency**	**Partners**	**Budget US$ million**	Indicators
By 2030, restore 20% of degraded ecosystems on land and inland waters, coastal marine environments, wetlands, mangroves, and forests. By 2050, effectively restore all degraded ecosystems to enhance their capacity to provide ecosystem services that support the livelihoods of local communities and the national economy.	**2**	Undertake a national mapping and assessment of the degraded ecosystems by type throughout the country and categorization of the extent of degradation, type of degradation e.g. soil erosion, deforestation, overgrazing, sedimentation and factors contributing to degradation	3 Year	MWE/EPA	MAIF / URC/EPA SLPA / FZA/ UNAs CSO/ GALSUP/ ID/ MEGI / GEF	1.0	• National report on the status of ecosystems. • Ha of ecosystems degraded by type • Number of ecosystems mapped and assessed • Percentage of degraded ecosystems categorized • Number of degradation types identified (soil erosion, deforestation, etc.) • Percentage of degraded ecosystems by type • Number of factors contributing to degradation identified

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Enhancing marine ecosystem services through the development and implementation of dedicated wetland and coral reef restoration programs." .	5 year	MWE /EPA	MAIF / MSRA / UNAs URC/ K-M GBF GEF	8.0	• Number of programs developed • Number of habitat restoration programmes within marine protected areas or integrated coastal zone management ICZM • Proportion of land and sea covered by comprehensive spatial plans for biodiversity • Percentage of habitats within marine protected areas • Rate of change in land and sea use • Area of land and sea areas under restoration • .Increase the people's area Living coral • Low pollution rates in coastal waters
		Develop ecosystem restoration and implementation plans and community participation arrangements based on blended traditional knowledge, practices	5 year	MWE / EPA	MAIF / URC / CAPS / ID/ UNAs /MSRA /CSO / K-M GBF / GEF	2.0	• Number of Restoration and rehabilitation plans developed

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		and science based approaches					
		Implementation of artificial pasture activities for environmental sanitation and natural resource localization	2 year	MWE / EPA	MAIF / /URC/ AREA / /CSO / K-M GBF /GBF/ UNAs GEF /ID	2.0	• Number of recovery and rehabilitation plans developed • Effective implementation of management plans • Financial costs allocated or spend it to conserve biodiversity • Increase in the number of research studies focusing on environmental system recovery.
		Update: Water policies, regulations and tools	2 year	MWE	MWE /MOL/ MAIF / MPIC URC/ CSO / / ID / UNAs	**.500**	• Updated Water Strategy • Updated irrigation strategy • Updated Water Law
		Rainwater harvesting , programs rehabilitation of agricultural terraces ,and valley banks maintenance and preservation from erosion and deterioration	5 Years	MWE / EPA /	MPIC/ MAIF/ URC / AREA/ SDF / MEGI / PWP/ /CSO/ ID/	**10.0**	• Count the harvest programs • Amount of water harvested • Area of terraced agricultural land and reclaimed valley banks • Area of rehabilitated channels • Updated the water strategic plan

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Implement management plans for the conservation of terrestrial areas that fully integrate the ecosystem approach .into sectoral planning	5 Years	MWE / EPA	MPIC MAIF / AREA/ MPIC / URC / CSO /ID / K-M GBF / UNAs/ MEGI	2.0	• areas under restoration • Number of implemented administrative plans • Percentage of natural ecosystems with maintained and restored connectivity
		Identifying community economic livelihoods ,that support the poor and developing implementation plans To relieve pressure on ecosystems, community economic initiatives that support the poor include encouraging the use of alternative energy sources, production of livestock feed from invasive species such as Sesbania and Prosopis, as well as beekeeping and aquaculture.	3 years	MWE / EPA	MAIF ME /URC/ SDF / AREA CAC / /BankPS/CSO /ID / MEGI	20.0	• Number of community economic initiatives that support the livelihoods of the poor identified • Number of pro-poor economic initiatives that are operational • Number of beneficiary communities • Number of opportunities and jobs which was provided as a result For these activities • Extent of economic activity diversity available to poor communities • Rate of transformation to the use of alternative energy sources

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Integrating protected areas into the broader environmental context to reduce habitat fragmentation and enhance resilience to climate change. This includes integrated flood management and the creation of ,ecological corridors such as vegetated roadsides and stone retaining walls along wadi courses, to connect fragmented areas to protected areas and support the spread of wild plant species	4 Years	MWE/ EPA	MAIF /ME/URS / SDF/ AREA/ CAC / / Bank /PWP/ MEGI / CSO/ID / K-M GBF / UNAs / MEGI	5.0	• Number of pro-poor economic initiatives that are operational • Climate change adaptation improvement projects • Number and areas of rehabilitated drains and valleys • Area of distribution of wild plant species, their number and varieties • Increase in capacity Protected areas and local communities to adapt to climate change
		Establish community structures and collaboration mechanisms with government	6 months	MWE / EPA	MPIC MLA/CSO/ ID/ MPIC/ SDF/PWP	0.200	• Measuring community engagement • Number of societies in which well-defined community structures have been established.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		departments responsible for leading and coordinating community-level recovery and rehabilitation programs.					• Number of national legislation, policies or measures updated and implemented · • Community accountability mechanisms for resource use.
		Training community members on recovery programs according to the recovery and rehabilitation plans .developed .	Year	MWE / EPA	/CSO/ID/ MLA	.300	• Number of community members trained on ecosystem restoration and rehabilitation plans • Number of educational and training programs implemented • Capacity assessment of trainees in applying field skills
		Strengthening the management of nature reserves through a community-based approach	4 Years	MWE / EPA	/CSO/ID/ MLA/ UNAs/ K-M	3.0	• The number of reserves whose management has been strengthened . and developed • Number of local groups trained • Measuring the extent of improvement in awareness Local communities The .importance of reserves Natural

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Monitoring of biological diversity within reserves to assess improvements in their condition.
		• Implement the ecosystem restoration programme based on the restoration , plans developed And implement systems and practices in accordance with the ecosystem .approach • Monitor and evaluate long-term restoration .programmes	5 Year	MWE / EPA	MAIF / MF / MPIC /PWP / SDF / CSO/ ID/GEF / UNAs / MEGI	17.0	• Area of environmental systems completed for restoration, measured in hectares (including planting and rehabilitation of mountain terraces, valley banks, and agricultural land rehabilitation). • Areas under treatment and rehabilitation • Number of projects implemented • .Recovered areas • Assessing the commitment of different parties • Quarterly and annual monitoring reports
		Implementing community initiatives that support poor	5 Year	MWE / EPA	MAIF / PWP / SDF/ MF/ /CSO/ ID/ UNAs	5.0	• Number of communities that have benefited from pro-poor economic initiatives

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		groups, which were .previously identified			MLA		• Number of families and individuals employed • Revenue generated from economic initiatives
		Study and document the traditional knowledge of local communities in the field of land resource conservation and planning. And rationalize its use in a sustainable manner	Two years	MWE / EPA	MAIF / AREA /	0.150	• completed and documented studies • Create a national database • Number of Publication and guides
		Setup national and sectoral environmental databases and develop cooperation networks between all .environmental sectors	2 years	MWE / EPA	CAPS ID/ MAIF	0.500	• number Staff and the cadres • Electronic and digital databases available for those concerned . • Number of Network Central supported • Assessment Digital used In data .management • Accuracy and integrity of data measurement • Building trust between Various parties

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Develop an effective national energy strategy based on the ,use of low-carbon fuels support the use of renewable energy, and eliminate energy subsidies except for the .poor population	1 Year	MWE / EPA	MOE/ME/CAMA ID/MPIC/MoF / GCF	.500	• National Energy Saving Strategy
		Develop and implement response plans and introduce early warning system To monitor and observe climate changes and prepare emergency response programs to overcome any potential damage or threats of natural disasters	3 Year	MWE / EPA	MPIC /MAIF / MLA /MOI / MOH /CAMA / CSA /ID/ GCF / UNAs	10.0	• National Disaster Response Strategy • clear response plans • Number of implemented programs
		Implementation of environmental awareness programmes at the rural level	2 years	MWE/ EPA	CSO //URC/ID / MOE/ MOI	0.200	• ,Number of beneficiary communities • Percentage of increase in awareness of biodiversity.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		And raising the efficiency of civil society organizations working in the environmental field					
		Launching pioneering afforestation projects using local drought-resistant plant species	2 Year	MWE/ EPA /	SDF / URC /AREA /ID/MAIF / MLA/ CIF/ MEGI	0.700	• ,Number of trees planted • Area of reclaimed land. • Number of nurseries in leading areas

Goal 1 : Ensure that urgent conservation and restoration needs are met to halt species extinction

Outcome 1.0 : Well-functioning and restored ecosystems supported by effective protected area management.

Output 1.2 : Increased coverage of protected areas with improved operational management effectiveness

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, 20% of biodiversity-rich ecosystems should be conserved and managed under effective and interconnected terrestrial and marine protected areas with joint management systems, where local communities play an active role in conserving and managing existing protected areas.	**3**	undertake a un national assessment to identify highly biodiverse ecosystems across the country that can be declared as .protected areas	2 years	MWE/ EPA	MOT / MLA / URC/ ID	0.300	• A national report that highlightssensitive and species-rich .ecosystems • potentially highly diverse ecosystems As nature reserves
		Development of a Network of Nature Reserves to Represent Terrestrial Protected Areas in Yemen, with Efforts to Expand Its Coverage to More Than 10% of the Country's Territory.	3 Years	MWE / EPA	MOT / MLA / ID / URC MAIF/MPIC / UNAs / UNAs/	1.0	• Existence of maps defining the PAs network • Announcement of network decision • Establishment of a national database

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Consult with relevant stakeholders on proposed protected areas for approval and co-management .proposals	Year	MWE / EPA	MLA / MAIF / MoLA CSO /ID	0.250	• Number of communities consulted • Number of meetings and workshops was held with Stakeholders. • Stakeholder satisfaction rating regarding the management plan • Frequency of surveys to gather stakeholder opinions
		Review and strengthen the legal framework for decentralizing the management of protected areas in the country to enable the community to play an active role in the management of protected areas	6 months	MWE / EPA	MLA / MOLA / CSO/ ID	0.100	• Decress cisions and policies reviewed • Number of decisions and policies introduced to promote decentralization
		Implementing programmes to restore natural habitats such ,as wetlands mangrove forests, and coral reefs	4 Years	MWE / EPA	MAIF/ URC /URC / ID / /CSO / K-M GBF /GBF / UNAs	3.0	• .Area of restored wetlands • Area of restored mangrove forests • Restored areas of coral reefs

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Establishing a number of industrial pastures to compensate marine life for their environmental habitats
		Develop Community participatory protected area management plans	2 year	MWE / EPA	MLA/MPIC / CSO /ID/ /CSO / K-M GBF / UNAs	1.0	• Number of community-based management plans developed for local communities • Community satisfaction measurement About management plans and its positive impact
		Enhance institutional capacities in PA operational effectiveness	continuous	MWE / EPA	CSO /ID / K-M GBF / UNAs	11.0	• Number of trainees • Number of institutions that have been their capacities strengthened • Equipment and supplies • Number of researches and scientific studies • Increase environmental awareness In societies Levell
		Establish and improve a comprehensive system for the management and operational effectiveness of	3	MWE / EPA	CSO/ ID/	1.0	• Integrated management system • Number of reserves developed • Efficiency of communities in implementing tasks for the reserve

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		protected areas in Yemen					• Evaluation of the extent of application Laws and legislation Environmental protection • Protected areas • Evaluation of the effectiveness of programs Environmental restoration • Expanding the establishment new protected areas
		Enhancing the capacities of local communities on PA management	2 year	MWE / EPA/	MLA/CSO/ MLA	0.500	• Number of communities trained annually • Number of community members trained annually
		Improve institutional capacity to manage PAs effectively through training on the effectiveness of protected area management processes	2 year	MWE / EPA/	MLA/ /ID/ CSO / /CSO / K-M GBF	0.400	• Number of staff trained inPA management • Financial value of resources allocated to the concerned institutions • Reports Implementation Effective for legislation • Measurement of improvement in administrative efficiency through performance comparison before and after training.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Increase in the number of administrative plans developed and implemented.
		Implementation of biological and statistical studies of natural resources For reserves	6 months	MWE / EPA	MAIF/AREA /URC / CAPS	0.100	• Reliable and updated technical reports on the resources of natural reserves. • Number of biological and statistical studies for natural resources in reserves. • Number of reserves with updated biological and statistical data.
		Strengthening institutional capacities to effectively enforce legal legislation	2 year	MWE / EPA	MOLA/ /ID/ CSO	0.100	• .Number of employees appointed • The financial value of the resources allocated for implementation • Reports on the effective implementation of legislation • Number of employees appointed for enforcing legal enforcement. • Number of institutions with enhanced capacity for legal enforcement.
		Updating and reviewing national laws, regulations and legislation related to		MWE / EPA/	MOLA /MAIF / CSO /ID	0.800	• Updated Environmental Protection Law and National Regulations

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		the environment and its natural resources including Environmental Protection Law No. 26 .of 1995					• Established environmental courts to enforce the law Environment and Natural Resource Protection Laws • Established and operational an environmental police
		Identify wildlife corridors between ecosystems of ecological importance to enhance connectivity , And develop management plans to maintain intact wildlife .management corridors	Two years	MWE / EPA	MAIF / MAI / K-M GBF / URC /CSO /ID / UNAs	0.650	• Number of PAs connected by corridors • Number of lanes created • Area of aisles in hectares • Number of productive aisle management plans
		Develop a national , land use map identifying wildlife .corridors	Year	MWE / EPA	MAIF AREA /ID	0.300	• Existence of a national land use map that shows wildlife corridors and their connectivity
		Implement effective measures to preserve PAs and select suitable areas for establishing	2 year	MWE / EPA	MAIF / MAI / URC /CSO /ID	1.0	• Area of Pas established • Number of modern reserve areas and their spaces

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		PAs and areas proposed in the previous strategy as PAsand declare them			/MLA / AREA / CSO / ID		• Strengthening cooperation between different stakeholders (governments, NGOs, private sector) • Increase in employment opportunities in environmental sectors (environmental tourism, sustainable agriculture)
		Monitoring and evaluating the effectiveness of operation and management of .protected areas	Year	MWE / EPA	MAIF / MLA / MCT /ID / CSO	0.200	• Effective monitoring program • Evaluation report
		Preparing habitat conservation programs for major rare and threatened animal and plant .species and breeds		MWE / EPA	MAIF /AREA /CSO/ID	2.0	• Periodic technical reports • Number of habitat conservation programs developed for rare and threatened species. • Increase in the number of protected habitats for rare species.
		Inclusion of integrated coastal zone management to cover .all coastal areas	2 year	MWE / EPA	MAIF / MSRA URC CSO ID	1.0	• Integrated and updated plan • Effectiveness of institutions responsible for integrated management implementation

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Increase in the area of coastal reserve regions • Evaluation of the development and implementation of policies and legislation supportive of integrated management •

Goal 1: Ensure that urgent conservation and restoration needs are met to halt species extinction

Outcome 1.0: Well-restored functional ecosystems supported by effective protected area management

Outcome 1.3: Improved spatial planning of ecologically important ecosystems

Targets	Target	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030: 20% of areas of environmental importance should be under spatial planning and effective management. By 2050, all land in Yemen should be under spatial planning to prevent land use changes in biodiversity-rich ecosystems. This includes sustainably increasing the area, quality, connectivity, access to, and utilization of green and blue	1	Develop a comprehensive national land use policy that ensures spatial planning for all lands in the country	2 years	MWE / EPA	UP / AREA/ MOPW	0.200	• Developed national land use policy. • Increased alignment of land use with national priorities.
		Monitoring land use changes and identifying areas through remote ,sensing techniques including high-resolution satellite imagery, as well as issuing qualitative maps for land registration and land ownership documentation, in	5 Year	MWE / EPA	MOPW /UP / GISRSC / URS/ / ID	2.0	• Evaluation reports on land use change around ecological significant ecosystem • Timely land use change maps depicting changes around ecological significant ecosystems

Targets	Target	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
spaces in urban and densely populated areas..t		addition toNDVI . vegetation index maps					
		Establish a National Spatial Planning Unit to oversee the implementation of the National Land Use Plan .Policy	Two years	MWE / EPA	MPW/ GISRSC / URC / AREA / UNAs	2.00	• A functioning national spatial planning unit • Evaluation of improvement in institutional efficiency and resource management
		Develop national land use plans that identify environmentally sensitive areas and propose compatible uses for adjacent land.	Year	MWE / EPA	MPW/ GISRSC / URC / AREA /ID	0.300	• maps around environmentally sensitive areas • National land use plans developed. • Environmentally sensitive areas identified. • Community engagement in plan development. • Compatibility of adjacent land uses ensured.
		Integrate protected areas, connectivity corridors, and buffer zones into land use plans as a key element	Year	MWE / EPA	MPW/ GISRSC / URC / AREA /ID	0.300	• Number of protected areas integrated into land use plans. • Percentage of connectivity corridors included in spatial planning.

Targets	Target	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Area of buffer zones established within land use plans. • Percentage of land use plans incorporating conservation priorities.
		Increase institutional capacity to enforce national land use plans and zoning through increased manpower adequate resource allocation, and training to avoid land use changes around environmentally sensitive areas	3 Year	MWE / EPA	MPIC / MOF / MPW/ AREA / GISRSC / URC / AREA /ID / UNAs	1.0	• Number of staff trained in land use monitoring • Resources allocated to monitoring and implementing land use and .changes • Number of institutions whose capacities were built
		Establish land use structures in communities and create effective mechanisms for implementing land use plans, with the aim of	Year	MWE / EPA	MPIC / MOF / MPW/ AREA / GISRSC / URC / AREA /ID	0.200	• Number of communities with an approved land use structure. • Number of land use structures established in communities. • Percentage of communities with active land use management systems.

Targets	Target	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		controlling land use changes around environmentally .sensitive areas					• Number of community members trained in land use planning and management.
		Establish and implement a regulatory mechanism for land pricing, and registration	2 year	MWE / EPA	MPIC / MPIC / MOF /MPW/ AREA / GISRSC / URC / AREA /ID	0.100	• Number of community members .involved in land use monitoring • Clear and implemented mechanism • Increase in number Lands Registered With the new system
		Develop and implement ,national policies ,development plans		MWE /EPA	MPIC / MPIC / MOF /MPW/ AREA / GISRSC / URC / AREA /ID / UNAs	10.0	• Number of policies developed and implemented • Clear development plans • Investment programs in urban planning and infrastructure • Percentage of urban planning budgets that include biodiversity and sustainability values. • Number of infrastructure projects incorporating biodiversity conservation measures. • Amount of investment allocated for sustainability initiatives in urban development.

Targets	Target	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Number of road and infrastructure development projects integrating environmental considerations. • Evaluation of biodiversity outcomes in urban planning and infrastructure projects.
		Enforce Environmental Impact Assessment EIA and Strategic Impact Assessment SEA as tools to reduce land use changes .	conti nuou	MWE / EPA/	MPIC / MPIC / MOF /MPW/ AREA / GISRSC / URC / UP /ID / UNAs	0.700	• Ecosystem Services Mapping • Number of EIAs and EMP approved and operationalised • • EIAs Audits on the approved EIA
		Updating the national plan for the integrated management development and natural pastures of forests	2 year	MWE / EPA	MAIF /AREA/ ID	0.200	• Development and updating of the National Forest Plan

Goal 1: ensure urgent conservation and restoration needs to halt extinction of species

Outcome 1.0. well restored functioning ecosystems supported by effective PA management

Output 1.1.4. Prevent extinction for threatened species

Targets	**Target number**	Activities	**Duration**	**Lead agency**	**Partners**	**Budget US$ million**	**Indicators**
Take urgent measures to prevent extinction caused by human activities, natural factors, and climate changes for threatened species, and restore and conserve species to significantly reduce the risk of extinction. Additionally, preserve and restore genetic diversity within native, wild, and domesticated species communities. By 2030, list all endangered species under the Convention on International Trade in	**4**	Conduct a comprehensive national species survey to classify all wildlife according to the IUCN vulnerability index and conduct a comprehensive assessment of the reasons for classifying threatened species	Year	MWE / EPA	MAIF / AREA / CAPS /ID	1.0	• Red List of Ecosystems • extent of natural ecosystems • Detailed study On the causes of species loss
		Develop a strategic conservation plan for each threatened species to reverse the likelihood of their extinction	Year	MWE / EPA	MAIF / AREA / ID	0.200	• Strategy developed
		Develop a funding strategy for threatened	Two year	MWE / EPA	MPIC /ID	0.100	• Financing strategy in place • Revenue generated

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
Endangered Species of Wild Fauna and Flora (CITES) and implement specific conservation measures to reduce the risk of extinction caused by human activities for priority threatened species or their trade		species to implement the conservation plan					
		Strengthening the capacities and arrangements of institutions in conservation efforts and combating illegal hunting and trade of species, by allocating the necessary resources and providing appropriate training	Yearly	MWE / EPA	MLA /MOIA / MOF/ /ID/ MAIF / /CSO / K-M GBF	0.400	• Number of trained staff • Availability of resources for conservation and monitoring • Resources allocated for combating illegal fishing and poaching • Monitoring report for improvement

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Develop national poverty alleviation and reduction programmes, including economic initiatives targeting poor groups ,linked to biodiversity such as beekeeping and aquaculture to reduce illegal biodiversity activities.	4 Year	MWE / MPIC / MF / /EPA	MPIC / MF /MLA //MOLA /MOI/CA/ MAIF /AREA MSRA / ID / UNAs	7.0	• poverty index • Number of economic initiatives targeting the poor that have been implemented • Household income generated from the introduced activities • Number of communities supported • Measurement of income improvement in poor communities benefiting from the programs • Evaluation of income growth in poor communities after the implementation of initiatives
		Restoring connectivity between natural ecosystems and conserving biodiversity	5 year	MWE / EPA	MWE EPA MSRA /ID / /CSO / K-M GBF	0.450	• Conservation status of species in high biodiversity areas • Area of high biodiversity conserved • Conservation of landscapes and intact wilderness areas • .Increase natural forest cover • increase in tree cover

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							And the percentage of natural scenery
		Enhancing and establishing observation networks for meteorology, agriculture, and hydrology, along with an early warning system for droughts and extreme weather. Coastal and inland research stations will monitor climate conditions, while Doppler radar will improve precipitation measurement and weather forecasting.	5 year	MWE / EPA	/ CAMA MAIF / NWRA / AREA / UNAs / ID	7.0	• Number of monitoring networks • Regular monitoring reports • Accuracy Rating Weather forecasts the ability to predict floods And drought • Assessment of system integration with other systems, such as disaster • early warning system • Published information • Efficiency evaluation System • Database available
		Conduct a comprehensive assessment of the impact of climate change on marine resources, including seagrasses and coral reefs in the Red Sea	Year	MWE / EPA	MAIF and / MSRA /CAMA /ID / URC	0.100	Comprehensive assessment of climate risks to marine resources

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		and Gulf of Aden, to identify the underlying causes of the marine environment's vulnerability to climate change.					
		Conduct climate change risk assessments for biodiverse wetlands and coasts and identify the underlying causes of their vulnerability to climate change	Six months	MWE / EPA	MAIF / MSRA /CAMA / ID / URC	0.050	• Comprehensive assessment of climate risks to wetlands and coasts
		Conduct a comprehensive assessment of the risks of climate change on biodiversity and agrobiodiversity of the highlands and valleys and identify the underlying causes of .climate change	Year	MWE / EPA	MAIF / CAMA / ID URC/ NGOS	0.050	• Integrated report on the risks of climate change on biodiversity and agrobiodiversity For valleys And the highlands

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Enhance the natural adaptation of ecosystems to the impacts of climate change by identifying the resilience capacities of mangroves pasturesand coral reefs and complying with sustainable harvest levels	6 Months	MWE / EPA / CAMA	MAIF / CAMA / MSRA / ID /GCF	3	• Area of managed ecosystems • Area of managed pastures • Area of coral reefs managed

Goal 2: Safeguard ecosystems integrity through sustainable uses

Outcome 2.0. Sustainable use of ecosystems and their diversity

Output 2.1. sustainably managed agroecosystems

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, implement ecosystem-based approaches in all agricultural systems (agriculture, aquaculture, fisheries, and forestry) to ensure sustainable and safe food production in the future, conserve and restore biodiversity, maintain ecosystem services, including pastures and ensure that food production does not degrade due to ecosystem degradation	**10**	Develop a national sustainable agriculture strategy at the country level that includes a sustainable plan that outlines ecosystem-based approaches, nature-based solutions, and smart agriculture practices including soil ,and water management and integrated pest management	Year	MWE / EPA	AREA URC/ CSO ID / MEGI	0.400	• A national sustainable agriculture strategy has been developed • Number of farmers practicing sustainable practices • Percentage of agricultural area under productive and sustainable agriculture
		Develop a resource mobilization strategy to implement the National Strategy for Sustainable .Agriculture	Year	MWE / EPA	/AREA /MOF	0.100	• Revenue generated For sustainable agriculture • approved strategy

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Building the capacity of farmers and food producers to implement the National Strategy for Sustainable Agriculture through training and establishing agricultural .associations	Year	MWE / EPA /	MOF/AREA/ID MSAL / URC	0.150	• Number of trained farmers • Number of farmers practicing sustainable agriculture • Percentage of agricultural area under productive and sustainable agriculture
		Establishing gene banks for horticultural crops in different agro-ecological zones.	5 year	MWE	MAIF /MOLA / MOF/CSO / AREA /ID	1.0	Number of gene banks established. Percentage of agro-ecological zones covered. Amount of horticultural crop varieties stored. Rate of successful seed preservation. Number of crop species included in the gene banks. Frequency of gene bank management updates. Amount of genetic material accessed by researchers.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Strengthen institutional and technical capacities within the MAIF to implement the sustainable agriculture strategy.	2 years	MWE / EPA	MOF/AREA /ID	0.300	• Number of staff within MAIF trained in sustainable agriculture • Revenue allocated for implementation
		Eliminate harmful agricultural subsidies and replace them with environmentally sustainable tools	6 Months	MWE / EPA /	MWE / EPA / MF /MAIF / AREA / ID/ UNAs	0.05	• The value of subsidies and other incentives that promote unsustainable agricultural practices. • The value of available incentives that promote ecosystem-based agriculture practices.
		Increase the value of available incentives that promote ecosystem-based agriculture practices.	Year	MWE / EPA /	ID/ GASQ /FZA	0.100	• Percentage of agricultural area under productive and sustainable agriculture • Number of farmers practicing eco-labelling •
		Strengthening support for sustainable agricultural land management through integrated land and water resource management, and green	3 years	MWE / EPA	UNAs / MOF/AREA /ID	3.0	• Increase natural forest cover. • Institutional Capacity Assessment Agricultural on offer Support for farmers • Number and type of green technologies

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		technology in efficient irrigation.					• Rate of water consumption before and after the use of green technology •
		Rehabilitation of agricultural terraces to reduce water runoff and soil loss resulting from flooding.	4 years	MWE / EPA / MAIF	AREA SDF / PWP / /SCO	5.0	• Rehabilitated terrace area • Evaluation of the increase in agricultural yield due to improved water resource management • Evaluation of the reduction in soil loss due to improved water resource management
		"Implementing rehabilitation programs through the Green Middle East Initiative, including afforestation, agroforestry, sand dune and valley bank stabilization, protective belts, green belts, windbreaks, and drainage basin management and protection."		MWE / EPA / MAIF	AREA /SDF / CSO /ID / GMEI	6.0	• Soil and land rehabilitation programs • Aquaculture projects • Afforestation programs • rehabilitated valley banks • Green belts • Area of land reforested using native species. • Decrease in rates erosion on the banks Valleys and dunes Sandy
		Control the use of fertilizers pesticides and herbicides , through regulations.	2 year	MWE / EPA /	**AREA** /URC / MAIF	0.200	• Clear mechanismfor fertilizer management

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Clear mechanism for pesticide management • If the regulations are applied • Reduction in registered highly hazardous pesticides. • A database is available.
		Reviving traditional best - practices for pest control such as cutting or pulling weeds, crop rotation, crop diversity, and timing of planting and harvesting dates.	2 year	MWE / EPA /	AREA /MAIF /SCO / ID	0.300	• Documentary study of traditional practices to combat pests • Number of traditional agricultural methods Implemented
		Promoting integrated pest management	Two year	MWE / EPA /	AREA /MAIF /SCO / ID	0.100	• Existence of a clear mechanism for integrated pest management • Increase in the use of biocontrol and biological agents in pest management
		Strengthening capacities to inventory and monitor invasive marine species	Year	MWE / EPA	MSRA / URC	0.100	• Recording of a number of invasive species
		Support the mechanism for implementing laws	Year	MWE / EPA / MAIF	MOLA / ID / MAIF	0.020	• Mechanism for implementing and enforcing laws

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		related to the use of pesticides and fertilizers.					

Goal 2: Safeguard ecosystems integrity through sustainable uses

Outcome 2.0. Sustainable use of ecosystems and their diversity

Output 2.2. sustainable managed marine ecosystems

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.	**5**	Sconducting marine scientific research aimed at updating fish lists and monitoring their growth stages, natural environments and quantities of withdrawal from their marine stocks	2 year	MWE / EPA	MSRA / MAIF/ URC /ID	2.0	• Number of researches conducted over time • Data base on marine species
		Establishing a partnership with the leading marine research institutes at the regional and global levels.	continuous	MWE/ EPA /	MSRA/ URC/ MAIF /ID	0.500	• Signing of emoranda of understanding • Number of researches conducted through collaborations • Number of agreements and memoranda of understanding signed with regional and international institutions • Number of visiting research boats

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• number Participants in Research
		Develop a fisheries management development plan based on fish stock assessment with detailed annual sustainable fishing quotas for all fish species.	Year	MWE / EPA	MSRA/ URC/ MAIF /ID/ MOI	0.500	• Number of marine management plans produced • Percentage of fish stocks within biologically sustainable levels • Number of courses and workshops aimed at developing fisheries management
		Strengthening support to national fisheries) authorities MFW and (relevant stakeholders in conducting Monitoring and surveillance tools to reduce illegal fishing from .international vessels	Year	MWE /EPA	MSRA/ URC/ MAIF /ID	0.400	• Number of employees trained • Number of illegal fishing violations • Resources allocated to the Ministry of) Fisheries Wealth MFW (• Providing devices to monitor and control industrial fishing operations • A database is available.
		Restoration and rehabilitation of important fisheries breeding habitats such as mangrove systems, and the establishment of artificial pastures	2 years	MWE / EPA	Marine MSRA/ URC/ MAIF / ID / UNAs	2.0	• Areas under rehabilitation • Rehabilitated areas • evaluation space Areas The restored • evaluation Diversity Biological For plants and animals in Forests restored • Reagitating and studying environmentally degraded sites

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Develop a programme to monitor and regulate fishing methods, practices and techniques	Year	MWE / EPA	MSRA/ URC/ MAIF /ID	0.200	• Percentage of fish stocks within biologically sustainable levels • Monitoring program
		"Integrated Coastal Zone Management (ICZM) plans that support marine protected areas and implement monitoring and control programs along the coastline."	2 years	MWE / EPA	MSRA/ URC/ MAIF /ID /MLA/ MOF/ID	6.00	• Management plans updated • Increase in area Vegetation Coastal
		Enhanced and improved marine resources/Fishery legal framework	Year	MWEMinistry of Agriculture/Environmental Protection Authority	MSRA/ URC/ MAIF /ID /MLA/ MOF/	0.100	Updated regulations and legislation
		Establishing Environmental Justice and an Environmental Police force with equivalent deterrent powers."	cont.	MWE/ EPA	MOI / MOLA/ MoJ /ID / UNAs	3.0	• An established and operationalised Environmental Police Force • Resource allocated for the Environmental Police Force •

Goal 2: Safeguard ecosystems integrity through sustainable uses

Outcome 2.0. Sustainable use of ecosystems and their diversity

Output 2.3. sustainable managed forest and rangeland ecosystems

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%..	**5**	Conduct national assessment of forest resources and their sustainable yield to control fuel and medicinal .harvesting	Year	MWE / EPA	AREA /URC /ID	0.200	• Harvest rates for fuel wood and medicinal plants. • Total available forest resources
By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems'	**9**	Establish payments for ecosystem services related to fuel wood and medicinal plants based on a quota system	6 Months	MWE / EPA	AREA /MAIF / URC / ID	0.050	• Operationalised PESs Scheme • Users fees • Revenue generated annually.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
contribution to the national economy and community livelihoods by 10%, and by 70% by 2050.		Setup a quota for the indigenous communities and vulnerablegroups to exclude them from payments for ecosystem services.	cont.	MWE / EPA	AREA /MAIF / URC / ID /MOF	0.080	• Indigenous community access strategy • Number of indigenous with full access to forestry resources
		Establish and strengthen partnerships between government departments and communities to monitor and regulate harvest rates based Management plans a s.	Year	MWE / EPA	AREA /MAIF / URC/ MOF /MLA/ /AREA/ /ID	0.100	). Number of communities working with the government. . Reports on the number of incidents reported by communities.
		Identify alternative energy sources (methane production from livestock manure and use of invasive species to generate renewable energy) to reduce dependence on wood fuel.	3 Years	MWE / EPA	AREA /MAIF / URC / ID	0.500	• Alternative energy sources • Share of renewable energy in the household energy mix . • Number of households using alternative energy sources.
		Developing a Non-Wood Products(NTFPs) Value Chain Strategy To improve	Two years	MWE/ EPA	AREA /MAIF / URC / ID	0.200	• Number of households engaged in activities related to non-timber products(NTFPs)

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		income generation alternatives for communities and reduce pressure on forests.					• Share of household income from non-timber products(NTFPs).
		Establish a mechanism to monitor forest land use change.	6 Months	MWE / EPA	MOLA/ MARF /AREA/ MAIF/URC	0.100	• Monitoring mechanism Effective
		Strengthening community reserve management by establishing monitoring networks using modern technology	3 years	MWE / EPA	/MOLA / URC/ /ID	0.500	• Number of reserves equipped with technology, regular monitoring reports.

Goal 2: Safeguard ecosystems integrity through sustainable uses

Outcome 2.0. Sustainable use of ecosystems and their diversity

Output 2.4: Sustainable managed freshwater ecosystems

Target 5: By 2030, ensure harvest rates of all species are at or below the maximum sustainable yield to guarantee the conservation of all species and reduce illegal trade of species by 20%.	**5**	Conduct a country-level assessment of economic ,instruments (subsidies taxes, incentives) to assess their impact on .freshwater ecosystems	Year	MWE/ EPA	NWRA /MOF / MLA /ID	0.100	• .Report on economic instruments • The value of subsidies and other incentives .that are harmful to freshwater ecosystems • The value of environmentally friendly .incentives
		Undertake policy reforms to eliminate harmful subsidies and replace them with environmentally friendly tools	Year	MWE/EPA	NWRA /MLA /ID/ /MOF	0.120	• Value of subsidies and other incentives harmful to biodiversity • Value of environmentally friendly incentives
		Mapping and assessment of aquatic ecosystems in terms of level of degradation	2year	MWE /EPA	AREA / MF /MLA /ID/ / URC	0.400	• Mapping of aquatic ecosystems and their level of degradation • Assessment of degradation levels in aquatic ecosystems

		Develop a management plan for environmental conservation and sustainable utilisationr	3 years	MWE /EPA	NWRA/MLA /ID/ URS	0.600	• Size of area to be restored • .Develop and implement a recovery plan • Increase the area of protected areas And secure it • Long-term funding secured for the plan •
		Establish a joint management structure to implement the conservation and rehabilitation management plan for aquatic ecosystems.	5 Years	MWE	NWRA / AREA / MLA /ID UNAs /URC	15.0	• Area to be reclaimed • Implemented management plans • restored ecosystems • Monitoring improvement in system health Aquatic environment and increasing diversity Biological •
		Develop a comprehensive national plan to improve rainwater and fog , harvesting techniques	5 years	MWE	NWRA/AREA / MF /MLA / SDF / PWP/ URC/ UNAs	12.0	• Number of harvesting programs • areas Irrigated agricultural with water harvest
		development and implementation of integrated water management plans for , groundwater catchments and promoting efficient ,water management including reuse and	4 Years	/EPA / MWE	NWRA /MOF / MLA /MAIF /ID/ / UNAs/ URC	4.0	• Water consumption • Watershed Management Plans • Number of projects implemented • Evaluating the success of re-entry systems Use and recycling in Save water • Increase the amount of water available For agricultural use Industrial and domestic • A database is available.

		recycling, for surface and groundwater catchments					
		Improving water harvesting methods by renovating traditional water storage systems (water tanks/ Tanks) and construction in at least 10 mountainous areas.	5 years	MWE	NWRA / MAIF / MOF /MLA/ URC / UNAs	14.0	• Number of water harvesting programs • Number of beneficiaries • Increase in the amount of water stored After renewing and building the systems • Improvement in the quality of water stored in tanks
		Declaration and implementation of protection zones for degraded aquifers.	2years	MWE	NWRA / MAIF / MOF /MLA/ URC / MLA/ UNAs	0.500	• Number of declared areas • Amount of water saved
		Construction of dams and water reservoirs based on technical economic and environmental feasibility studies	5 Years	MWE	NWRA / MAIF / MOF /MLA/ URC / UNAs	7.0	• Number of dams implemented • Amount of water stored • Improvement in local water supplies and achieving water security
		Establishing desalination plants in at least four coastal areas.	5 years	MWE	NWRA / MAIF / MOF /MLA/ URC/ LWSC/ UNAs	45.0	• Number of projects implemented • desalinated water
		Promote water use efficiency in all economic sectors prioritising irrigation	5 years	MWE	MAIF / MF /MLA / ID/ **URC /** LWSC/AREA / UNAs	8.0	• Number of irrigation projects • Irrigated areas • Efficiency of water use in irrigation and reduction of water loss

							• Increased area planted with rain-fed crops and modern irrigation techniques • Increase in agricultural income for farmers as a result of improved productivity • Evaluation and comparison of the total costs of applying new technologies and their economic returns • number And type Technologies
		Conducting studies and surveys to determine suitable sites for ,constructing small dams ,diversion dams, barriers reservoirs and distribution canals.		MWE /EPA	MLA /ID/ NWRA/ MAIF / SDF/PWP	0.05	• ,Number of small dams, diversion dams barriers, reservoirs and distribution canals. • Number of beneficiaries
		Encouraging the reuse of treated water for irrigation.	3 years	MWE	NWRA/AREA / MAIF / MF /MLA / MEGI ID / UNAs	4.0	• Amount of water used • Monitoring of water treatment quality (percentage of pollution) against required standards • Regular assessment of water treatment quality
		Reducing freshwater pollution from industrial waste by imposing waste fees, providing soft loans and grants to finance the purchase of wastewater	continuous	MWE	NWRA //MOF / MLA /PS /ID/ / MEGI /**URC/** UNAs	1.0	• Waste fee mechanism • Amounts collected • Number of borrowers • evaluation bezel compliance • monitoring the Water Industrial quality

		treatment equipment, and issuing tradable emission .permits					
		Develop and implement local water basin management plans that take into account gender balance and climate change response.	continuous	MWE	NWRA / AREA / MF /MLA / ID	0.500	• Number of management plans for basins • Implemented projects • number Beneficiaries Based on on Gender • number Beneficiaries
		Reform the water withdrawal policy to ensure sufficient provision of fresh and safe drinking ,water for all Yemenis including women, local communities, and poor and vulnerable groups.	cont	MWE	NWRA/ / MOF / MLA / ID	0.200	• Clear water withdrawal policy • safe fresh water quantity • number Categories Beneficiary
		Raising public awareness about water resource management as a common and economic commodity.	Cont.	MWE	NWRA / MOF / MOI /MLA / ID	0.100	• Number of people and target groups and raising their awareness • number program Awareness

Goal 2: Safeguard ecosystems integrity through sustainable uses
Outcome 2.1 reduced pressure on ecosystems
Output 2.5. improved waste management and reduced pollution levels

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, significantly reduce pollution levels and the negative impacts of pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects and the ecosystems' capacity to absorb biodegradable pollutants. Achieve a 20% reduction in the use of agricultural chemicals and pesticides, and achieve 70% in recycling, reuse, and	**7**	Ban single-use plastic and promote the use of .reusable shopping bags	conti	MWE/ EPA	/MLA/ UNAs/ / ID/ URC /	0.500	• Proportion of plastic waste to total waste generated • appreciation density Plastic waste Floating (macro and Micro in column Water. •
		Conduct a detailed research study to identify and evaluate the effects of environmental pollution and direct and indirect severe damage to renewable natural resources, and the standard levels of the volume and type of	2 years	MWE	/AREA /MLA /ID /URC/ MOE	0.100	• Integrated Environmental Impact Assessment Study • Radiological evaluation • A database is available.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
reduction of plastic waste by 2050		radioactive pollution and .its various concentrations					
		Develop institutional capacity for waste management and ,promote reuse recycling/composting and waste disposal systems.	3 Years	MWE/EPA	/ CIF /MLA/ ID /NGOS / UNAs	1.0	• Amount of waste produced • Total aggregate applied toxicity • Number of facilities created for waste collection, sorting, and recycling • Number of staff trained in waste management and recycling • Increase in recycling rates and reuse of materials • Rate of waste converted into compost by members
		Develop a waste management plan for the country, including strategies for landfill sites and greywater treatment plans.	Year	MWE /EPA	UNAs /CIF / MOLA/NGOs / MEGI	0.400	• A number of landfills constructed and operationalised . • Amount of waste processed at landfills annually • Total aggregate applied toxicity • Coastal Recharge Potential Index
		Establishing a mechanism for collecting and disposing of hazardous waste, including waste	Year	MWE	MPIC/EPA UNAs/ ID/ URC/ CIF	0.250	• Clear and specific mechanism • Proper management of separation and disposal

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		from health facilities and .pharmaceuticals					• Number of incinerators for health facilities in operation • Monitoring of waste quality through periodic inspections • Compliance with national or international standards for waste quality
		Develop and operationalize a waste management sector financing strategy that ”includes “polluter pays principles and user fees to support the construction of waste management facilities	Year	MWE	MoF /EPA / UNAs /ID	0.500	• Revenue generated • Number of job opportunities created in the waste management sector • Number of waste management facilities completed during the year
		Developing programs for recycling waste in all its forms		MWE	MOF/ UNAs/ ID/ MIT / URC	2.0	• Number of recycling programs • Volume of waste recycled • Number of waste management facilities that have been finance and operate it efficiently

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Encouraging the transfer of advanced technologies in wastewater treatment.	2 year	MWE/ EPA	/UNAs /ID/ URC / LWSC	5.0	• Number of advanced technology • Levels of toxicity
		Enhance and Promote wastewater treatment and reuse for irrigation of green spaces or moving sand near roads and cities or irrigation of rehabilitated forests	2 year	MWE / EPA	/MAIF / UNAs / ID/ CIF /MEGI /	0.300	• Number of irrigation projects from treated water and irrigated areas • Quantity and type of fertilizers produced • Evaluation of wastewater treatment and reuse for irrigation of green spaces and quicksand on roads and near cities • Irrigation of rehabilitated forests and other uses in safe ways, and production of fertilizers from sludge. • Periodic evaluation of water quality for healthy exchange • Compliance with national or international water quality standards
		Preparing systematic research plans with official standards for the reuse of treated wastewater and developing mechanisms		MWE/EPA	/MAIF / UNAs / ID/ CIF /MEGI /	0.200	• standards for the use of treated wastewater • Specific quality control mechanism

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		to monitor the quality of this water and control its use.					
		Strengthening institutional support for the implementation of legal frameworks related to pollution	conti.	MWE/EPA	MOLA/ CIF ID / UNAs	1.0	• Number of illegal dumping sites • Compliance with environmental laws and procedures • Pollution reduction and natural resource preservation
		Monitoring waste management and pollution control efforts	conti.	MWE/EPA	MOLA / CIF /ID	0.05	• Annual reports
		Develop effective national waste management plans to reduce hazardous waste generated from industrial activities	Year	MWE/EPA	MOLA / ID / MIT	0.100	• management plan Industrial waste
		Establish and introduce appropriate waste recycling systems in major industries and reduce the impacts of wastewater and solid waste on .biodiversity	2 years	MWE /EPA	MoLA/ / MIT / ID /CIF	3.0	• Amount of solid and liquid waste recycled for large industries • Number of industrial wastewater and liquid treatment projects • Green belt area around and inside factories

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Establishing an - information center to organize and preserve data that will provide sufficient information on the state of pollution in the marine environment and develop appropriate plans .to address it	2 years	MWE	MAIF/AREA / MSRA / CAPS	0.600	• Number of qualified personnel • Center performance evaluation
		Rehabilitation and - maintenance of aquaculture centers to preserve endangered species as a model for dissemination	year	MWE	CAPS /MAIF/ UNAs/ ID	2.0	• evaluation of the center's efficiency and performance • The center is maintained and .rehabilitated • Number of working staff • Number of species raised

Goal 2 Protect the integrity of ecosystems through sustainable uses

Outcome 2.1 Reduced pressure on ecosystems

Outcome 2.6 Invasive species under control

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, prevent the introduction of any new invasive species into the country. Identify and take necessary measures to eradicate existing invasive alien species in environmentally priority sites and control them in lower priority sites.	**6**	Conduct a comprehensive assessment and eclassification of invasive species in the country And their path ways	2 years	MWE	MAIF // UNAs / ID / AREA/ MAIF	0.400	• Invasive alien species incidence ● Invasive species range ● Number of recorded invasive species
		Develop and implement national invasive species control and eradication l management plans .	Year	MWE	MAIF / / UNAs / ID / AREA	0.500	● .Management plan is in place ● Establishment rate of invasive alien species ● Invasive Species Coverage ● Number of invasive species
By 2030, train and enhance the competence of all relevant stakeholders in biosecurity measures to protect the	15	Preparing a financing and incentive plan to implement the national plan to combat and	Year	MWE	MOF / MOF / URC /UNAs /CA /ID	0.500	● consolidated revenue ● Number of invasive species for which funding has been allocated

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
country's biodiversity and human health, utilize environmentally friendly and health-safe biotechnology, and strengthen the control and ,supervision of the transfer processing and use of genetically modified organisms and related materials, while providing the necessary information to consumers in line with the Cartagena Protocol and national .legislation		eradicate invasive .species					● Revenue expenditures on - invasive species
		Strengthening the capacity development of relevant institutions to control invasive species and prevent their entry across borders and points of entry, by providing appropriate training and allocating .sufficient resources	cont.	MWE	CA/ /UNAs /ID /AREA/ MOI	1.0	• Establishment rate of invasive alien species • Invasive Species Coverage • Number of invasive species • Area cleared of invasive species • Efficiency of institutions in controlling invasive species • Institutional compliance with laws and policies on invasive species control • Use of modern technology in invasive species monitoring and control
		Develop a pro-poor poverty reduction strategy on using invasive species in poverty alleviation programmes, such as ,charcoal production ,livestock feed production	year s	MWEMini/ stry of Finance	AREA /UNAs /ID /MOLA/ MAIF	1.0	• Area cleared of invasive species • Revenue from managed invasive species products • Economic improvement in poor communities from targeted projects

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		and methane production as cooking gas					• Protection of biological diversity through invasive species control
		Develop a stakeholder engagement and participation strategy for invasive species control and management	Year	MWE / EPA	MOLA / MOF/AREA / MAIF/MOLA URC /CSO/ UNAs / ID	0.040	• clear strategy • Number of communities involved in invasive species management and control • Approved disinfection programs for invasive species
		Strengthen legal framework regulating the import and export (entry and exit of living (organisms.	6 months	MWE/EPA	/MOLA/ ID	0.030	• National law regulating and managing the import and export of living organisms
		Preparing programmes to monitor the spread of invasive alien species.	cont.	MWE/EPA	/ AREA/ MAIF / ID / K-M GBF	0.500	• Monitoring programmes for the spread of invasive alien species • Number of reports • Number of trainees • Ready and available database
		Create a database of invasive species and identify the most	Year	MWE	/AREA/ CAPS/ K-M GBF / ID	0.500	• Ready database • Report on the most dangerous species for ecosystems

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		aggressive species that affect ecosystems					• cooperation with research institutions in scientific research

Goal 2: Safeguard ecosystems integrity through sustainable uses

Outcome 2.1 reduced pressure on ecosystems

Output 2.7. climate resilient ecosystems

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Develop the NAP with specific components on ecosystem and biodiversity sectors	5 years	MWE	/MAIF / AREA / ID/ UNAs/ K-M GBF / MEGI	10.0	• National Ecosystem Plan • Rehabilitated spaces • Number of well managed areas • Carbon stock in restored ecosystem • Reduction in greenhouse gas emissions in restored ecosystems
		develop of a sectoral adaptation plan for ecosystems and biodiversity	5 years	MWE	/MAIF /AREA / UNAs / K-M GBF / GCF /ID	20.0	• Preparation of a sectoral adaptation plan for the ecosystem • Restored Ecosystem Area • Well-managed ecosystem area • carbon capture

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Revising NDCs to include biodiversity and ecosystems with a focus on ecosystem restoration and rehabilitation to absorb greenhouse gas emissions	5 year	MWE	/MAIF /AREA / UNAs / GCF/ / ID/ MEGI	30.0	• Greenhouse gas emissions from ecosystems • carbon capture • Increase in restored areas of wetlands, forests, and mangrove trees
		,Increase protected areas "restore "blue carbon ,ecosystems (mangroves seagrasses), and reforestation to mitigate greenhouse gas emissions through carbon sequestration	4 Year	MWE	/ ID / MAIF/ MIT/ CGF/ K-M GBF/ MSRA	3.0	• Number of protected areas • Area of new protected areas • Afforestation areas • Ready database
		Reducing emissions-induced ,forest degradation; land use land-use change and forestry(LULUCF) based on best management practices	5 year	MWE	CGF /MAIF / AREA / URC / ID	4.0	• Rehabilitated protected areas • Area of protected and restored lands • Rehabilitated forest areas • Developed and documented practices • low in an average deterioration Forests • Ready database
		"	5 year	MWE / EPA	MOF/ / ID / MAIF/ MIT/ CGF/ / MOLA	4.0	• low carbon national strategy development • GHG emission

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Develop and implement a country low carbon national strategy					

Goal 3.0: safeguard communities' access and equitable benefit sharing from biological/genetic resources and contribution to national economy

Outcome 3.1. improved access and equitable benefit sharing of biological resources to the communities

Output 3.1.1: increased number of communities with access to ecosystems, their functions and services

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, manage all ecosystems sustainably to increase the flow of ecosystem services and enhance ecosystems' contribution to the national economy and community livelihoods by 10%, and by 70% by 2050..	**9**	Restoration and rehabilitation of degraded ecosystems to enhance their capacity to deliver optimal ecosystem functions and services, in support of community livelihoods and the national economy	5 Years	MWE	/NGOs/ MOLA/GEF/ ID // K-M GBF	2.0	• Ecosystem services provided • Number of households benefiting from ecosystem services • Ecosystem contribution to household income • Area under restoration • Measurement of biomass increase for plants and animals in restored areas • Increase in productivity of agricultural lands and rangelands in restored areas

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Develop and implement programs to strengthen community capacity, enabling them to become effective partners in the management of ecosystems, including protected areas.	cont.	MWE/EPA	MOLA UNAs//NGOs/ ID	1.0	• Number of community training programs. • Community participation rate in management activities. • Partnerships with ecosystem management . • Community-led conservation initiatives. • Improvement in community ecosystem knowledge. • Protected areas with community involvement. • Increase in income from ecosystem services. • Community satisfaction with management roles.
		Strengthening legal frameworks to recognize communities as equal partners in ecosystem management	6 months	MWELeg/ al Affairs	MOLA/ /MOLA// CSO/ID	0.200	• Number of legal frameworks updated to include community involvement. • Percentage of communities recognized as equal partners in ecosystem management.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Number of community representatives involved in decision-making bodies. • Rate of legal recognition of community-led conservation initiatives. • Frequency of legal reviews to integrate community rights into ecosystem management.
By 2030, integrate urban green spaces (recreational) into urban land use planning, ensuring their connectivity with nearby ecosystems to enhance the flow of ecosystem services, improve human health and well-being, increase connectivity with nature, and contribute to overall sustainable and inclusive integration while	12	Develop community management and strategic plans for sustainable management of ecosystems and biodiversity	Year	MWE	/MOLA /NGOs/ID	0.100	• Number of community management plans developed. • Percentage of ecosystems with a sustainable management plan in place. • Number of biodiversity conservation strategies implemented at the community level. • Rate of community involvement in ecosystem and biodiversity planning.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
providing essential ecosystem functions and services							• Frequency of updates to community management and strategic plans.
		Designing a national community value chain strategy for biological resources, aimed at enhancing community participation to maximize benefits for society and the national economy.	Year	MWE/EPA	MOF /MOLA NGOs / //ID	0.100	• Number of communities involved in the design process. • Percentage increase in community participation in the value chain. • Economic impact from the value chain on local communities. • Increase in income for communities engaged in the value chain. • Proportion of biological resources integrated into the national value chain.
		Promote the adoption of an ecosystem-based approach to enhance the contribution of the ecosystem in production processes such as food production	2 years	MWE/ EPA	/MOLA /NGOs/ID /MAIF / K-M GBF	1.0	• Increase in ecosystem-based practices adopted in production processes • Improvement in food production linked to ecosystem services

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Number of training sessions on ecosystem-based approaches • Area managed using ecosystem-based approaches • Increase in stakeholder engagement in ecosystem-based practice.
		Strengthening partnerships between communities and the private sector in the genetic resources manufacturing sector	2 years	MWE	/MOLA /NGOs/ID / K-M GBF/AREA	0.500	• Number of partnerships established between communities and the private sector. • Increase in community income from genetic resource manufacturing. • Number of genetic resource-based products developed. • Percentage of private sector investment in genetic resource projects. • Capacity-building programs for communities in genetic resource manufacturing.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		Design and implement an ecosystem services plan with beneficiary communities	3 years	MWE	MOLA /NGOs/ID /UNAs	1.0	• Number of ecosystem services plans designed and implemented. • Percentage of beneficiary communities engaged in the plan. • Increase in ecosystem services' value to communities. • Number of training sessions conducted for community stakeholders. • Improvement in community livelihoods due to ecosystem services. • Area of ecosystems restored or conserved under the plan. • Percentage of community participation in plan activities. • Increase in biodiversity levels in managed areas.
		Increase the resilience of communities and	5 years	MWE /EPA	MOLA /NGOs/ID /UNAs	1.0	• Number of disaster-resilient community plans developed.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		ecosystems to natural disasters					• Increase in ecosystem areas restored for disaster mitigation. • Percentage of communities trained in disaster resilience. • Reduction in disaster-related damages to ecosystems. • Improvement in community livelihoods post-disaster.
		Strengthen the resilience of communities and ecosystems (agriculture, forestry, and rangelands) to adapt to the impacts of climate change.	5 years	MWE/ EPA	/AREA / MOLA /NGOs/ID /UNAs / NGOs/ /ID / MEGI	1.0	• Percentage increase in climate-resilient agricultural practices adopted by communities. • Area of ecosystems (forests, rangelands) restored or adapted to climate change. • Number of community members trained on climate resilience techniques. • Reduction in losses to agriculture and ecosystems due to climate-related events.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Increase in water and soil conservation measures implemented.
		Regulating land use by issuing a fair system for land ownership and rental.	Two years	MWE/ EPA	MOLA /NGOs/ID /UNAs	0.200	• Percentage of communities benefiting from the fair land ownership system. • Frequency of land use regulation updates. • Increase in the number of land disputes resolved through fair systems. • Percentage of agricultural land rented under regulated terms. • Number of public awareness campaigns on land use rights and regulations. • Rate of land utilization efficiency under the new system.
		Recovering public lands illegally seized by individuals and making them available for	4 years	MWE / EPA	MOLA /NGOs/ID /UNAs	1.0	• Amount of public land recovered

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		agricultural development and poverty eradication					• Percentage of recovered land allocated for agriculture • Number of beneficiaries from land redistribution • Increase in agricultural productivity on recovered lands • Reduction in poverty rates in areas with redistributed land • Number of legal actions taken to recover land
		Establishing small income-generating projects in agriculture, fisheries and forestry and establishing the Agricultural and Cooperative Bank(CACBank) to enable the poor to obtain loans at reasonable interest rates for use in project .development	5 Years	MWE / EPA	MOLA /NGOs/ID /UNAs / / CAC / / Bank /MAIF NGOs// MEGI	5.0	• Number of small income-generating projects established in agriculture, fisheries, and forestry. • Amount of loans disbursed by CAC Bank for agricultural development. • Percentage of beneficiaries from the poor community accessing loans. • Number of projects developed through financial support from CAC Bank.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							• Increase in income levels of beneficiaries from small projects. • Number of cooperatives benefiting from CACBank services.
		Enabling the poor to access water by imposing fair quotas for the distribution of flood water between upstream and downstream in watersheds, setting reasonable water tariffs ,for the poor in rural areas developing legally accepted and protected water rights, and eliminating subsidies for pumping water for qat .cultivation		MWE/EPA	MAIF/NGOs/ MOLA/ ID	0.500	• Number of poor beneficiaries with access to water • Number of shares distributed • Tariff amounts • Number of fields developed • Amount of water collected
		Reallocate 1% of the government budget to national development funds to be redirected		MWE/ EPA	MOLA/ MOF/MAIF //NGOs/ID	5.0	• Percentage of government budget reallocated to rural employment opportunities.

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		towards creating employment opportunities in rural areas, while implementing construction activities planned under the National Biodiversity Action Plan3					• Number of job opportunities created in rural areas. • Progress in implementing construction activities under the National Biodiversity Action Plan. • Amount of funds directed toward rural development projects.

Goal 3.0: safeguard communities' access and equitable benefit sharing from biological/genetic resources and contribution to national economy

Outcome 3.1. improved access and equitable benefit sharing of biological resources to the communities

Output 3.2. increased income generation from the genetic resources

Targets	**Target number**	**Activities**	**Duration**	**Lead agency**	**Partners**	**Budget US$ million**	Indicators
By 2030, ensure that all companies transparently disclose profits from the use of genetic resources and potential risks to ecosystems, and implement effective risk mitigation systems while ensuring fair benefit-sharing with communities.	14	Enact national legislation for the fair and equitable sharing of genetic benefits	2years	MWE	MAIF /MOLA / MOF/ /MOLA / CSO /ID	0.030	- proportion of total revenue made from genetic resources going to the communities . - Percentage of genetic resources under formal protection or regulation. - Amount of financial resources allocated for genetic benefit sharing programs. - Number of institutions implementing genetic benefit-sharing laws.
		Develop a national value chain strategy for the NTFPs aimed at improving benefit sharing for the lower value	5 months	MWE /EPA	MAIF /MOLA / MOF/ /CSO / AREA /ID	0.100	Revenue generated by the communities/household from NTFPS

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		chain activities that involve the local communities					
		Develop a national partnership strategy to promote partnerships between local communities and (multi) national corporation	6 months	EPA	MWE, MAI, AREA, MFW, MSRA, SFNC, NGOS, UNDP	0.100	• Number of biodiversity related businesses under community-private partners - Revenue generated to the communities
		Encourage and expand plant and animal diversity to achieve sustainable agriculture	years 3	MWE /EPA	MAIF /MOLA / MOF/CSO / AREA /ID	2.0	• Number of projects implemented • Number of farmers adopting sustainable agricultural practices • Increase in the production of diverse agricultural products • Reduction in the use of chemical inputs in diverse agricultural systems • Number of training programs for farmers on sustainable practices

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning processes (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels	**13**	"Develop and implement a national strategy for the value chain of non-timber forest products, aiming to enhance benefit-sharing mechanisms for low-value chain activities involving local communities."	years 5	MWE/ EPA	MAIF /MOLA / MOF/CSO / AREA /ID / MEGI	2.0	• National strategy for non-timber forest products developed and implemented. • Number of local communities involved in non-timber forest product activities. • Increase in income from non-timber forest products for local communities. • Number of benefit-sharing mechanisms established for local communities.
		Develop a national partnership strategy to enhance partnerships between local communities and (multinational) companies	1years	MWE / EPA	MAIF / MOF/ MOLA/ /NGOs / ID	0.080	• Number of companies linked to the ecosystem under the private community partnership • Revenue generated for communities
		Building the capacity of local communities to establish and operate gene-based enterprises to exploit genetic resources through	1year	MWE / EPA	MAIF /MOLA / MOF/CSO / AREA /ID	0.050	• Number of community-run gene-based businesses • Revenue generated

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		training and the establishment of cooperative structures					• Number of communities whose capacities were built
		Conduct research to improve knowledge and understanding of the distribution and importance of genetic diversity	cont	MWE/EPA	MAIF /MOLA / MOF/CSO / AREA /ID	0.200	• Research and studies of genetic species
		Periodic updates to the national biosafety database or clearing house mechanism(CHM)	cont	MWE/ EPA	MAIF /MOLA / MOF/CSO / AREA /ID	0.04	• Updated data • Constantly updated database
		Collecting genetic resources and documenting, improving and disseminating traditional knowledge	cont	MWE/EPA	MAIF /MOLA / MOF/CSO / AREA /ID	0.300	• Number of species and varieties collected and documented • documented traditional knowledge

Goal 4: Adequate means to support implementation of biodiversity conservation

Outcome 4: Adequate resources for the implementation of the NBSAP III

Output 4.1. reduced financing gap for NBSAP III

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, mobilize financial resources from all funding sources sustainably to bridge the biodiversity financing gap by 20%, and increase it to 80% by 2050.	17	Develop a biodiversity financin strategy that ,identifies financing gaps sources of financing(domestic public) finance, domestic private ,finance, multilateral finance bilateral finance, innovative finance, etc.) and strategic activities to mobilize finance from different sources	2years	MWE / EPA	MAIF /MOLA / MOF/CSO / AREA /ID	0.400	• Operational Biodiversity Finance Strategy • International public financing for the conservation and sustainable use of biodiversity and ecosystems • Domestic public financing for the conservation and sustainable use of biodiversity and ecosystems • Private financing (domestic and international) for the conservation and sustainable use of biodiversity and ecosystems
		Building the institutional capacity of relevant institutions to mobilize	Year	MWE	MAIF /MOLA / MOF/CSO / AREA /ID	0.050	• Operational Biodiversity Finance Strategy

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		funding from international sources, by training them to develop proposals and strengthen the necessary institutional arrangements					• International public financing for the conservation and sustainable use of biodiversity and ecosystems • Domestic public financing for the conservation and sustainable use of biodiversity and ecosystems
		Develop a strategy for stakeholder engagement and participation to enhance community contribution through in-kind resources (labor resources) in biodiversity management and conservation	Year 1	MWE /EPA	MAIF /MOLA / MOF/CSO / AREA /ID	0.050	• Number of communities participating in sustainability and environmental conservation programmes • Value of community human resources in participating in conservation and sustainable use programs
		Design and implementation of PES plans	Two years	MWE	MAIF /MOLA / MOF/CSO	0.030	• Revenue generated from the ecosystem payments system
		Establish an environmental protection fund to manage funds allocated and	2 years	MWE /EPA	MOLA /MOL / MOF/CSO /ID	0.300	• Operational Biodiversity Fund

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		generated by biodiversity from all sources					
		Develop and integrate a resource mobilization strategy into the third National Biodiversity Strategic Plan that has the capacity to secure the necessary funding for its implementation	conti	MWE / EPA	MOF/ID /UNAs	0.400	• Resource Mobilization Strategy for the Implementation of the BiodiversityAction PlanIII
		Increase government funding for the implementation of the third phase of the National Biodiversity Strategy to meet the necessary funding needs,	cont	MWE/ EPA	MOF / /ID	0.050	• Value of local financing • Increase rate

Goal 4: Adequate means to support implementation of biodiversity conservation

Outcome 4: Adequate resources for the implementation of the NBSAP III

Output 4.2: information and data and knowledge is available and accessible to decision makers

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, ensure an adequate scientific base, transfer traditional knowledge, enhance scientific research capabilities, monitoring capabilities, encourage innovations, and enable stakeholders to design, implement, and use advanced technology to conserve biodiversity. Ensure unrestricted access to necessary information,	**18**	Establish strong partnerships with local and international research institutions for joint research initiatives in the field of biodiversity	2 years	MWE/ EPA	MFAE / MPIC /UNAs /ID	0.100	• Signing of a Memorandum of Understanding and Agreement between Local Institutions and Regional and International Research Institutes • Number of biodiversity-related ,research conducted by local regional and international research institutes
		Develop and implement communication strategies to transfer knowledge and information among stakeholders	2 years	MWE / EPA	MAIF /AREA / MOLA / / NGOs /MOI	0.050	• An existing platform for the transfer of information and .knowledge

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
data, and technology for all stakeholders, including community members, involved in biodiversity management and conservation.		Building the capacity of communities, women and children in relation to available technologies and gathering information and knowledge	cont	MWE /EPA	MAIF /AREA / MOLA / / NGOs /MOI	0.060	• Number of women and children trained in available techniques • Number of community members trained on available technology
		Research and documentation of traditional practices related ,to biodiversity conservation restoration and sustainable management practices	cont	MWE/ EPA	MAIF /AREA / MOLA / / NGOs /MOI	0.110	• Number of documented traditional practices • Number of ecosystems, area protected under traditional environmental practices
		Training communities in scientific research with a focus on women and youth	2 years	MWE/ EPA	MAIF /AREA / MOLA / / NGOs /MOI / URC	0.050	• Number of women and youth trained in scientific research • A database is available.

Goal 5: use of appropriate economic instruments to create an enabling environment for sustainability

Outcome 5.0: A conducive environment for sustainable ecosystem management

Output 5.1. Mainstreamed economic value of ecosystems in national planning processes

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, engage communities in the value chain of products obtained from ecosystems in their surroundings and ensure fair rewards for managing, harvesting, and using genetic resources. Integrate the total economic value of biodiversity and ecosystems into national planning process (national development plans, poverty reduction plans, national accounting systems) at national, regional, and sectoral levels.	**13**	Build and strengthen Institutional capacity on ecosystems valuation and mainstreaming approaches through training and hiring relevant experts	1YEAR	EPA / MWE	MOF, MWE, MAI,	0.030	• Number of employees trained on ecosystems valuation and mainstreaming • Number of expert hired on valuation and mainstreaming
		Undertake Periodic ecosystems valuation exercises throughout the country	1 YEAR	EPA /MWE	MAIF/ URC / MPIC / MSRA	0.100	• number of ecosystem valuation annually
		Develop the sustainable income account framework for the country which incorporate value of natural resources		MWE/ EPA	MOF / MOLA		- an existing sustainable income account framework • estimated sustainable national income for the country
				MWE / EPA	URC /MOF / ID	0.100	• Number of staff trained to assess the impacts of

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							monetary instruments on ecosystems
		Design and operational Payment scheme for Ecosystems Services (PES).		/ MWE/ EPA	MOF,	0.100	• Number of users fees operational for ecosystem in the country

Goal 5: use of appropriate economic instruments to create an enabling environment for sustainability

Outcome 5.0: A conducive environment for sustainable ecosystem management

Output 5.2. market corrected from distortions

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, halve the monetary value of subsidies harmful to biodiversity and promote environmentally positive incentives targeting green technologies, ecosystem-based programs, and clean and renewable energy	**16**	Design and operate the country's payment ecosystem services scheme for all ecosystems such as water resources (water extraction), fertilizer use internalizing the cost of) ,(pollution to the environment fisheries, and firewood harvesting (sale of permits)	3 years	MWE /EPA	MOF / NWRA/ MAIF/ AREA/ /ID / MSRA	1.0	• A national Payment for ecosystem services plan has .been developed • Number and value of user fees applied to ecosystem ,services (water extraction (.firewood, etc
		National assessment of monetary instruments (subsidies, taxes, incentives) and their environmental impact and identification of environmentally friendly incentives based on international best practices	6month	MWE/EPA	MOF/ /ID	0.020	• Number of monetary instruments assessed for environmental impact • Identification of environmentally friendly incentives • Assessment of subsidies, taxes, and incentives based

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
							on international best practices • Percentage of environmentally beneficial incentives introduced • Development of recommendations for improving monetary instruments
		Develop strategies to reallocate revenues from harmful subsidies to ecosystem-friendly incentives		MWE / EPA	MOF /ID	0.100	• Number of subsidies faced • Number of incentives offered
		Capacitate relevant institutions on systematic approach to assess the impact of the proposed economic incentiveS prior to implementation		MWE	MOF / ID	0.100	• Number of staff trained to assess the impacts of monetary instruments on ecosystems

Goal 6: Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

Outcome 6.1. good governance in ecosystem and biodiversity management

Output 6.1.1. revised legal and policy framework

Targets	Target	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
: By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable,	19	Review existing decrees policies and laws to ensure that the legal framework recognizes communities as equal partners in natural .resource management	6 months		MOLA /MPIC / ID	0.100	• Number of decrees/policies reviewed for community inclusion • Number of consultations held with communities during review • Implementation of legal reforms to ensure equal partnerships
		Reviewing the legal framework to promote decentralization in the management of ecosystems such as protected areas	6 Months	MWE / EPA	MOLA/ MOF/ ID	0.050	• Number of legal documents reviewed for decentralization • Percentage of ecosystem management policies

purposeful, and informed participation at all levels of environmental action and biodiversity-related decision-making							reflecting decentralization • Number of stakeholders consulted in the review process • Number of protected areas with decentralized management systems
		Develop community-based sustainable management plans for the protected area and other sensitive .ecosystems	2 years	MWE / EPA	MOLA /ID	0.100	Number of management plans developed

Goal 6: Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

Outcome 6.1. good governance in ecosystem and biodiversity management

Output 6.2. restructured institutions

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of	**19**	Each concerned department should set a goal to increase the ,representation of women youth, vulnerable groups (people with disabilities) and indigenous groups to ensure equitable representation in decision-.making	Year	MWE/ EPA	CSO/ MSA /VGA / ID	0.050	• Number of women, youth and local staff in relevant departments/ministries
		Establish a community focal point (liaison officer) for community .engagement	6 Months	MWE /EPA	MSA / VGA /CSO /ID	0.020	• A community engagement and coordination liaison officer .has been appointed • Number of trainees from local communities
		Strengthen collaboration with institutions and	cont	MWE /EPA	CSO/ MSA /VGA / ID	0.020	• Effective communication and collaboration channels

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
environmental action and biodiversity-related decision-making		departments that deal ,with communities ,indigenous peoples gender groups and . vulnerable groups					• Clear cooperation mechanism
		Strengthening the capacity and capabilities of research institutions to produce meaningful research on the status and trends of biodiversity and ,ecosystem loss community engagement and enhancing the role of vulnerable groups, women and children	2year	MWE/ EPA	CSO/ MSA /VGA / ID	0.100	• Number of published researches • Training and seminars • Published reports • number Participants in Research
		Create cohesive and resilient ecological networks supported by restructured policies and appropriately empowered and empowered local communities and institutions for the sustainable and equitable		MWE /EPA	/MOLA CSO/ MSA /VGA / ID	0.050	• Number of cohesive ecological networks • Number of restructured policies • number Subscribers in The network

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
		use of natural capital of importance to human well-being and economic prosperity					

Goal 6: Strengthening ecosystems governance and institutional capacities, and arrangements for improved ecosystems management

Outcome 6.1. good governance in ecosystem and biodiversity management

Output 6.3. well-equipped and trained community

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
By 2030, ensure fair and reasonable representation of women, youth, and vulnerable groups in committees, working groups, and departments whose primary mission is biodiversity management. Adopt a gender-responsive approach to ensure the effective participation of women, vulnerable groups, marginalized communities, and youth in achieving national and international biodiversity Targets, providing them with opportunities to access natural resources and ensuring their fair, equitable, purposeful, and informed participation at all levels of environmental action and	**19**	Design training programmes for the community on co-management for ,protected areas community-based protected area management, financial .management, etc	2 year	MWE /EPA	URC / CSO /MOF / MOLA /ID	0.100	• A training manual for communities has been developed • Number of community members trained in nature reserve management
		Establish community structures for protected ,area management ,ecosystem management .etc	Year	MWE/ EPA	CSO /MOLA / ID	0.020	• Number of communities with functional community structures to operate nature reserves and ecosystems
		Design community-based ecosystem management plans and train communities to create .structures on this basis	Year	MWE/ EPA	/URC/CSO/MOLA / MOF	0.030	• Number of community management plans produced

Targets	Target number	Activities	Duration	Lead agency	Partners	Budget US$ million	Indicators
biodiversity-related decision-making		Strengthening community capacities on sustainable use of natural resources to combat poverty and promote ways of living in harmony with nature	cont	MWE /EPA	/URC/CSO/MOLA / MOF ID	0.100	• Number of trainees in income-generating. • Number of small projects for local residents